CAUSES AND CHALLENGES FOR FOOD WASTE MANAGEMENT IN FIVE STAR HOTELS WITH A SPECIAL REFERENCE TO GALLE DISTRICT, SRI LANKA

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Abstract

Food waste is the major type of waste problem that has been facing the world. In Sri Lanka, half of the total solid waste represents food and green waste. The hotel sector can be considered a major food waste generator compared to other food service industries. Food waste also negatively impacts the environment, economy, and society of the country. This study aims to identify the causes of food waste in five-star hotels, identify the challenges faced by five-star hotels when managing food waste, and examine the sustainable food waste reduction strategies that can be adopted by five-star hotels in the Galle district, Sri Lanka. The qualitative research approach and phenomenology have been selected as the research design. The data were collected through semi-structured interviews, and both face-to-face and telephone interviews were conducted. Based on the analysis using qualitative thematic analysis, the findings were six causes of food waste were identified as Menu Planning error, ingredient spoilage, Inventory controlling error, Taste of the food, Guest's attitudes, Buffet, and causes for food waste were classified into two categories such as Pre consume and Post consume there are five food waste management challenges identified as internal challenges as The staff of the hotels, Type of food service, Menu planning and external challenges as Ingredients spoilage and guest's attitudes. Five-star hotels in the Galle district currently use food waste disposal practices and food waste reduction strategies, and they are concerned about their food waste control, so they use some awareness programs, especially for their staff community. In this study, the researcher mainly identified from interviews that the main factor for food waste is the guests' attitude. The recommendations for better food waste prevention and reduction include different means such as using new food waste composting machines, using artificial intelligence, using food waste management software, conducting awareness programs for reducing food waste, and achieving business sustainability.

Keywords: Food waste, food waste reduction, five-star hotels, sustainability .

1. Introduction

Municipal Solid Waste (MSW) is a pool of various solid wastes by towns and cities from different types of household activities. It may include food and green waste, electronics and electrical waste, and composite waste (Ozcan, et al., 2016). Food waste has been identified as a major portion of total MSW waste in the world (Zhang, et al., 2018). Food waste means food intended for human consumption, either in edible or inedible status, removed from the production or supply chain to be discarded including at primary production, transportation, storage, retail, and consumer levels except for primary production losses.

According to the Food and Agriculture Organization (FAO), one-third of global food is wasted. 1.2 billion tons of food is wasted on farms each year – the weight of 10 million blue whales and the global volume of food wastage is estimated at 1.6 billion tons of primary product equivalents. Total food wastage for the edible part of this amounts to 1.3 billion tons (FAO, 2019). According to the UN Food Waste Index 2021 in Sri Lanka, the per capita food waste is 76 kg annually while every year over 1.6 million tons of food waste are generated in households. In Sri Lanka, 64% of solid waste consists of food waste mainly from households, restaurants, meat, and vegetable markets (Forbes, Quested, & Connor, 2021). According to the United Nations Food Program, about 22% of the total population in Sri Lanka does not have sufficient food to sustain a healthy life. According to the 2020 GHI report, 7.6% of Sri Lanka's population is undernourished. It also showed the country recorded a 15.1% of wasting and 17.3% of stunting rate among children under five years (Grebmer, et al., 2020). About 22% of the total population in Sri Lanka does not have sufficient food to sustain a healthy life and 33% of the people cannot afford a nutritious diet (Reitemeier, Aheeyar, & Drechsel, 2021).

Food waste mainly occurs in the food service sector and that includes hotels, cafeterias, catering, and many other formats. Being a large resource consumer, the hotel sector is considered a high food waste-generating sector (Sandaruwani & Gnanapala, 2016). The expansion of the hospitality sector's operations would lead to an increase in waste generated by the sector (Pirani & Arafat, 2016). As an example, in the UK alone, 920,000 tons of food is wasted at hospitality and food service sector outlets annually, 75% of which is avoidable (Parfitt, Hawkins,, & Prowse, 2013). Food waste is a major problem within the hotel sector across various countries (Goh & Jie, 2019). The hotel industry in Sri Lanka has been labelled as one of the highest energy consumers and waste generators with an estimated 79% of their waste related to food (Corporation, 2013). In Sri Lanka, the amount of food waste can be estimated as 353 tons per day and gives the highest contribution to that waste from households as half of the total food waste, and the hotels and restaurant sector generates 110 metric tons per day (Fernando & Santini, 2018). In Sri Lanka, The hotel industry is a significant

waste generator which is responsible for 11,749 tons (72,941 cubic meters) of waste annually (Wijesekara, & Sridarran, 2020). In a typical hotel, the breakup of solid waste generation by type is food and non-recyclables, 46.2% of food waste.

Sri Lanka should be considered a leading tourist service provider in the South Asian region and provide a massive contribution to the economy by generating employment opportunities and earning USD dollars for the economy. Food is the backbone of the hotels (Nair, Choudhary, & Prasad, 2019). Five-star hotel means that hotels provide flawless guest services in a state–of–the–art facility. As a five-star property, it has premium dining options and personalized services for its guests. While considering the subject in the tourism sector, the selection of five-star international chain hotels stems from the fact that these enterprises set an example to other tourism facilities by appealing to a wide range of people with the help of their quality standards and brand recognition—similarly, the loyalty of the star hotel customers and their tendency to revisit. With increasing tourist arrivals and occupied hotel rooms, there is a high tendency to generate food and other types of waste materials in the 5-star hotel sector. The typical hotel guest produces approximately 1 kg of waste per day (Zorpas, et al., 2012). The typical hotel food waste generation percentage is 46.2% of their total solid waste (IFC, 2013). According to the report of Ensure Sustainability in Sri Lanka Hotels, in the hotel sector, the major solid waste type is food waste and the quantity is 6000 metric tons per month (IFC, 2013).

According to the Sri Lanka Tourism Development Authority (SLTDA, 2018), the annual tourist arrivals to Sri Lanka are around 1.4 billion. They have also mentioned that most of the registered villas and hotels are concentrated in the Galle District and the south coast region has 35.04 of the total accommodation capacity in Sri Lanka. It is highlighted as the second-highest accommodation capacity in Sri Lanka. Therefore, it can be considered that the Galle District is the most tourist arrival and destination place. According to SLTDA statistics, the south coast is considered the third highest occupancy distributed-rated region in Sri Lanka. Occupancy rates mean the percentage of occupied rooms in the area, the percentage representing 73.10% (SLTDA, 2018). In 2020 the percentage of room capacity of graded accommodation units by star category was 21% in the five-star hotel category. The south coast region was reported as the third highest tourist accommodation capacity in Sri Lanka at a percentage of 14.9% and provided facilities for 6370 tourists in 2020. In Sri Lanka, the proportion of foreign guest nights spent in the south coast region was 35.8% and it was the second largest percentage in Sri Lanka the largest proportion of nights local guests spent reported in the south coast region was 34.73% in the 2018 year (SLTDA, 2018). It represented the highest rate for local guests in Sri Lanka in the 2018 year.

The Sri Lankan hotel industry is crucial since there is no strict legal background that specifically governs the hotel industry waste, except for a few regulations related to tourism (Wijesekara, & Sridarran, 2020). Therefore, the hotel sector needs a better and more effective food waste management approach to tackle food waste. The researcher has identified that there are only a few studies done regarding food waste management in Sri Lankan five-star hotels. Especially, there were no comprehensive studies found on food waste management in five-star hotels in the Galle district. Therefore, there is a knowledge gap about food waste management in five-star hotels and this study will focus on the following research objectives.

1.1. Research Objectives

The researcher's aims of this study are to examine the contributing factors to generate food waste in the five-star hotels in Galle District, to examine the challenges faced by five-star hotels in Galle District in managing food waste And to suggest sustainable food waste reduction strategies that can be adopted by the five-star hotel in Galle District.

1.2. Limitations of the Study

- This study does not consider the quantity of food waste generation in the selected hotel sector for analysis and findings.
- The research studies could collaborate with waste management companies, organizations, and institutions to explore applicable and scientific solutions to limit continuous food waste.
- In this study, the researcher considered food waste management in general without focusing on financial, environmental, and social perspectives.

2. Literature Review

2.1. Concept of Waste and Food Waste

Waste is an urban area (garbage) composed of degradable organics (Plants and animals), no degradable organics (plastic polythene) , various metals, glasses, rubber, materials textiles, and papers (Wijetunga, 2013). Waste is any subsistence materials derived from the primary use or a useless defective, solid waste or garbage composed of unwanted and discarded materials from houses, street waste, commercial waste, and industrial operations (Dharmasiri, 2019). Food waste includes municipal solid waste and half of the municipal solid waste represents food waste. According to Gordon & Rensburg, (2002), food is an edible substance that gives people nourishment. FAO states that both food loss and food waste mean the decrease of food in subsequent stages of the food supply chain intended for human consumption FAO, (2013). Food waste is

witnessed by most people in their everyday life Ozdemir & Gucer, (2018). (Filimonau, et al., 2020) state that defining food waste can be problematic and there is often no clear differentiation, especially from the managerial viewpoint between food waste and food loss. Food waste is removed food and is no longer available to consume due to damage or other causes (Cahyana, Vanany, & Arvitrida, 2019) Food losses and waste can occur during any stage of the food supply chain (Díaz & Mena, 2014).

Figure 1: Food Losses and Food Waste in Different Regions of the World
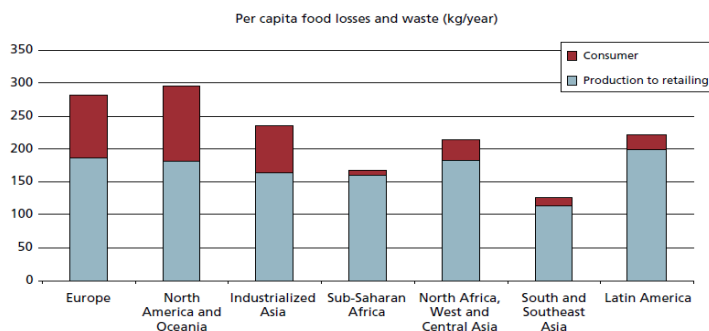
 Source: Gustavsson, et al. (2011)

Figure 1 illustrates that the per capita food loss in Europe and North America is 280-300 kg/year. In sub-Saharan Africa and South/Southeast Asia, it is 120-170 kg/year. The total per capita production of edible parts of food for human consumption is, in Europe and North America, about 900 kg/year and, in sub-Saharan Africa and South/Southeast Asia, 460 kg/year. Per capita, food wasted by consumers in Europe and North America is 95-115 kg/year, while this figure in sub-Saharan Africa and South/Southeast Asia is only 6-11 kg/year (Gustavsson, et al., 2011).

2.2. Hotel Sector Food Waste

Food waste is a major problem within the hotel sector across various countries (Goh & Jie, 2019). Based on (Quested, et al., 2011) and (Papargyropoulou, et al., 2014). In the hotel sector food waste is grouped into three categories: Avoidable food waste, Unavoidable food waste, and possibly avoidable food waste. As an example, in the United Kingdom (UK) alone, 920,000 tons of food is wasted at hospitality and food service sector outlets annually (Parfitt, Hawkins,, & Prowse, 2013). For example, in Denmark, the hospitality industry contributes more than 50%of waste related to food waste (Curry, 2012). Being the largest food

consumer in the hotel sector generates a large portion of food waste (Sandaruwani & Gnanapala, 2016). In Sri Lanka, the typical hotel food waste generation percentage is 46.2% of their total solid waste (IFC, 2013). The hotel industry in Sri Lanka has been labelled as one of the highest energy consumers and waste generators with an estimated 79% of their waste related to food (Corporation, 2013). In Sri Lanka, the hotels and restaurant sector generate 110 metric tons per day (Fernando & Santini, 2018).

2.3 Impact of Food Waste

It lists the main influences of food waste on the environment such as land waste, water waste, air pollution, greenhouse gases, energy waste, and toxicity (Linh, 2018). Similarly, scientists found the ecological impact of food waste in hotels, cafés, and restaurants nearly twice the size of the arable land in Lhasa (Lingen, et al., 2018). The economic value of the food wasted globally is approximately 1000 billion dollars per year, this figure rises to 2600 billion considering the hidden environmental costs that result from the phenomenon (Seberini, 2020). Most of the food wasted is actually in good shape and edible. It is calculated that 1.3 out of 1.6 gigatons of food waste consists of edible parts. If food wastage can be recovered, it will feed enough hungry people and animals, too (Linh, 2018).

 (Karakas, 2021), (Okumus, 2019) Tekina & Ilyasov, (2017) and many researchers have found five-star hotel sector food waste management practices, challenges, and opportunities to reduce food waste in their research. Ofei & Mikkelsen, (2011) and many other researchers in the world found that causes of food waste   generated in the hotel sector. In Sri Lanka. Sandaruwani & Gnanapala, [2016], Wijesekara, & Sridarran, (2020), and other researchers have done a lot of studies about hotel waste and food waste management for hotels' sustainable business operation but the researchers have not found any research studies about hotel food waste-related causes, or reduction practices that hotels implement, and strategies in Sri Lanka. This study focuses on studying the causes of food waste and food waste management challenges and identifying the most sustainable food waste management practices to reduce food waste in the Galle district five-star hotels.

3. Methodology

The researcher has selected the qualitative, Inductive approach to conduct the research. In this study, the researcher attempts to find in-depth ideas about hoteliers' kitchen staff and management teams, contributing factors to generate hotel food waste, challenges faced by the hotel to reduce food waste, and sustainable strategies that can be adopted by five-star hotels. The case study research design has been selected for this study because it is a suitable research design to meet the research objectives. In the case of this study the researcher only stays as an observer and collects the experiences and opinions from the

people who have direct interactions with the subject phenomenon, the food waste management process at five-star hotels in the Galle district.

3.1. Research Site Selection Rationale

All five-star hotels located in the down south area Galle district have been selected as the population for this study. There are two registered five-star hotels located in the Galle district under the Sri Lanka Tourism Development Authority.

This research study is based on five-star hoteliers in the Galle district. The researcher selected down south area Galle district area five-star hotels because the Galle area is covered by a marvelous beach area and most of the foreign tourist attractions places are located in that area with high foreign destination places the hospitality sector has to provide various food and beverage as foreigners prepared. According to the Sri Lanka Tourism Development Authority (SLTDA, 2018), the annual tourist arrivals to Sri Lanka are around 1.4 billion. They have also mentioned that most of the registered villas and hotels are concentrated in the Galle district and south coast region has 35.04% of the total accommodation capacity in Sri Lanka. It is highlighted as the second-highest accommodation capacity in Sri Lanka. In Sri Lanka, the proportion of foreign guest nights spent in the south coast region was 35.8% and it was the second largest percentage in Sri Lanka the largest proportion of nights local guests spent reported in the south coast region was 34.73% in the 2018 year (SLTDA, 2018). It represented the highest rate for local guests in Sri Lanka in 2018. According to SLTDA, the largest proportion of night local guests spent was reported from the south coast as 37.21%. The Galle area can be identified as also the most local tourist attraction place in Sri Lanka. Due to different cultural changes, values believe their consumption pattern has a huge difference from foreigners' consumption patterns.

The researcher uses purposive sampling to collect data for the study because choosing participants for interviews such as the Executive chef, cooks, food and beverage manager, servers, and hotel manager as reliable data sources to conduct this study. Two five-star hotels in the Galle district were selected for the study. For this research study, primary data was used to conduct the analysis. The researcher attempts to gather in-depth information from the hotel kitchen staff and management team about their waste reduction strategies and the challenges faced by the hospitality sector in controlling food waste. The data for this study is collected through semi-structured depth interviews. The interview protocol has been developed by the researcher based on the literature review. Face-to-face interviews were conducted and due to the limited period, some interviews were conducted through the telephone. The researcher has conducted eleven interviews to collect data.

Thematic analysis is used to deduce the meaning behind the words people use and thematic analysis is also used in semi-structured interview data analysis. This is accomplished by discovering repeating themes in the text. These meaningful themes reveal key insights into data and can be quantified, particularly when paired with sentiment analysis.

To ensure the trustworthiness of this study the researcher used member checking and audit trial techniques. The data collected from interviewees provided much suitable information from their job experiences and hotel food waste management process and the researcher was able to achieve the aims of this study. Eleven hotel staff members were interviewed for this study.

Table 1: Respondent Protocol

Respondents	Male/Female	Age	Occupation	Education Level	Experience
RE/01	Male	54	Chef	Advanced Level	25 years
RE/02	Male	45	Chef	Advanced Level	08 years
RE/03	Male	38	Chef	Diploma	10 years
RE/04	Male	32	Chef	Advanced Level	05 years
RE/05	Male	50	HR Manager	Diploma	20 years
RE/06	Male	42	Manager	Degree	14 years
RE/07	Female	34	Stores officer in charge	Advanced Level	10 years
RE/08	Female	21	Clerk	Advanced Level	01 years
RE/09	Female	28	Stores Assistant	Advanced Level	08 years
RE/10	Female	24	Accountant	Diploma	03 years
RE/11	Male	33	Cleaning Supervisor	Ordinary Level	05 years

Source: Field data 2023

Interviews were held for 10 minutes to 20 minutes, to collect relevant data. The main purposes of this study are to identify the causes of food waste in five-star hotels in the Galle district, identify the challenges when managing food waste in that hotel sector, and examine sustainable food waste reduction strategies that can be adopted by five-star hotels in the Galle district. Mainly there are codes and themes developed according to the research objectives.

Table 2: Data Coding Table

Themes	Sub themes	Sub-themes
Courses on food waste in five-star hotels in the Galle District	Pre consume	• Menu Planning error • Ingredients Spoilage • Inventory Controlling error
	Consume	• Taste of the food • Guest's attitudes • Buffet
Challenges facing when managing food waste	Internal challenges	• The staff of the hotel • Type of food service • Menu planning
	External challenges	• Ingredients Spoilage • Guest's attitudes
Food waste disposal practices	Current food waste management practices	• Bio gas unit • Donate to piggery farms • Produce fertilizer
Food waste reduction strategies	Strategies to reduce food waste	• Conducting waste audit • Awareness program for staff • Inventory controlling

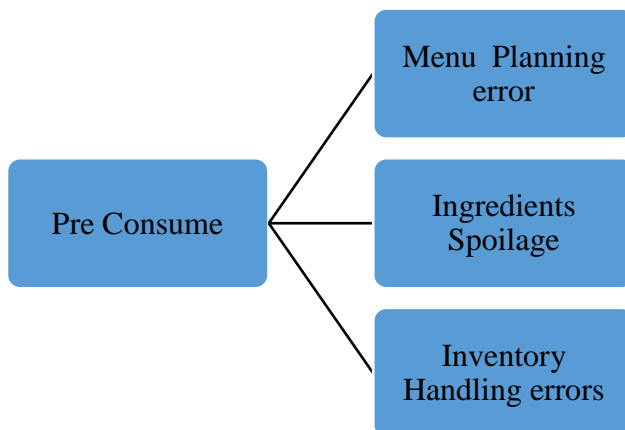Source: Developed by the Researcher 2023

4. Findings and Recommendations of the Study

The causes of food waste are the first question of this study and aim to identify the causes of food waste in five-star hotels in the Galle district. Therefore, identifying the causes of food waste is the first theme developed from theories. According to the respondent's information, the researcher developed themes,

categories, and codes based on the identification of causes of food waste in five-star hotels.

4.1. Pre-Consume

Figure 2: Pre-Consume

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                           ┌──────────────────┐
                           │  Menu  Planning  │
                           │      error       │
                           └──────────────────┘
┌──────────────────┐       ┌──────────────────┐
│                  │       │   Ingredients    │
│   Pre Consume    │───────│    Spoilage      │
│                  │       └──────────────────┘
└──────────────────┘       ┌──────────────────┐
                           │    Inventory     │
                           │ Handling errors  │
                           └──────────────────┘
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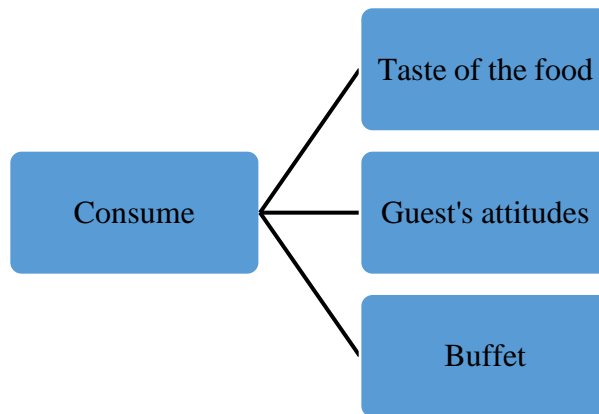
Source: Developed by Field Data

Identifying the contributing factors for food waste in five-star hotels in the Galle district can be divided into two parts; food pre-consume and food post-consume. Pre-consume means in the five-star hotel sector food waste can be generated before the guests consume and according to the respondent's information researcher identifies the menu planning error, ingredient spoilage, and inventory controlling as the food waste-generating factors under the pre-consume stage. Post-consumption means in five-star hotels food waste is generated after the food is consumed by the guests. In the hotel sector, some portion of food waste cannot be avoided anyway due to inedible parts of the ordering food.

Spoiled vegetables, fruits, and other food for use in hotel consumption generate food waste because some fruits and vegetables cannot be identified as low quality or spoiled at the time when it's ordered or bought by hotels. That is the considerable situation for food waste generated.

Inventory handling and machine maintenance is other contributing factor to food waste generation in five-star hotels. Most organizations use the first in first out (FIFO) for inventory control.

4.2. post-consume

Figure 3: Post Consume

Source: Developed by Field Data

Under the post-consumption stage, food goes down to waste after consumption by hotel guests. According to the respondent's information, the taste of the food is caused to generate food waste in the five-star hotel sector because consumption depends on the taste of the food.

More than half of the respondents referred to over-ordering and preparation as massive contributors to food waste. For example, one of the respondents with over 15 years of work experience as a chef in the hotel industry stated,

> *"I can say confidently that the majority of the waste comes from our staff sector. The buffets produce a lot of waste. We cannot advise him or her when sharing food on the plate. It is his or her to share as much as necessary that comes from his or her attitudes". (Respondent 01personal interview 2023)*

The buffet serving is another fact identified in the respondent interview and proven in the below statement.

Identifying the challenges faced when managing food waste is the second question of the study. Food waste is a complicated issue that involves many parties and many stakeholders, thus there remain many obstacles. The hotel sector faced various challenges when controlling and minimizing food waste. Because reducing the generation of some types of waste is difficult. Challenges mean difficulties in managing that waste. Challenges to reducing food waste can be divided into two parts such as internal challenges and external challenges.

4.3. Internal Challenges

Figure 4: Internal Challenges
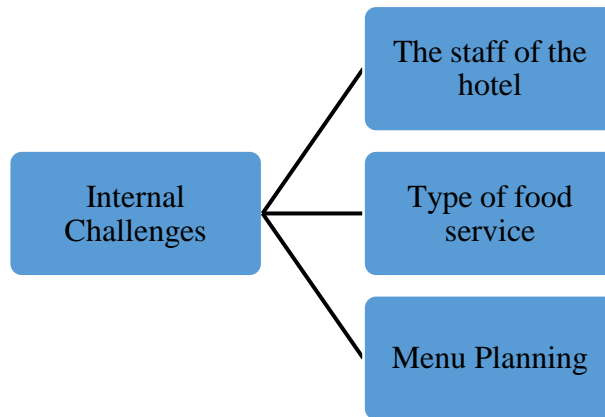
Source: Developed by Field Data

The staff of the hotel is the most critical challenge identified from respondent information. The below-mentioned statement will prove that. Most of the chef respondents said that the hotel staff behavior is affected by generated food waste.

> *"Our staff food service is free and they can use any food during eating time. New staff members get more food than they eat portions and dump it into bins although some inform banners and other posters." (Respondent 03 personal interview 2023)*

Another challenge the five-star hotel sector faces is the food service type. There are various types of food services such as Buffet service, Guerdon service, Room service, Silver service, and French service, etc.

> *"In our hotel widely use buffet service is more widely used than other types of food service. Our staff meals are provided as buffet service. This buffet service is a huge challenge because of more food waste origin then. And we are not able to control that because some portions of food in the buffet are not eaten."(Respondent 06 personal interview 2023)*

In addition to that, the hotel sector faces menu planning. Most of the hotel's menu planning is done by the chef according to their experience level and it plans according to the number of guests in the day.

4.4. External Challenges

Figure 5: External Challenges
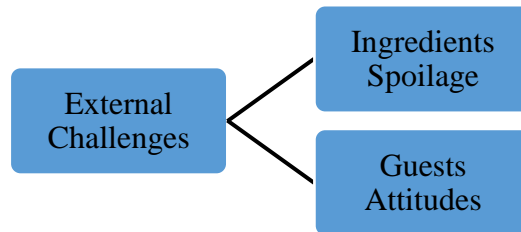
Source: Developed by Field Data

External challenges identified are that ingredient spoilage means some vegetables, dairy items, fish, and meat, and some fruits are spoiled before it's processed for consumption. Respondents said,

> *"We cannot control these ingredients' spoilage before processing, which is one major difficulty when managing food waste at our hotel. As an example some vegetables and meats are spoilage and that vegetable appearance is good but inside is spoilage."(Respondent 02 personal interview2023)*

Another external fact that was identified during the respondent discussion is guest attitudes. The guest's attitude depends on that person and anyone can't control that. These attitudes externally impacted food waste management in the hotel sector.

4.5. Food Waste Disposal Practices

The third objective of the study is to suggest sustainable food waste reduction strategies that can be adopted by the five-star hotel in Galle District.

Figure 6: Current Food Waste Management Practices
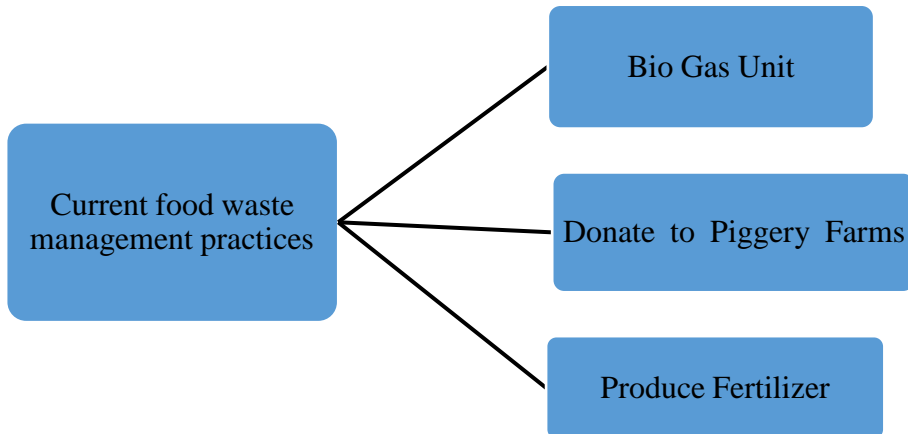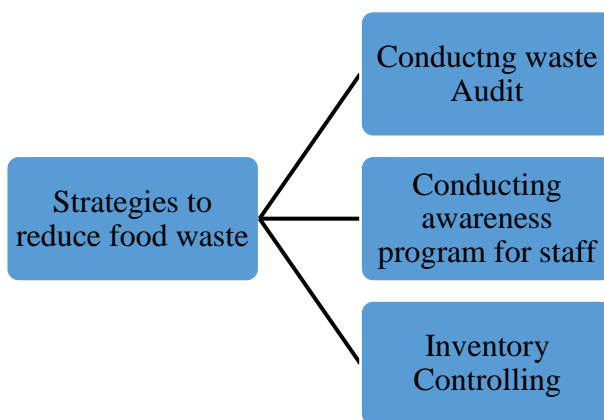

Source: Developed by Field Data

Hotel food waste management practices vary from one country to another and from one organization to another. Globally hotel waste management practices include prevention and reduction, recycling, donating, composting, tracking, improving ingredients purchase and storage, smart food merchandising, menu design, employee training, customer engagement, portion control, and service model changes. According to the respondent information above mentioned codes were identified.

Today most organizations commonly use biogas units for cooking activities that operate using generated food waste from that organization. It is proven in below below-mentioned statement.

> *"We have a biogas unit for the food waste coming in. We dump that waste to it and take biogas to cook the food in the staff cafeteria. A liquid fertilizer is produced from generated food waste."(Respondent No 11 personal interview 2023)*

In the Galle district, five-star hotels use different strategies to reduce food waste at different stages.

Figure 7: Strategies to Reduce Food Waste

Source: Developed by Field Data

Most hotels commonly use food waste audits to reduce food waste and identify the higher waste-generating items during food production: serving and post-consumption. Food waste is mainly generated by people's attitudes because some people do not consider the waste. During the interviews, most of the respondents stated their hotel's staff has directly contributed to generating food waste because hotels provide meals to their staff for free therefore new workers have no idea about food waste and they dump some meals after eating. The five-star hotels in the Galle area use awareness programs for new staff members. It is stated in the below statement.

> *"Our old staff members know how to use food, but the new staff members do not know that, so we conduct a program to educate them.."(Respondent No 05 and 03 at personal interview 2023)*

Another piece of information identified during the personal interview is inventory control. One respondent stated the below-mentioned statement. Inventory controlling is affected to generate food waste at hotels. Because ordering more than food for requirements generates food waste. Inventory control is one strategy to reduce food waste.

5. Discussion

The first objective of this study is to identify the food waste-generating factors in five-star hotels in the Galle district. According to the respondent's information, the researcher identified the two types of food waste-generating factors at five-star hotels. One type is consume-stage food waste such as menu planning, ingredient spoilage, and inventory controlling errors. Another food

waste-generating type of five-star hotel was posted to consume stage food waste such as the taste of the food, guest's attitudes, and buffet. In five-star hotels, food waste is generated before and after food consumption. According to (Kasavan, et al. 2019) in their study, they found poor hotel management and policy, lack of skills in food preparation, lack of facilities and food waste technology, non-implementation of waste audit and waste separation, unsustainable food consumption patterns of the customers, risk of food ingredients spoilage, ineffective communication, and inadequate education and awareness are the generating factors of food waste in hotels.

The second objective of this study is to identify the challenges when managing food waste in the five-star hotel sector. As it has been pointed out throughout this study food wastage is an issue that affects everyone and that is of concern for businesses in the hospitality and food service sector, it requires effective management. Effective management of food waste faces several challenges. This study revealed two types of food waste controlling challenges: external and internal. The external challenges include ingredient spoilage and guests' attitudes. The internal challenges associated with the staff of the hotel, type of food service, and menu planning. Guest's attitudes mainly impact the hotel food waste according to their consumption pattern. The five-star hotel sector is not able to control food waste without the contribution of customers. Customers are a major contributor to generating food waste in hotels (Silvennoinen, et al. 2015) (Mirosa, et al. 2018) (Sakaguchi, et al. 2018) found that education and raising awareness via effective communication can reduce customer plate waste. Over-ordering is a major factor in generating food waste under guests' attitudes. During the interview, the researcher identified the hotel's staff behavior and attitude directly affecting the hotel's food waste.

Food waste has an impact on the environment, society, and economy of the country. Therefore, every person has a responsibility to reduce food waste from the food supply chain. The five-star hotels follow some management practices to reduce and dispose of food waste. They also followed ISO 22000 food safety management systems and followed the hotel's mother company policy about food waste. In this study, the researcher identified food waste management practices followed by five-star hotels in the Galle district as food waste audit, biogas unit for food disposal, donating piggery farms, and producing fertilizer. Some Food waste management practices are caused to generate and expose some harmful gasses to the environment, such as carbon dioxide, methane, etc. It has also been found that food waste management practices are key in ensuring business sustainability by leveraging hotel resources in sustainably serving customers; however, food waste remains one of the most complicated issues in hotels since it is caused by various factors and at every stage of the food supply chain.

In the Galle district, five-star hotels can minimize food waste using hotel staff training, new technology such as Artificial Intelligence (AI) approaches for food waste management, food waste management software such as (TENZO, Winnow Solutions) and innovative inventory management software such as (TotalCtrl) and community composting method. Used for reducing food waste, and conducting proper awareness programs for especially local guests. Reducing food waste also helps to reduce food and labour costs, maintaining higher profits, sustainability, and business ethics.

6. Conclusion

This study investigated the primary reasons for food waste and the challenges faced by five-star hotels in managing food waste. This study suggests sustainable strategies that can be adopted by five-star hotels to reduce food waste. The researcher identifies menu planning, ingredient spoilage, inventory controlling errors, the taste of the food, guests' attitudes, and the buffet. The main challenges faced by the five-star hotel sector when tackling food waste such as the staff attitudes, type of food service, menu planning, ingredients spoilage, and guest attitudes. In the Galle district five-star Hotel's management is concerned about their food waste control, so they use some awareness programs especially for their staff community. In this study the researcher mainly identified from interviews the main factor for food waste is guest's attitudes. Hotel management follows some policies when preparing food and following food waste management practices such as waste audits, the use of biogas for cooking activities from wasted food, producing liquid fertilizer, and donating wasted food to piggery farms for feeding animals.

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