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A Study On Restaurant Waste At Feni Town

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Abstract

This study identified the key reasons for food waste production and management in restaurants in Feni Town with a view to understanding the waste management of this city. This had been conducted using a mixed-methods research design. 20 Restaurants from the busiest areas of Feni Town served as the study's research population. The information was gathered through a questionnaire survey, observation, and conversations with restaurant workers and owners. According to the study's findings, almost 7.15% of prepared food was wasted each day and more than 50% of this wasted food was from customers' plates. Other causes of waste include poor food storage, haphazard arrangement of raw ingredients, waste that occurs during cooking, and portion size. A survey found, 60% of leftover food was thrown away in the environment. So, effective management allows restaurants to reduce food waste, but it can be difficult to get patrons to do the same. The analysis's basic findings showed that the majority of restaurants in Feni Town are uninformed of the negative environmental effects of food waste and are doing very little to create a zero-waste establishment. Only 10% restaurants that are comparatively new provide some training to their staff about FW management. This study might be very promising for the future large scale research on restaurant waste management of poor and overpopulated countries like Bangladesh.

Keywords: *SDG; Food Waste; Questionnaire; Mixed-method approach.*

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Introduction

The Sustainable Development Goal 2030 (SDG), achieving zero hunger for the world's growing population is considered as one of the top global challenges of the 21st century [1, 2]. While the food production could be an obvious and easy solution to meet this challenge, climate change and the scarcity of conflict-free and unpolluted agricultural land make increasing food production very difficult. Approximately one billion meals are wasted every day across all continents according to the United Nations Environment Programme (UNEP)'s Food Waste Index Report 2024 [3]. According to an estimate of the Food and Agriculture Organization (FAO)'s 2024 report, one in three people of our experience food insecurity, and 783 million are affected by hunger only in a year [4]. Approximately 32% of global food production is lost or wasted annually. This includes over 13% lost during post-harvest and supply chain stages, and maximum, 19%, wasted at retail and consumer levels [4, 5]. So food waste (FW) is not just a local issue but has some serious global consequences.

The environmental consequences of the food waste (FW) are also alarmingly significant. According to an estimation of FAO, FW produces about 3.3 billion tons of CO_2 annually and leads to the loss of 250 km^3 of freshwater each year [6, 7, 8]. Globally, the financial impact of FW is staggering, amounting to US$310 billion in developed countries and US$680 billion overall [9, 10]. Studies by Gustavsson et al. and the Institute of Mechanical Engineers estimated that 30–50% of all food produced for human consumption is lost or wasted annually [11]. Tragically, the FW each year could feed the 821 million people facing hunger four times over [12]. This has become a severe problem in overpopulated countries like Bangladesh, where consumption is large but negligible focus on waste management. Reducing FW would significantly improve the sustainability of the planet. In this context, the idea of "zero waste" is gaining momentum [13]. Although countries like Bangladesh face challenges in implementing sustainable measures due to high costs and infrastructure gaps, the environmental and social benefits make it a necessary ambition. However, due to limited studies and information in this field especially at the small town or community level are abode researchers from getting the proper situation, hence the solutions of the FW problem in Bangladesh [14, 15].

FW is commonly categorized into avoidable, possibly avoidable, and unavoidable waste [16]. Worldwide, in households, common causes of waste include over-purchasing, excessive food preparation, refusing to eat leftovers, and poor storage [14]. In restaurants, most waste stems from three main sources: preparation mistakes, spoilage, and plate waste from customers. Client plate waste alone accounts for 34%

of all FW in restaurants, often due to oversized portions or mismatched customer preferences [17]. Inefficiencies across the food service process mainly contribute to restaurant FW. According to researches, poor forecasting about customers' choice, inadequate planning, and improper food handling lead to waste during both preparation and service stages [18, 19]. To face this growing problem, understanding where FW occurs and how to reduce it, is essential. So the economic, social, and environmental costs of FW is very significant for the growth of a country as well as for the efficient economic environment for businesses, customers, and society [20-22]. Addressing FW is thus a "triple win": it can save money, fight hunger, and mitigate environmental harm [23, 24].

Our study was aimed at the amount of FW production and management in restaurants, a major contributor to the overall issue. A detailed questionnaire-based survey was conducted among 20 restaurants in Feni Town, Bangladesh, aiming to examine sources of FW at three stages: food preparation, spoilage, and customer plate waste. By focusing on FW at the restaurant level, this study contributes to a better understanding of how everyday business practices can be transformed to build a more sustainable future for all. The main focuses of the study were to measure the quantity and types of FW produced across a representative sample of Feni Town's restaurants; to identify the main sources of waste and assess the feasibility of achieving zero-waste restaurant operations; to evaluate general sustainability practices beyond FW; and to explore the potential of establishing a community food bank to redistribute surplus food and reduce hunger among the poor.

Methodology

For the purpose of the research, a primary survey was carried out on 20 restaurant owners in different locations of Feni Town from 17th to 19th April 2023. Four major areas in Feni Town were selected as sample locations as most of the restaurant hubs are situated there. Among the 20 participating restaurants, the seating capacity ranged from 30 to 100 seats and staff numbers ranged from 5 to 30, including both kitchen and front-of-house staff. The goal was to reach a variety of restaurant types to generate results as close to an 'average' restaurant as possible. It was decided that conducting the Restaurant FW Survey during midweek for one day was a better option than a Friday, Saturday or Sunday. This ensured that the restaurants would not be at their busiest and therefore would have the time to separate and weigh the FW on their less-busy days and would also consistently capture customer patterns of a working day lunch and dinner. A mixed-method approach was used, combining quantitative data from questionnaires with qualitative insights [25]. The questionnaires shown in Figure

1, included fixed alternative, closed-ended, and open-ended questions. For data collection, questionnaires were prepared containing 10 questions each. The questionnaire included three different types of questions. Questions with fixed alternative answers to choose from, closed-ended questions and a few questions with open ended answers.

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Restaurant Food Waste Survey Questionnaire

[N.B.: This survey will use only for research purpose. It will not be used for any legal or illegal justifications]
(Please write your response and provide a tick in Squares (☐) where asked.)

Restaurant Name and location: _____

Day, Date and survey time: _____

1. **What amount of food is prepared each day?** (e.g., number of meals or kilograms)
Response: 1) Carbohydrate.....2) Protein.....3) Vegetables.....4) Others.....
Comments: .....
2. **What is the source of maximum food waste of your restaurant?**
Response: .....
Comments: .....
3. **What are the main reasons for waste of food in your Restaurant?**
Level of agreement (0 = Strongly Disagree to 5 = Strongly Agree)
0 (Strongly Disagree) 1 2 3 4 5 (Strongly Agree)
☐ ☐☐☐☐☐
Comments: _____
4. **How much food do you throw away each day?** (e.g., kilograms of waste per day)
Response: .....
Comments: .....
5. **Does your menu change seasonally?**
Response: ☐Yes ☐No
Comments: _____
6. **What do you do with unserved food at the end of the night?**
Response: ☐ Through Away ☐ Donate to Staff ☐ Donate to poor
Comments: _____
7. **Do you have any measures to prevent wasted food on the plate?**
Response: ☐ Have ☐ Don't have
If yes, please describe: _____
8. **What packaging materials do you use?**
Response: _____
9. **Do your staff receive training on food waste reduction?**
Response: ☐ Yes ☐ No
Comments: _____
10. **What other initiatives do you have in place to reduce food waste?**
Response: _____

_____
Signature and date of Surveyor

Figure 1. The questionnaire for the restaurants' food waste survey

Data has been analyzed through statistical software SPSS and MS Excel 2016. Based on the data collected the findings have also been examined qualitatively through discussions. The correlations of different variables have been shown in SPSS and an analysis based on the results of correlations from the annex table is presented as well.
It should be mentioned that the Restaurant FW Survey was intended to provide a snapshot overview of FW in a small sample of restaurants so all results in this report should be viewed as a guide to the likely numbers involved and the general principles under consideration. Since this data has been extended to reflect the FW from 365 days of the year, it must be understood that the volume, weight, and kind of FW created on a single day are likely to change from the FW produced the next day. These estimates are predicated on the premise that the participating restaurants are opened for breakfast, lunch, and supper seven days a week and operate throughout the year. Customer plate waste could not be monitored as precisely for any participating restaurants that provide takeout or home delivery, since some may already be doing more to limit their FW than others. Together, the survey crew and the appropriate restaurant representative completed the survey forms. Due to their constant need to serve meals, the representatives did not provide enough time to explain the survey. Many of them refused to help, and others of them kept quiet because they believed it would be detrimental to them. However, the team and the personnel from the participating restaurants made every effort to adhere as closely as possible to the survey protocol.

Results and Discussions:

For the ease of analysis, the survey can be categorized into 3 sections. In the first section, the correlation between the amount of prepared food and wasted food was shown by the first two questions of the questionnaire. In second, section (from question 3-6) the author finds out the management of FW. And finally, it is seen that the preventive measures and initiatives that is taken to reduce FW in the restaurants of Feni town from questions 7-10 of the questionnaire.

The correlation between the amount of prepared food and waste can give us an idea about the food choices of people of Feni hence helping us to predict the classes of FW produced in Feni town. The Table 1 shows the data of prepared food of four categories: Rice and other related carbohydrates, vegetables, Proteins and others, like salads and dessert items, and the percentage of wasted food in 20 restaurants. On average, the restaurants of Feni prepare 39% Protein, 27% Carbohydrates 24% vegetables, and 10% other items in Figure 2. So, people of Feni prefer protein-

classified food more than any other food in restaurants. Again on average 7.15% of total prepared foods are wasted each day in these restaurants.

Table 1. The percentage of prepared and wasted food in 20 restaurants of Feni Town

SL	Name the Restaurant	Prepared Food (%) per day in Weight				Wasted Food (%)
		Carbohydrates	Vegetables	Protein	Others	
1.	Timepass Restaurant	20	20	50	10	0
2.	Fusion Hut Restaurant	30	20	30	20	10
3.	The Café Club Restaurant	30	20	40	10	7
4.	Food storm Restaurant	30	20	40	10	3
5.	Best Inn Restaurant	30	30	40	0	10
6.	Sizzler Restaurant	30	30	30	10	5
7.	The Foodian Restaurant	40	30	30	0	7
8.	Estestion Restaurant	25	25	45	5	10
9.	Sky Lounge Bistro Restaurant	20	30	30	10	6
10.	Uthsob Restaurant	20	30	40	10	10
11.	Bhojon Company Restaurant	20	30	50	0	5
12.	Food Garden Restaurant	30	20	40	10	10
13.	Brownea Kitchen Restaurant	35	30	30	5	8
14.	Handi Kitchen Restaurant	25	35	40	0	10
15.	Bangaliana Restaurant	20	15	55	0	5
16.	Jalallia Restaurant	20	20	50	10	5
17.	State of Food Restaurant	30	25	55	0	5
18.	Nabi Hotel & Restaurant	25	30	35	10	10
19.	Little Westin Restaurant	30	20	40	10	7
20.	Rondhan Kabbo Restaurant	50	20	20	10	10

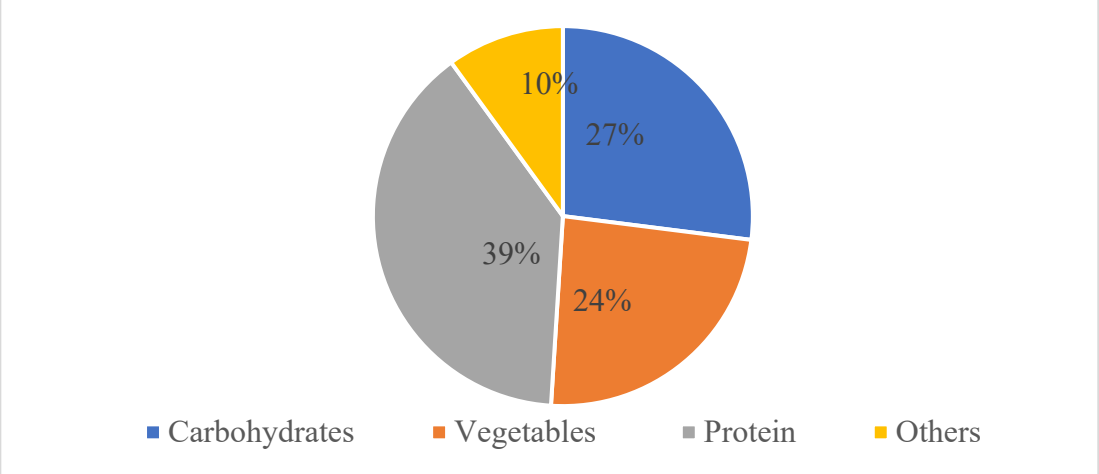

Figure 2. Average amount of prepared foods per day

From questions 3-5 of the questionnaire, it estimates an overall picture of the source and management of FW in Feni town. In these restaurants, most of the FW (50%) is from the customers' plates (Figure 3). Where the customers leave this waste for overeating or the mismatch of taste. Among these waste a big portion is avoidable. From the study, it has been found that, 85% of restaurants change their menus seasonally to suit customer preferences. 25% of food is wasted due to menu changes. A total 9% FW is produced from stale food. This is because of the lack of knowledge and facility of food preservation of the staff. As 90% of the restaurants don't provide any kind of training on food management and preservation (Figure 3). 15% restaurants have no idea or record of the reasons or causes of FW at their restaurants.

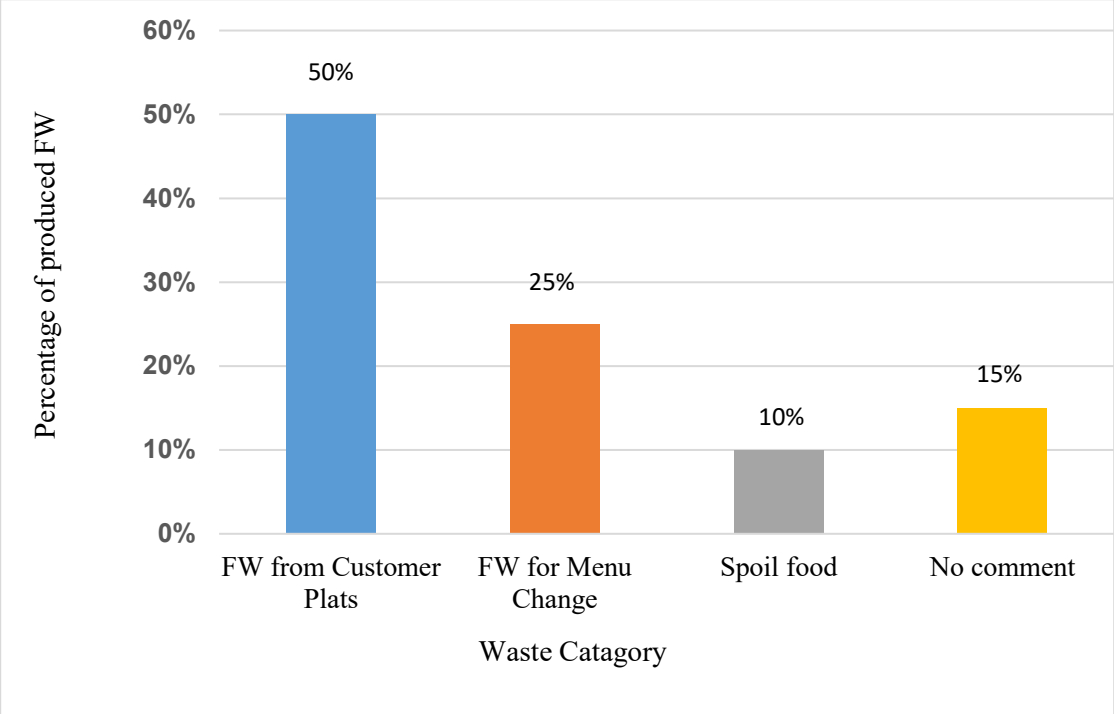

Figure 3. Causes of food waste production in the restaurants of Feni town

A large amount of prepared food also remains unserved each day. Though there is no specific data about the amount of this unserved food but it has collected data about the management and preservation of this food. The unused food that is left over at night is distributed in various ways.

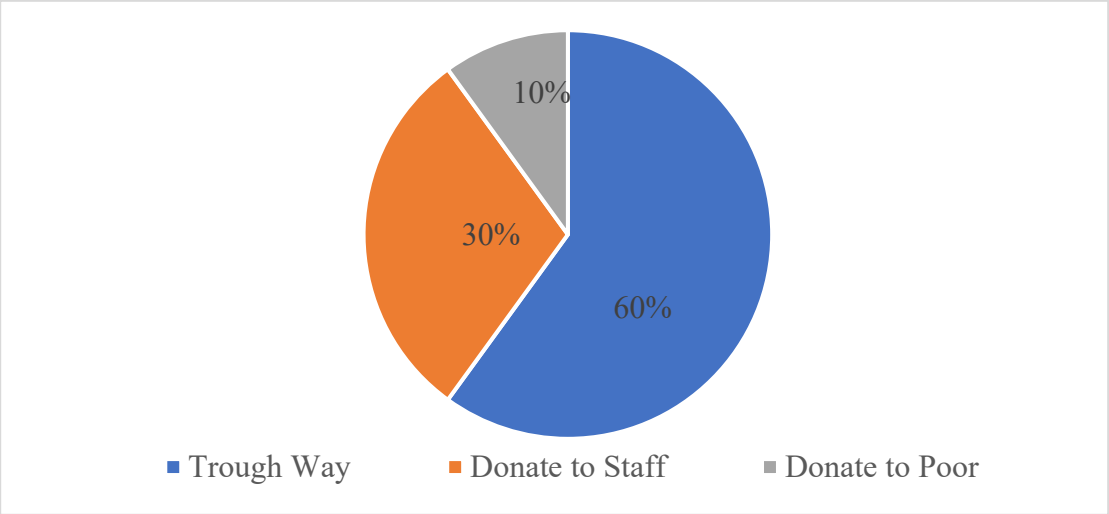

Figure 4. Management of Unserved foods

As mentioned in Figure 4, 60% of these 20 restaurants throw out the leftover food. 30% and 10% food are donated to their staff and the poor, respectively. Most of the owners provide meals to the staff during their service period as per contract. So, in most cases the staff don't need to take this food to their home. Again, as the amount of food is uncertain so very few poor persons can have the information about the unserved food. So, the restaurants have no choice but to threw it away. In this survey, we have tried to figure out about the preventive measures and initiatives that are taken to prevent FW in the restaurants by finding the answers to the questions 7 to 10 of the questionnaire. But the most alarming was 80% restaurants of these 20, don't have any preventive measures to reduce the FW (as mentioned in Figure 5).

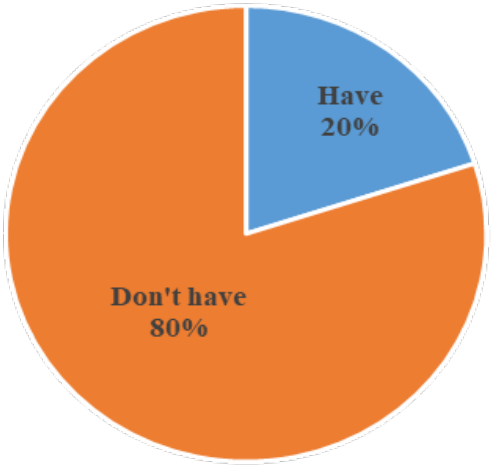

Figure 5. Preventive measures to reduce FW

These restaurants sell their food in a packaged system. The customers have to pay whether they have food or not. Only 2 restaurants imply the price only based on the amount of the served food to reduce the FW. Almost all restaurants use packaging products. Among the 20 restaurants, eight are recycle, packaging materials. Two restaurants reuse and one restaurant composts the packaging materials. The remaining 9 restaurants do nothing. Most restaurants gave us a negative response to training restaurant staff on reducing FW. We surveyed 20 restaurants and found that only 2 restaurants answered yes. The remaining 18 answered no. We calculated that 90% of the answers were yes, and the remaining 10% answered no. We saw that, they are indifferent to this matter. In Figure 6 we can see that the maximum restaurants did not or could not take much initiative to prevent food spoilage. Of the 20 restaurants we surveyed, 12 restaurants did not take the initiative.

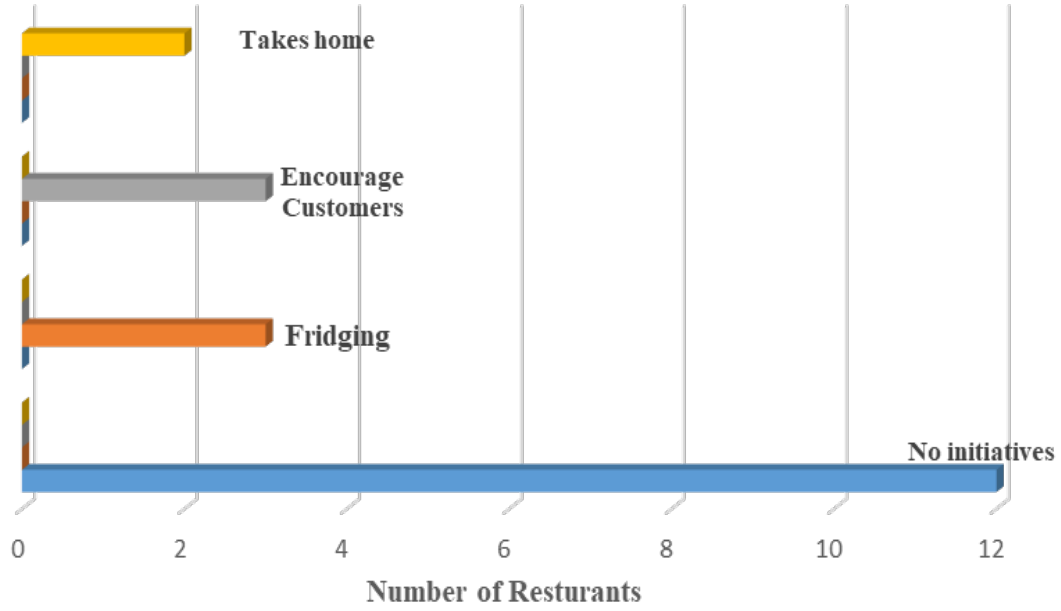

Figure 6. Initiatives by the restaurants to reduce FW

Then the authorities of the 3 restaurants say that they encourage customers in this regard. Two restaurants say they store their extra food in the fridge. The remaining 2 restaurants send food home. The Figure 7 also reveals that the restaurants also have less interest in training existing staff. 2 restaurants among the 20 gave a positive reply on staff training on FW reduction, which was only 10% of the total sample area.

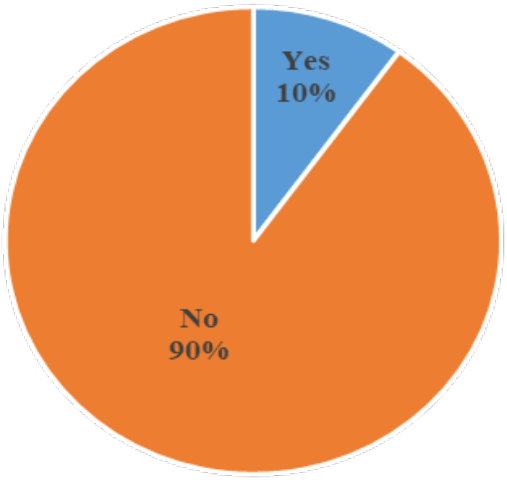

Figure 7. Proportion of giving further training to existing staffs to reduce FW

For controlling FW in restaurants, if the staff members are better aware of the detrimental effects of FW, it might be simpler. Additionally, as 50% of food is wasted on consumer plates, greater effort needs to be made to raise customer awareness. Customers waste food as a result of eating habits, carelessness, or ignorance of the consequences of wasting [23]. FW at restaurant back houses happens as a result of inefficient storage brought on by inadequate equipment, an excess of raw materials because restaurants frequently don't employ a systematic strategy to forecast how much is needed, and occasionally because of the buffet and food package system [26]. The restaurants also have less interest in training existing staff or hiring experienced and educated persons. The survey data also reveals that compared to more than 5 years old restaurants, new restaurants are friendlier and more conscious of their green practices. This might be because eateries that have been in operation for at least five years feel too secure to invest in expensive waste control strategies. Despite the fact that the majority of restaurants have advocated for the adoption of one or more types of green initiatives, these are extremely modest in scope. No efficient standard method exists to allow restaurants to coordinate their efforts in a way that has an impact on the environment or their economic line. Finally, sustainable waste management is frequently perceived by restaurant operators as being expensive. This is obviously a worry because employing sustainable management practices and green manufacturing techniques can only be effective over the long run. Restaurants should therefore get incentives from the public and private sectors to adopt sustainability and zero waste as their strategy and goal.

Conclusions

The report discusses the issue of FW in restaurants. FW at the restaurant level occurs during meal preparation and consumption phases, leading to economic, social, and ecological burdens. The main reasons for FW in restaurants are analyzed with factors including customers' plate waste, customer awareness of new food items, customer food choice preferences, food spoilage during storage, and the size of food portions. Our study found that FW at restaurants occurs due to inefficient storage caused by a lack of proper equipment, over-supplies of raw materials as often restaurants do not follow any systematic approach to predict how much is needed, and also sometimes package and buffet system in restaurants. To assess the quality of food preparation and maintenance, several factors should be considered, such as the amount of food prepared daily, whether food is prepared from scratch upon order, the quantity of food discarded each day, the treatment of unserved food at the end of the night, seasonal menu changes, and measures to prevent wasted food on the plate. Often, customers end up taking more food on their plates to get the worth of their money regardless of the fact that they might not be able to finish it. Even though it is terrible that very few restaurants (only 20%) are actively taking any action taken to considerably reduce it. Also, more attention needs to be given to build awareness among the customers as 50% of food is wasted on customer plates. In depth questioning and discussion reveal that customers waste food due to customer food habits, careless attitude or lack of awareness about the impacts of wastage. The survey might have been more in-depth and the sample size could have been increased to provide a better picture if there had been more time and resources available.

Finally, in terms of reducing waste in any way, proper initiative can be taken to make them understand the financial benefit of saving the environment and enhancing sustainability through it. Only then, maybe a number of zero waste restaurants will be a reality in Bangladesh. Awareness building among the restaurant personnel and customers and policy implementation and regulatory guidance by the concerned authorities should be aimed at and achieved first.

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