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Understanding Food Waste in Restaurants and Hotels: A Systematic Review with Framework

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ABSTRACT

This text discusses food waste, which includes both edible and inedible parts discarded throughout the food supply chain. It can be unavoidable (like eggshells) or avoidable (food that spoils before consumption). Cultural factors can also influence what's considered waste. While some studies use "food loss" and "food waste" interchangeably, others differentiate them based on when food is lost in the system. This research considers them the same, focusing on waste generated at different points, including consumption. Food waste can occur at home or in restaurants (hospitality sector). Hospitality can be further divided into commercial, non-commercial, and other types of food service.

RESEARCH PAPER

INTRODUCTION

The hospitality sector is a major contributor to food waste, estimated at nearly 12% recently. This is a growing concern that deserves attention. While food waste in hospitality is a major concern, especially with rising out-of-home dining, research in this area is lacking. The media frequently highlights the issue, but academics haven't given it enough attention. Despite being recognized as a key challenge, there's a gap in rigorous studies on this topic.

Existing research on hospitality food waste covers various topics, like measurement, composition, handling, customer attitudes, and government policies. However, these studies are scattered, with limited generalizability, focus, scale, and geographic scope. For example, management practices to reduce waste haven't been well-explored, and research often focuses on developed countries even though the issue is more pressing in developing economies. Given the importance of food waste reduction for sustainability and resource use, this lack of in-depth research is concerning. We need to bring together fragmented findings and conduct more comprehensive studies in this area. While some reviews on food waste exist, few focus specifically on hospitality.

This research builds on their work in three ways:

1. **Refining the Focus:** It defines the "hospitality sector" more precisely as "Hospitality and Food Services (Hafsa)" with three sub-categories for a more detailed analysis.
2. **Expanding the Scope:** It includes research specifically on the profit-making side of HaFS, which may have different waste patterns.
3. **Guiding Future Research:** It develops a framework for further academic research, complementing the existing practice-oriented approach.

By focusing on the profit sector of HaFS and using a combination of research profiling and content analysis, this study aims to set a new direction for future research on food waste in hospitality. This research focuses on the profit sector of the HaFS industry, which encompasses businesses that serve prepared food and drinks for immediate consumption outside the home. This sector includes various sub-categories like restaurants (fine dining, casual, etc.), hotels, and catering services.

RESEARCH GAPS:

The study identified several gaps in existing research on food waste within HaFS. These gaps include:

- **Research Methodology:** The robustness of methods used in past studies and the reliability of their samples need further examination.
- **Global Scope:** Research has been geographically limited, and more studies are needed from diverse regions.
- **Demographics and Behavior:** The impact of demographics and customer behavior on food waste requires further investigation.
- **Theoretical Frameworks:** Existing research lacks strong theoretical underpinnings.
- **Limited Variables:** Studies have often focused on a narrow range of variables related to food waste.

By analyzing these gaps, the research aims to develop a framework that guides future studies on food waste in the profit sector of HaFS. This framework can also provide practical insights for businesses to reduce food waste. The author acknowledges the complexity of HaFS, highlighting how food waste issues differ between profit and cost sectors. For example, restaurants might donate leftovers, while hospitals can't due to hygiene concerns.

The author proposes a new HaFS segmentation that goes beyond the profit/cost binary:

1. **Business Segment:** This includes profit-driven establishments like hotels, restaurants, cafes, and workplace canteens.
2. **Education Segment:** This covers schools and universities.
3. **Health Care Segment:** This includes hospitals, elder care facilities, and nursing homes (both private and public).

This refined segmentation recognizes the growing trend of private healthcare and allows for more targeted research on food waste within HaFS. The research focuses on all food service establishments within these three segments.

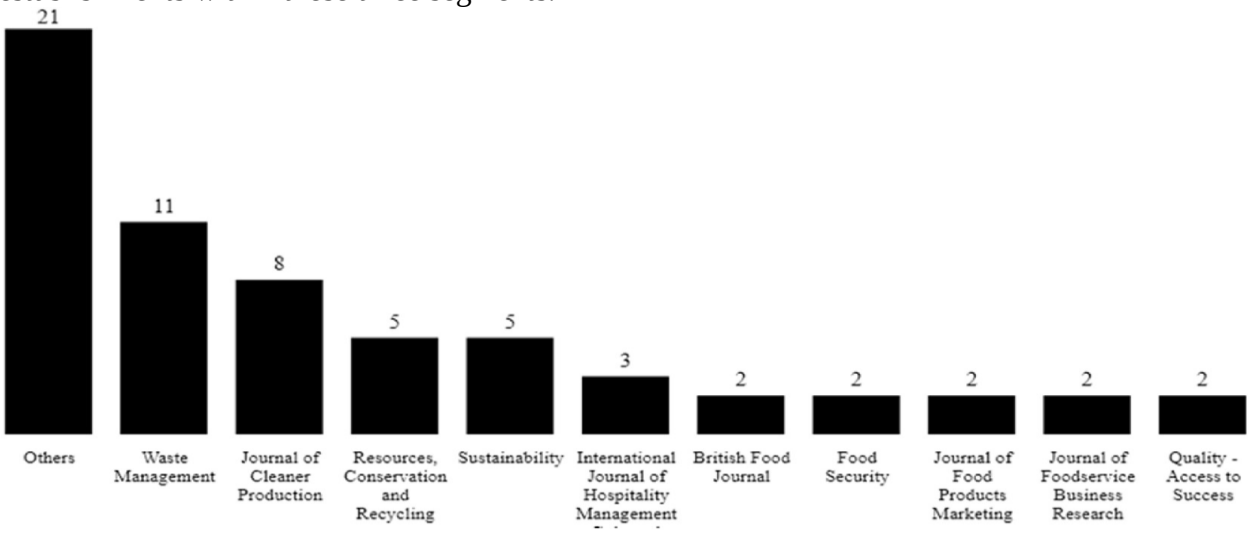

Figure 1: Distribution of Studies Across Journals

This figure shows the academic journals where the selected research on food waste in hospitality was published.

- A variety of journals published the studies, with some appearing in outlets dedicated to hospitality and tourism like "African Journal of Hospitality, Tourism and Leisure" or "Journal of Hospitality Marketing and Management."
- Other studies appeared in broader journals that focus on sustainability, consumer behavior, or waste management.
- No single journal published a large concentration of the research.

This research focused on understanding food waste in the profit sector of hospitality, including restaurants, cafes, and catering services.

To analyze past research, the author used content analysis, a common method for examining qualitative data. The author independently reviewed the studies to identify key themes. After discussion and consultation with food sector experts, the author agreed on eight main themes:

- **Causes of Food Waste:** This explores why food gets wasted, such as overproduction, serving issues, and uneaten food.
- **Waste Hotspots:** This identifies areas in the hospitality process where food waste is most likely to occur.

- **Nudges:** This examines strategies to influence customer behavior to reduce food waste.
- **Types of Facilities:** This explores how food waste patterns might differ between restaurants, cafes, and other catering services.
- **Leftover Handling:** This examines how leftover food is managed and its impact.
- **Stages of Waste Generation:** This looks at the different points in the hospitality process where food waste occurs.
- **Demographic Factors:** This explores how customer demographics might influence food waste.
- **Waste Control:** This examines strategies to reduce and manage food waste.

There was some initial debate on how to categorize causes, waste by facility type, and waste generation stages due to overlapping content. However, the author decided to present them all for a more detailed discussion.

This section explores the root causes of food waste in the hospitality industry, specifically looking at restaurants, cafes, and catering services. Here's a breakdown of the key factors:

- **Menu and Preparation:** The type of food served, production processes, and use of pre-prepared items all play a role.
- **Portion Control:** Larger plates and serving sizes are linked to increased waste.
- **Employee Skills:** Staff training and skill levels can impact food waste.
- **Inventory Management:** Poor planning and procurement practices can lead to waste.
- **Customer Behavior:** Factors like taste preferences and leftover plate waste are important.

The research also explores how these causes differ across hospitality sub-sectors:

- **Restaurants:** Waste is influenced by menu type (e.g., meat-based menus), operating hours, and ingredient spoilage.
- **Buffets:** Inaccurate customer predictions, strict leftover policies, and poor coordination between departments all contribute to waste.
- **Workplace Canteens:** Taste preferences can lead to uneaten food on plates.
- **Airlines:** The length of flights directly correlates with the amount of food waste.

Where and When Does Food Waste Happen in Hospitality?

- **Food Waste Hotspots:** Researchers examined which food items are most frequently wasted. Vegetables seem to be a common culprit across various hospitality sectors. However, there isn't a clear link between geography or culture and specific waste hotspots. For instance, salads and sides are wasted often in some restaurants, while fruits and vegetables are a problem in hotel restaurants of another country.
- **Stages of Food Waste Generation:** Understanding when food gets wasted is crucial for managing it effectively. Waste can occur at any point, from purchasing ingredients to customers finishing their meals. Researchers have categorized food waste based on the stage:
- Storage waste
- Preparation waste (during cooking)
- Serving waste (improper portioning or discarding uneaten food)
- Plate leftovers (customer discards)

The research also suggests that some production waste is unavoidable, while other types (like serving waste) can be influenced by practices like quality control procedures. For example, a restaurant with less strict quality control had lower overall waste.

Food Waste by Hospitality Sector and Customer Demographics-

This section explores how food waste patterns differ across hospitality businesses and how customer characteristics can influence waste.

Variations by Establishment Type:

- Casual dining restaurants tend to have more leftover plate waste compared to fine dining, though fine dining may waste more food per customer overall.
- High-end restaurants generate the most waste per establishment, followed by mid-range and then low-end restaurants.
- Larger restaurants tend to have lower per-employee waste.
- Waste can also vary depending on the meal purpose. Business banquets and large gatherings tend to create more waste than smaller, private meals.
- Hotels waste a larger portion of their food input compared to restaurant complexes.
- The amount of food wasted per serving also differs, with canteens averaging around 50g and restaurants around 190g per serving.

Impact of Demographics:

- Age and gender can influence food waste. Studies suggest younger diners and females may leave more food uneaten. However, findings on gender differences are mixed.
- There may be a gap between what people say they waste and their actual behavior. Men might be more likely to underreport wasted food.
- Cultural background and geographic location seem to influence food waste patterns. Countries with different food preferences (freshly cooked vs. ready-made meals) may have varying levels of waste.
- Tourist diners tend to waste more food compared to locals. Additionally, waste patterns can vary by the type of city a restaurant is located in.
- **Environmental Issues:** Food waste is a major sustainability challenge, contributing to climate change through greenhouse gas emissions.
- **Economic Losses:** Uneaten food translates to lost revenue for businesses. Estimates suggest restaurants lose 23% of their food purchases.
- **Food Security Risks:** Wasting food can worsen global food security issues, especially considering the amount of land and resources used to produce the wasted food.
- **Customer Satisfaction vs. Waste Reduction:** While hospitality professionals understand the financial downsides of food waste, customer satisfaction often takes priority, creating a conflict when it comes to implementing waste reduction strategies.

Nudging Customers to Waste Less-

The research explores the concept of "nudges" - subtle suggestions that influence behavior. Here are some examples of nudges that have been effective in reducing food waste in hospitality settings:

- **Smaller Plates:** Reducing plate size encourages customers to take less food, without impacting their satisfaction.
- **Removing Side Plates:** Fewer plates mean less opportunity to pile on extra food.

- **Social Cues:** Posters or messages reminding customers about food waste can raise awareness.
- **Leftover Packaging:** Offering to pack leftovers for customers to take home reduces waste.
- **Informational Prompts:** Place cards on tables with information about waste reduction can nudge diners to be more mindful.
- The effectiveness of these nudges varies depending on the type of establishment.

Leftover Dilemmas: To Take or Not to Take?

Ideally, leftover food should be reused or recycled, not thrown away. Here's a look at the challenges and opportunities surrounding leftover food:

- **Taking Leftovers Home:** Customers may be hesitant to take leftovers due to social stigma, concerns about food safety, or wanting to avoid appearing wasteful.
- **Restaurant Leftover Management:** Restaurants may offer to pack leftovers, but some are hesitant to donate leftover food due to liability concerns. Legal frameworks to protect food donors could encourage more donations.
- **Alternative Uses for Leftovers:** Leftover food can be used to feed staff, donated to charities, composted, or even used as animal feed (depending on its condition).

The passage concludes by highlighting the need for a multifaceted approach to food waste reduction in hospitality. This includes nudging customer behavior, addressing legal barriers to food donation, and exploring alternative uses for unavoidable leftovers.

Combating Food Waste in Hospitality-

This section explores the different strategies used to control food waste in hospitality businesses.

- **Restaurant Awareness and Practices:** Many restaurants recognize the financial benefits of reducing waste and actively implement control measures. These practices include:
- Proper portion control and trimming of ingredients to minimize food scraps.
- Effective purchasing and menu planning to avoid overstocking.
- Utilizing demand forecasting to predict customer needs.
- **The Importance of Staff Training and Involvement:** Studies show that having a skilled and knowledgeable staff, along with employee participation in developing and implementing waste reduction plans, can significantly reduce food waste.
- **Government Involvement in Food Waste Reduction:** Government initiatives play a role in curbing food waste. Examples include:
- Public awareness campaigns to educate consumers.
- Legal frameworks and financial incentives that encourage waste reduction in businesses.
- Targeted policies to promote commitment from businesses and consumers.
- Training programs for hospitality staff on minimizing kitchen waste.

While restaurants understand the financial advantages of waste reduction, they often prioritize cost-saving measures when implementing new practices. Additionally, proper measurement of food waste is crucial for tracking progress and identifying areas for improvement. Automated tools can be a cost-effective solution for establishments with high waste volumes.

Data Limitations:

1. Generalizability Issues: Studies encompass various locations, businesses, and contexts, making it difficult to apply findings universally.

2. Research Design: The heavy reliance on qualitative research methods (like interviews) can introduce bias and raise questions about the strength of the results. Some experimental studies were conducted in unrealistic settings, limiting their usefulness.
3. Self-Reported Data: Surveys and interviews may not always capture accurate information because participants might be hesitant to provide truthful responses.
4. **Sample Size Issues:** Many studies used small groups of participants to gather information. This raises concerns about whether the participants accurately represent the larger population of interest. Small sample sizes can lead to unreliable findings
5. These limitations make it challenging to draw definitive conclusions about food waste practices.

Shortcomings in Current Research-

The review highlights key areas where food waste research in hospitality can be strengthened:

- **Narrow Research Focus:** Studies often delve into isolated aspects of food waste, like nudges or customer behavior, without considering the bigger picture. Practitioners need a comprehensive understanding, and research needs to explore the long-term effects of interventions.
- **Inaccurate Waste Measurement:** Inconsistent methods for quantifying food waste lead to unreliable data. Establishing a standardized and accurate measurement approach is crucial for identifying problem areas.
- **Geographic Bias:** Research heavily focuses on developed countries, neglecting the issue in developing nations facing unique challenges. More studies are needed to understand food waste patterns in these regions.
- **Limited Understanding of Underlying Factors:** While some research acknowledges the influence of personality, social settings, and meal types on food waste, a deeper exploration is needed. The relationship between factors like restaurant type, meal occasion, demographics, and waste generation needs to be investigated to understand how these variables interact and influence waste patterns.
- **Missing Theories:** Most studies relied on qualitative data or surveys without using established theories. While the findings were valuable, they lacked a strong theoretical foundation. This makes it difficult to guide future research.
- **Need for Behavioral Theories:** Since food waste generation and prevention are linked to consumer behavior, incorporating relevant behavioral theories and frameworks could significantly improve research in this area.

New Directions for Food Waste Research-

This section identifies promising areas for future research to advance both theory and practical applications:

- **Broadening the Scope:**
- Researchers can improve the generalizability of findings by conducting studies across various geographic locations and food service establishments. For instance, a restaurant waste reduction model could be adapted and tested in cafeterias or canteens.

Additionally, research from developed countries could be compared to studies in developing economies to understand the influence of cultural and policy factors.

- Replication studies can be used to assess the effectiveness of waste reduction efforts in different contexts. For example, a study on food waste reduction strategies in one country could be replicated in other countries to see if the same strategies are successful.
- **Better Measurement Techniques:**
- Researchers need to develop more comprehensive methods for quantifying food waste. This could involve using techniques like Material Flow Analysis (MFA) to track food waste at different stages within the food service system.
- Standardizing waste measurement practices would allow for easier comparisons between studies conducted in different establishments.
- More accurate measurement of food waste is crucial to identify areas for improvement and develop effective reduction strategies.
- **Utilizing Diverse Research Methods and Variables:**
- Studies should leverage existing food waste data from government or other reliable sources whenever possible, instead of relying solely on self-reported data from individual participants.
- Research should incorporate data from various personnel within food service establishments, including kitchen staff and managers, to get a more complete picture of waste generation patterns.
- **Deeper Exploration of Interventions:**
- Research is needed to understand the long-term effectiveness of different interventions aimed at reducing food waste and raising awareness.
- **Theoretical Frameworks:**
- Future research should incorporate established behavioral theories to provide a stronger foundation for understanding food waste generation and prevention.
- **Including Online Food Delivery:**
- The growing popularity of online food delivery services necessitates including them in future research on food waste in the hospitality industry.
- The research gaps identified in this review provide a springboard for future research in food waste reduction within the hospitality industry. Researchers can leverage this framework, either in its entirety or by focusing on specific parts, to tailor their studies to their research objectives.
- **Incorporating Moderating and Control Variables:**
- In addition to the variables identified in Table 5, future studies should consider the influence of moderating and control variables. This includes collecting demographic data (age, gender, income, education) from managers, staff, and diners. These demographics can act as moderating variables to help understand how individual differences influence food waste generation and reduction behaviors.
- For instance, prior research suggests that gender may play a role, with men and women potentially having different calorie requirements and appetites that contribute to plate waste variations.
- **Controlling for Extraneous Factors:**
- Researchers should also control for other factors that might influence food waste generation. This includes factors like the type of restaurant (fine dining vs. fast food), meal type (breakfast, lunch, dinner), and location.

- Existing research suggests that food waste patterns differ based on these variables. Testing the proposed framework with and without controls for these factors can provide valuable insights.
- **Dependent Variables:**
- The framework focuses on two dependent variables: food waste generation and food waste reduction. Food waste generation can be measured as the total amount of waste produced throughout the entire hospitality process, from procurement to consumption.
- Researchers can choose to collect and measure waste at different levels (e.g., per customer, per employee, or total establishment waste).
- Food waste reduction can be measured by implementing interventions (like smaller plates or educational posters) and comparing pre- and post-intervention waste generation to assess the effectiveness of the strategies.
- **Other Stakeholders:**
- The framework also acknowledges the roles of government and NGOs in food waste reduction.
- Future research can investigate the impact of government interventions (like public awareness campaigns) by interviewing staff and surveying diners about their perceptions of such initiatives.
- Additionally, research can explore the role of NGOs in areas like leftover food donation or composting programs.

Conclusion

This study reviewed existing research on food waste in the hospitality industry (HaFS), specifically focusing on the for-profit sector and out-of-home dining. A systematic literature review (SLR) approach was used to analyze published studies and identify areas for future research.

Review Methodology:

- The review was conducted in March 2017 and included studies published in English from academic journals within the defined scope.
- Standard protocols and key databases (Scopus and WoS) were used to ensure a comprehensive search.
- A rigorous selection process was implemented to identify relevant studies (n=63) encompassing various research designs (mixed-method, qualitative, quantitative, experimental).
- **Research Questions Addressed:**
- The review addressed four main research questions (RQ1-4) to guide future research.
- RQ1 focused on the current state of research on food waste in HaFS. Descriptive statistics were used to analyze publication trends, journals publishing research, geographic scope, research designs, data analysis methods, variables, and theories employed in the reviewed studies
- RQ2 focused on identifying key themes in the existing research. Content analysis revealed nine distinct themes related to food waste in HaFS.
- RQ3 focused on identifying gaps in current knowledge. By critically evaluating the research profile and thematic foci, the review identified limitations and areas for further investigation.

- RQ4 addressed future research directions. The review proposes a framework to investigate the multifaceted nature of food waste in HaFS and actionable recommendations for future research.

Limitations

The review acknowledges three main limitations:

1. **Keyword Search:** The possibility exists that some relevant studies might have been missed due to limitations in the keywords used for the search.
2. **Language and Source Restrictions:** The review only included English-language peer-reviewed journal articles, potentially excluding relevant research published in other languages or from other sources (conferences, reports, reviews).
3. **Scope Exclusion:** The review focused solely on the for-profit sector of HaFS and out-of-home dining, neglecting the growing trend of online food delivery for home consumption.

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