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Reducing food waste in Sunyani, Ghana: Experiences of managers and supervisors in the food services industry

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Abstract
Food waste is a significant global issue affecting food systems, especially food availability and management. This study examines the challenges undermining food waste management in the food service sector, probing its causes and potential strategies for reduction from a managerial perspective. The study uses a cross-sectional survey design and a mixed methods approach to collect and analyze qualitative and quantitative data. The study found that food waste in the food service industry is a significant issue, with 75% of food vendors not engaging in food waste sorting and food waste reduction. It argues that effective inventory management, proper storage practices, and regular fresh produce procurement as crucial strategies for reducing food waste and promoting healthier food choices. Staff training, incentives, and consumer engagement are also essential for food waste reduction, contributing to global food security and sustainable practices.

Keywords
Food Waste; Service Industry; Inventory Management; Sustainable Practices; Managerial Strategies

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1. Introduction

Food waste is a major challenge across diverse food system [1]. The Food and Agricultural Organization of the United Nations (FAO) noted that about one-third of the food produced globally is wasted [1], amounting to 1.3 billion tons annually. In Africa, 66 percent of fruits and vegetables, 40 percent of root crops, and 21 percent of grains are wasted yearly [2]. Approximately 37 percent of food is wasted annually in sub-Saharan Africa[3]. Furthermore, 3.2 million tons of food are either lost or wasted along the supply chain in Ghana [4]. Therefore, food waste has attracted much attention and is becoming a priority in most developed and developing countries. Food waste is generated from the processing, distribution, retail and food sales, and consumption [5]. Food waste has a high carbon, water, and ecological footprint [6]. Due to the increasing quantity of food waste, emissions estimated for 2020 rose to about 240 million tons of carbon dioxide equivalent gas in 2010 [7]. Methane gas is produced when food waste decomposes under anaerobic conditions at food waste landfills, with methane presenting a global warming potential 25 times higher than carbon dioxide [4]. This significant food waste generates large amounts of greenhouse gas emissions, causing climate change.

Moreover, the transformation of food waste is central to achieving the 2030 Agenda for Sustainable Development [3]. In particular, the Sustainable Development Goal 12 embodies food waste as a significant global issue and sets a specific target SDG 2,6,8 and 13 [8], which is to have per capita global food waste at the retail and consumer level and reduce food waste along the production and supply chain. Thus, enhancing food waste reduction is critical to achieving many other SDGs, which include SDG 2 - Zero hunger; SDG 6 - Clean water and sanitation; SDG 8 - Decent work and economic growth; SDG 11 - Sustainable cities and communities; SDG 12 - Responsible consumption and production; and SDG 13 - Climate action [8]. Unfortunately, food waste is one of

the biggest problems facing many countries [9]. Food waste occurs when the food service sector fails to plan, leading to over-purchasing, which results in food passing their "best before" dates [6].

In Ghana, food waste in the food service sector is either thrown away or used to feed animals rather than used for composting, biogas, or energy, which is a more sustainable practice [3]. Food waste adversely impacts food security, the environment, and the economy, making it a national challenge that requires scholarly and policy attention [2]. Studies undertaken on the causes, impacts, and potential solutions to reduce food waste in the food service sector are scanty. For instance, studies on food waste have largely focused on developing countries that have the capacity and resources to combat food waste. Despite the seemingly wide recognition of food waste and the need to drastically reduce it, in African cities, the opposite is happening. For instance, most urban areas in Africa dominantly feature weak and dysfunctional waste management systems that worsen the capacity of food vendors to sustainably manage their food waste. Some studies [2, 7, 10, 11] have explored food waste using a single establishment such as university canteens as case studies with limited empirical studies focusing on food waste reduction in major Ghanaian secondary and transition cities such as Sunyani, notwithstanding their increasing relevance in the global food waste management dynamics. For example, [2] examined the drivers and barriers to food waste reduction. It is therefore yet to be convincingly established in the Ghanaian context how the food service industry is reducing food waste. This study, therefore, assesses strategies for reducing food waste in the food service sector in the Sunyani municipality of Ghana. Specifically, it explored the state of food waste in the food service industry and analyzed the strategies for reducing food waste in the food service industry.

2. Study area and methodology

2.1 Study Setting

Sunyani Municipality is one of the 12 districts in the Bono Region of Ghana- serving as its capital. Located between 70°20' and 70°05' north latitude and 20°30' west longitude and 2010' west longitude, it borders Sunyani West City to the north, Dormaa East District to the west, Asutifi North District to the south, and Tano North Municipality facing east[12]. There is effective economic and social interaction with neighboring districts, facilitating the flow of resources between these districts. According to the 2021 Population and Housing Census, Sunyani City has a total population of 193,595, 16% of the region's total population. The population comprises 49.8% male (96,358) and 50% female (97,237). 156,343 of the population live in urban areas and 37,252 in rural areas. The surrounding natural landscape serves as the foundation for Sunyani's tourism industry [12]. The Municipality's total land area is 829.3 square kilometers (320.1 square miles). One-third of the total land area is uninhabited or cultivated, providing arable land for future investment (Medium-term plan, 2022-2025).

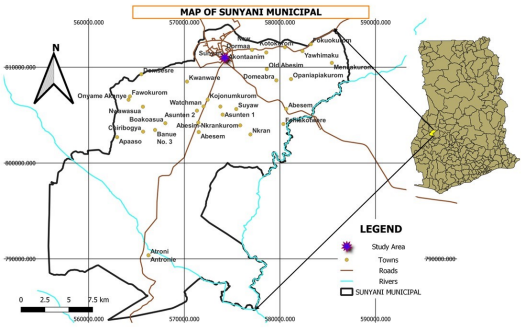

Figure 1. location of Sunyani Municipality on the Ghana map.

Source: Authors' construct, 2023.

The economy of Sunyani is predominantly based on agriculture, with approximately 48% of the population involved in farming. The service sector employs around 24% of the population, followed by commerce at 15% and industry at 13%. The municipal assembly manages waste through 52 sanitary sites, using communal centralized containers (CCC) for solid waste collection and disposal[12]. Daily, trucks collect waste from these sites for final disposal at a specific site managed by Waste Landfills, a subsidiary of Zoomlion Ghana Company Limited. For liquid waste, the assembly and Zoomlion Ghana Company Limited use vacuum-equipped trucks to empty cesspit tanks, with some contents discharged into the Assembly's Oxidation Pond [13]. The city is growing rapidly to engulf surrounding suburban communities. However, due to its rapidly growing population and emergence as a mining and educational hub and other anthropogenic activities in the rapidly growing city, there is significant growth of the food service industry especially restaurants, hotels and hospital and educational canteens, and food vendors [14]. These developments make the food service industry in Sunyani, a mid-sized, growth, and transition city a suitable case for this study as the findings may be fairly generalizable to rapidly growing cities with similar characteristics in the country and elsewhere, hence the purposive selection of the Municipality for the study.

2.2 Research design and methods

This study adopts a cross-sectional survey design using a mixed methods approach to collect both qualitative and quantitative data for the study. The case study approach was used to adapt and integrate several data-collecting methods, such as in-depth interviews, questionnaire administration, personal observation, and extensive content analysis [15]. The study's population comprised all man-

agers and supervisors of the food service industry due to the managerial and supervisory role including making decisions on food waste and its management. As a result, hotels, universities and schools, hospitals, and restaurants in Sunyani served as the study's target population. There were 110 restaurants and food joints, with a population of 110 managers/supervisors (Sunyani Municipal Assembly, 2020). The city has three 3-star, over fifteen contemporary, and rated hostels and three public hospitals with functional restaurants.

2.3 Sampling size and sampling procedure

The study used simple random sampling to select respondents. The simple random sampling approach provides representativeness for sound conclusions(Creswell & Creswell, 2018). The simple random sampling approach was used to sample 40 from a sample frame of 110 managers and supervisors for the study. For a sample to be representative of a study, it must be a good proportion of the population [15]. Sloven formula was used to determine the sample size of the study. This is given by n=N/[1+N(a)2], where n=sample size, N=population size/sample frame, a= error margin; thus, the confidence level was, and 1 is constant. The sample size was calculated with the desired degree of accuracy using the Slovin's formula (Slovin, 1960):

$$n = N/(1 + N(\alpha)\check{s})n = 110/(1 + 110(0.10)\check{s})n = 52$$

Where n = sample size to be calculated; N = total managers and supervisors (sampling frame), and α = Type 1 error (0.10). Following the lottery approach, each manager's restaurant, canteen or food joint was assigned a number. The numbers were randomly drawn to select the required samples [16].

2.4 Data collection

Questionnaire were administered to the managers/supervisors of the food service industry in the Sunyani municipality to gather data based on the research question and study's objectives. The Likert scale was used to estimate the extent of agreement on the state of food waste and the strategies for reducing food waste in the food service industry using a scale of 1-5, interpreted as SA- Strongly Agree (5), A-Agree (4), D- Disagree (3), UD- Undecided (2), and NA-Not agree (1). The instruments were self-administered to ensure a high response rate. The strategies for reducing food waste in the food service industry are discussed using narrative analysis. Tables and graphs were used to depict percentages and frequencies. Data was analyzed using SPSS and Microsoft Excel. Thematic analysis was used to categorize and analyze the qualitative data that was gathered.

3. Results and discussion

Table 1. Socio-demographic characteristics of respondents

Characteristics	Frequency (N)	Percentage (%)
Age		
20-29	5	9.6
30-39	22	42.3
40-49	17	32.7
50-59	7	13.5
60+	1	1.9
Educational Level		
SHS	16	30.8
Diploma	15	28.8
First Degree	20	38.5
Master's Degree	1	1.9
Rank		
Manager	38	73.1
Supervisor	14	26.9
Length of Service		
Below 2years	4	7.7
2-3years	14	26.9
4-5years	16	30.8
6 Years and Above	18	34.6

Source: Author construct, 2023.

3.1 Socio-demographical data of respondents

The socio-demographical data of the study participants/respondents, that is, managers and supervisors from each of the selected food service entity were collected and examined. Understanding the demographic characteristics of respondents within this industry is crucial for effective management and decision-making. This analysis examined the demographic data of the food service industry, including age, educational levels, rank, and length of service.

The food service industry presents intriguing demographic patterns among its workforce. The age group of 30-39 forms the largest segment, closely followed by the 40-49 age bracket. Interestingly, a substantial proportion of the workforce is also constituted by younger individuals aged 20-29 (Table 1). This trend corroborates the findings of Thyberg et al. [17] who posited that the food service industry is attractive to younger individuals due to the flexible work hours and potential for career advancement it offers. In the context of educational qualifications, it is observed that majority (38.5%) of the employees possess a first degree, while 23.1% hold a diploma (Table 1). This shows that the industry offers opportunities for individuals with diverse educational qualifications and by extension the need for continuous skill development. Riggs et al. [18] emphasized the significance of continuous learning and skill-building in the food service industry as a means to enhance job performance.

The hierarchical structure of the food service providers within the industry is consistent with the operational requirements for ensuring effective management and ef-

Table 2. Food waste classifications in the food service industry

Food waste classification	Frequency (N)	Percentage (%)
Waste Sorting		
Yes	13	25
No	39	75
Disposal Frequencies		
Daily	26	50
Weekly	22	42.5
Monthly	4	7.5
Types of Food Wasted		
Vegetable and Meat Scraps	20	38.5
Uneaten and Leftovers	7	13.5
Both	25	48.1
Expiration Dates Examination		
Often	40	76.9
Not Often	12	23.1
Length of Service		
Below 2years	4	7.7
2-3years	14	26.9
4-5years	16	30.8
6 Years and Above	18	34.6

Source: Author construct, 2023.

fective operations. This is further stressed by Filimonau et al. [19] that managers and supervisors play pivotal role in fostering employee engagement and boosting organizational performance in the food service industry. Furthermore, a considerable number of employees have been associated with their institutions for six years or more which suggests job stability. However, staff retention is a major challenge in most industries in Ghana which is influenced by economic conditions, labor market dynamics, and cultural norms [3].

Understanding the causes and classification of food waste in the food service industry, the study also explored waste sorting, waste disposal frequencies, methods used for disposing of wasted food, categorization of food waste, expiration dates examination, and whether the industries throw away food still edible but has passed the expiration date.

From Table 2, 25% of the respondents sort their waste, while 50% of respondents dispose of their waste daily. All respondents (100%) examine expiration dates before products are used. From observation, both waste sorting practices and disposal frequencies were influenced by the subscription to waste collection service providers such as Zoomlion Ghana Company Limited, Hand in Hand Waste Management, and BA and Allied Waste Management Company. The food service industry is a significant player in waste management, with waste sorting being a key strategy for reducing food waste and promoting sustainability. As per the report by GreenEats (2022) [20], restaurants that actively engage in waste sorting not only demonstrate their commitment to sustainability but also attract environmentally conscious customers. Organic waste sorting, including vegetable scraps and leftovers, helps reduce methane emissions, thereby contributing to the fight against climate change and aligning with Sustainable Development Goal 13. Moreover, [21] highlighted that businesses implementing food waste sorting and composting could see a 30% reduction in overall waste disposal costs. However, despite these benefits, it is concerning that 75% of the food service industry is not engaging in waste sorting [18, 20]. This is due to a lack of education on the benefits and methods of waste segregation, insufficient resources, the potential hazards associated with specific types of waste and waste segregation is labor intensive [23]. Also, waste collection companies do not have facilities to support waste segregation [23].

Effective management of food waste in the food service industry is a multifaceted process that involves several key practices, each contributing to the overall health, safety, and sustainability goals of the business. Regular checks of expiration dates are crucial in preventing foodborne illnesses. This practice ensures that the food served is safe for consumption, thereby maintaining the reputation of the business [24]. Serving expired food can lead to serious health issues for consumers and can significantly damage a business's reputation. Good manufacturing practices such as regular waste removal cannot be overstated. Regular waste removal helps to keep the premises clean, reduces the risk of pest infestations, and contributes to a healthier work environment [25]. Again, improving kitchen practices, particularly those related to the preparation of vegetables and meats, is another critical aspect of food waste management. There is the need for such improvements, as they can significantly reduce the amount of vegetable and meat scraps produced [2] . This can involve training kitchen staff on efficient food preparation techniques, portion control, and proper storage methods to extend the shelf life of ingredients.

From Table 3, the demand for cereals and grains in the food service sector is high, with 85% of businesses frequently purchasing them. These essential grains, rice, and cereal, are inexpensive, adaptable, and frequently used in various dishes. A reliable supply chain is crucial for maintaining this demand. The World Health Organization emphasizes the importance of offering a diverse range of cereals and grains in food establishments to cater to diverse dietary preferences and customer needs. 28.8% of the service industry claim to prevent cereal and grain spoilage by accurately forecasting customer demand and adjusting inventory, demonstrating highly effective practices in preventing spoilage. This confirms a study that emphasizes the importance of accurate inventory management in reducing food waste [4]. Majority 75% of respondents discard stale cereals and grains, indicating overestimating customer demand or poor inventory management, leading to resource waste, product quality loss, and customer dissatisfaction. The findings align with previous research highlighting the importance of

Table 3. Food storage and food waste dynamics in the food service industry

Common food items	Frequency	Percentage
Purchase cereals and grains		
Often	45	86.5
Not often	7	13.5
Ever thrown away cereals and grains because you have overestimated		
Yes	15	28.8
No	37	71.2
Cereals and grains storage		
Storage box	1	1.9
Refrigerator	39	75
Both	12	23.1
How often do you purchase dairy		
Often	34	65.4
Not often	18	34.6
Ever thrown away dairy because you have over-purchased		
Yes	7	13.5
No	45	86.5
Dairy storage		
Refrigerator	35	67.3
Separate container	0	0
Both	17	32.7
Vegetable and Fruits purchase		
Often	49	94.2
Not often	3	5.8
Ever thrown away vegetables and fruits because you have over-purchased or over-prepared		
Yes	18	34.6
No	34	65.4
Vegetable and fruit storage		
Refrigerator	52	100
Produce drawer	0	0
How often do you purchase proteins		
Often	47	90.4
Not often	5	9.6
Ever thrown away proteins because you have over-purchased or over-estimated		
Yes	1	1.9
No	51	98.1
How do you store proteins?		
Refrigerator	4	7.7
Freezer	35	67.3
Both	13	25

Source: Author construct, 2023.

effective inventory management in reducing food waste in the hospitality industry [26].

The report indicates that most food service establishments prioritize regular stocking dairy products like milk, cheese, and yogurt to meet customer demand and maintain product quality, as these essential ingredients are frequently used in various recipes. Many researchers have emphasized on the role of dairy products in providing essential nutrients and enhancing the taste and texture of dishes [1, 23, 25, 26]. Most establishments in the food service industry effectively manage their dairy inventory, accurately estimate their needs, and purchase dairy products frequently to ensure a more excellent supply of essential ingredients and meet customer expectations. A more significant percentage of establishments reporting that they do not throw away dairy products due to overestimation aligns with previous research on inventory management strategies in the food service industry. A study by Fenko et al. (2016) [29] emphasizes the importance of accurate forecasting and ordering practices in reducing food waste. Establishments can reduce waste by implementing proper inventory management techniques, such as regular audits and demand-based orders. Only 13.5% reported throwing away dairy products due to overestimation, suggesting successful strategies such as monitoring sales data and collaborating with suppliers.

Most establishments prioritize proper storage for dairy products, extending shelf life and reducing waste, with a high percentage using refrigerators. Van Bemmel (2020) [30] emphasizes the significance of maintaining appropriate temperatures for perishable items like dairy products to prevent spoilage and extend their freshness. Some of the of establishments (32.7%) use both refrigerators and separate containers to minimize waste, possibly implementing portion control or proper labeling. However, further research is needed to understand the specific practices and policies implemented by these establishments and their effectiveness in minimizing waste. Existing studies on the significance of incorporating fresh produce into the food service industry, for example, Addai [3]emphasizes the significance of reducing food waste and increasing the consumption of fruits and vegetables to improve overall sustainability. Regularly purchasing these items ensures a steady supply of nutritious ingredients, supports local farmers, and promotes healthier food choices for consumers. Due to limited storage space, seasonal availability, or menu preferences, only 5.8% of establishments frequently buy fruits and vegetables. However, 98.1% of establishments successfully manage their inventory and cut down on food waste which is consistent with earlier studies on reducing food waste in the food service sector. For instance, Caucci [7] emphasizes the significant environmental and economic implications of food waste within food supply chains. Minimizing waste through proper inventory management and menu planning can contribute to a more sustainable and efficient operation.

3.2 Causes of food waste in the food service industry

Majority (60%) of the respondents donate or compost their waste underscoring high awareness and practices of food donation and composting in the food service industry which contributes greatly to environmental hygiene and social wellbeing. Zandonadi [31] emphasized the importance of considering food donation and composting as part of a comprehensive waste management strategy in the food service industry. To control food waste in food service industries, several policies can be implemented. These include the implementation of mandatory food waste audits and the development of industry-wide standards, educating industry players to help change consumer behaviour to prevent food waste. Again farmers can be encouraged to use sustainable farming practices, such as reducing fertilizers, to prevent overproduction and waste. Reducing food waste can also have broader implications for global food security. As the world's population grows, minimizing food waste becomes crucial to ensure that resources are used efficiently and effectively. By preventing food waste, more food can be made available for those in need, reducing hunger and promoting equitable access to nutritious food [31]. The identified causes of food waste in the food service industry align with existing literature on the topic. Studies have consistently highlighted the role of improper handling, inaccurate forecasting, and inventory management in contributing to food waste [3, 10, 28]. The findings also confirm the impact of consumer preferences for quality and the influence of price fluctuations on purchasing decisions, which can lead to food

waste [25].

3.3 Current strategies used for reducing food waste.

Several strategies were identified by respondents in the food service industry in the Municipality of Sunyani (Ghana). For this section, these strategies are grouped and will be analyzed and discussed in four stages. This group of strategies encompasses all food waste reduction strategies aimed at actions that concern the whole business and are led, performed, and enforced by the manager. These strategies include giving incentives and awarding staff. Addai [3] found that providing incentives to staff, such as recognition or rewards for waste reduction efforts, positively influenced their engagement in waste reduction practices. Again, Luo et al. [27], examined employee participation in food waste reduction initiatives and highlighted that actively engaging staff through training, communication, and empowerment resulted in significant waste reduction and improved sustainability performance. The second is engaging staff and consumers to actively involve themselves in food waste reduction efforts through awareness campaigns, education, and behavioral nudges, which helped reduce waste and promote sustainable consumption practices[23].

At the managerial stage, the managers and supervisors also review the menu to eliminate unpopular dishes. Raynolds et al. [6] investigated strategies to address food waste at the menu design stage and found that menu engineering, which involves reviewing and optimizing menus based on customer preferences and demand, plays a crucial role in waste reduction by eliminating unpopular and low-demand dishes. There is a need to regularly review menus to identify and eliminate underutilized ingredients or dishes can help minimize waste and improve profitability [19]. In terms of planning and purchasing, the storage stage includes strategies used by businesses to reduce food waste in the food service industry related to planning, purchasing, and storing food [5]. Also, the menu should utilize the available resources of the business, use approaching expiration date products first, use leftovers and ensure that meals are wholesome till they are consumed [32]. Another aspect of planning as a strategy for reducing food waste in the managerial stage of the food service industry, identified by respondent, is about making accurate forecasting using their documented data on daily sales, plates served daily, reservations, and deliveries made daily.

Staff training in the food service business is critical for reducing food waste[24] as good training can significantly reduce food waste by enhancing staff awareness of food handling, storage, and quantity control. Training programs assist in the implementation of sustainable practices and the overall reduction of food waste in the industry by providing personnel with essential information and skills. At the preparation stage, most managers train their employees on how to improve and practice good kitchen ethics, reuse leftovers, and improve and sustain the recipe and taste of food[24]. To obtain information on the strategies used at this stage. A question was asked: "how do you train your employees to reduce food waste during food preparation?"

I train my employees on how t properly handle food items and maintain hygienic conditions in the kitchen. Also, they shouldn't overcook food to change the taste and also keep and use accurate measurements of food items when preparing food. (Manager, KFC)

Most establishments in the Sunyani Municipality use portion control to reduce food waste at the serving stage in the food service industry. By accurately measuring and controlling the amount of food served to customers, establishments minimize over-portioning and subsequent plate waste. Luo et al. (2021) [33], discovered that portion control interventions can effectively reduce food waste in restaurants. Another strategy is offering customizable options or "build-your-own" meals. This allows customers to select portion sizes according to their preferences, reducing the likelihood of unwanted or excess food [34,35]. Promoting awareness is one technique for encouraging consumer behavior that lowers food waste in the food service business [3]. Establishments can enhance consumer awareness and push them to make more conscientious decisions by giving information about food waste's environmental and social implications. Improving consumer awareness on the effects of food waste can reduce household food waste. The implications of this strategy include fostering a sense of responsibility among consumers and empowering them to take action to minimize food waste[4].

3.4 Strategies for food waste reduction

The current strategies implemented to reduce food waste, the targets set by managers to reduce waste, and the feedback to monitor progress. The data indicates that 22.5% of food service establishments have not implemented any technology to manage food waste, indicating room for improvement in utilizing technology to identify waste areas, track progress, and make informed decisions. A study by Raynolds et al. (2019) [6] emphasizes the importance of measuring and monitoring food waste as a crucial step in addressing the issue. The study reveals a need for more accurate data on food waste generation, indicating a gap in waste management. The majority of establishments (77.5%) still need to implement technology or software solutions, highlighting the need for increased awareness and adoption to improve efficiency and waste reduction. Real-time data on inventory management, portion control, and customer preferences can help establishments make data-driven decisions to minimize waste, contributing to sustainability efforts. The food service industry faces significant challenges in reducing food waste, with 52.5% of respondents reporting specific challenges, indicating a need for additional support and resources to manage

and reduce waste effectively. The studies by Ababio et al. (2015) [24] supports the significance of identifying and addressing challenges in reducing food waste. The study highlights that food waste behaviors are complex and influenced by various factors, including lack of awareness, inefficient processes, and inadequate infrastructure. By recognizing and addressing these challenges, establishments can develop tailored solutions to minimize food waste and improve overall efficiency.

Farmers are increasingly using excessive fertilizers in farming. This shortens the lifespan of farm produce before they get to us. Also, there needs to be more cans for us to sort our waste, and there are limited resources, both financial and technological resources, to help reduce waste: the Manager, Sunyani Technical University Restaurant. Despite challenges in the food service industry, it indicates the need for collaboration and knowledge-sharing among stakeholders. A study by Zandonadi et al. (2021) [31] emphasizes the importance of engaging all actors within the food supply chain to reduce food waste effectively. By sharing best practices, lessons learned, and innovative solutions, establishments can collectively work towards overcoming challenges and implementing effective strategies to reduce food waste. In terms of the targets to measure and reduce food waste, according to the data, 60% of respondents in the food service industry reported having set specific targets to measure and reduce food waste in their operations, while 40% did not have such targets in place. This finding suggests that most establishments in the industry recognize the importance of addressing food waste and have taken proactive measures to measure and reduce it. Implementing specific targets can drive efforts toward reducing food waste and promoting sustainability within the industry. The findings by Fenko et al. (2016) [29]) supports the significance of setting targets to measure and reduce food waste. The study emphasizes that with clear goals and targets, it becomes easier for organizations to manage and reduce their food waste effectively. By establishing specific targets, establishments can track their progress, identify areas for improvement, and implement strategies to minimize food waste throughout their operations.

To obtain information on the strategies, the participants were asked of their tools for reducing food waste through meal planning, proper handling and storage, and inventory management systems.

"As a way to monitor the target, I have seen a reduction in the volume of waste generated daily. My target is to reuce food waste at the preparation, serving, and consumption stage to boost income. To monitor and measure progress, portion size is controlled, and proper handling and storage are observed. (The Manager, City Aroma Restaurant)"

The presence of specific tools in the food service industry implies that there is a commitment to sustainability and responsible resource management. The findings of Sakaguchi et al. (2020) [32], highlights that setting targets to reduce food waste can lead to significant environmental benefits, including reduced greenhouse gas emissions and conservation of natural resources. The data suggesting that a majority of establishments have set targets to measure and reduce food waste implies a positive trend towards more sustainable practices within the industry. Based on the analysis, the food waste reduction strategies implemented by managers in the food service industry have yielded positive results. Strategies such as portion size control, accurate measurements, menu engineering, staff training, proper handling and storage, and inventory management have played a significant role in reducing the daily volume of waste. These strategies align with the set goals and demonstrate their effectiveness in minimizing food waste. However, to ascertain the effectiveness of the strategies, the study by Chen et al. (2018) [21] revealed that controlling portion sizes and accurately measuring ingredients in restaurants led to a significant reduction in food waste.

4. Conclusion

This study explored the strategies for reducing food waste in the food service sector in the Sunyani municipality of Ghana focusing on the experiences of managers and supervisors. From the analysis, majority of the restaurants, canteens and food joints rely on proper storage methods, such as refrigerators and storage boxes to minimize waste and ensure the freshness of their ingredients. The findings further show that the causes of food waste in the food service industry are indeed related to improper handling and storage, inaccurate forecasting, lack of inventory management, excessive use of fertilizer, over-purchasing, and unstandardized recipes. Also, donating excess food or composting was found to be a positive leaning towards sustainable food waste management practices in the food service industry. Thus, encouraging this practice can potentially lead to significant reductions in food waste and create a positive impact on both social and environmental fronts. Based on these findings, implementing better food handling practices, improving food forecasting and inventory management, and standardizing recipes are effective strategies to minimize food waste in the food service industry. Furthermore, implementation of technology or software solutions for measuring and managing food waste in the food service industry indicate a potential area for improvement. The low percentage of establishments utilizing these tools suggests a need for increased awareness and adoption. Encouraging more establishments to embrace technology can lead to more effective waste reduction strategies and contribute to overall sustainability in the industry. Based on the limitations of the study, in terms of its focus on managers and supervisors as well as the limited focus on Sunyani, a mid-sized city, there is

the need for further studies using major city with wider participation of various staff categories.

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