

TOWARDS A NEW UNIVERSAL SYSTEM FOR FOOD WASTE MANAGEMENT IN HOSPITALITY INDUSTRY: WASTE ANALYSIS AND POSSIBLE REDUCTION OPPORTUNITIES (WAPRO)

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ABSTRACT

Avoidable food waste (FW) prevention in hospitality industry is mentioned as one of the most important global problem that receives an excessive attention. While many suggestions about FW reduction had been introduced as a result of vast amount of researches, few researchers has been tried to develop a FW management system that aimed to control waste in food service establishments and no researches had been succeeded to develop preventive FW system that could be followed by all types of food service establishments. This research aims to develop and suggest a new universally FW management system that can be followed by various types of food service establishments. The research study called this innovative system as "Waste Analysis and Possible Reduction Opportunities- WAPRO".

Keywords: *Food Waste Management, Food Waste Practices, Hospitality Industry, Waste Reduction Opportunities and WAPRO System*

INTRODUCTION

Food waste (FW) is mentioned as one of the most important global problem that receives an excessive attention from both governmental and non-governmental organizations, most business industries, and various types of media (Gustavsson *et al.*, 2011). Food service operations generate considerable amounts of wasted food. These amounts of FW are estimated to be increased soon as the prevention and controlling practices followed by food service organizations are not enough (Derqui, Fayos & Fernandez, 2016). Thus, this research aims to develop a universally suggested FW management system that can be followed by various types of food service establishments (WAPRO).

While many suggestion about FW reduction had been introduced as a result of vast amount of researches, few researchers have been tried to develop a FW

management system that aimed to control waste in food service establishments and no researches have been succeeded to develop preventive FW system that could be followed by all types of food service establishments. This research paper provides both the hospitality researchers and operations with a new universal system for food waste management depending on waste analysis and possible reduction opportunities (WAPRO).

LITERATURE REVIEW

1. The Concept of FW

According to Parfitt *et al.*, (2010) FW expression used to describe "**any edible parts of food that used to feed animals or directed away from human feeding**". For scientific research purposes, dealing with such a definition need a special care as it does not distinguish avoidable from non-avoidable waste (See table 1).

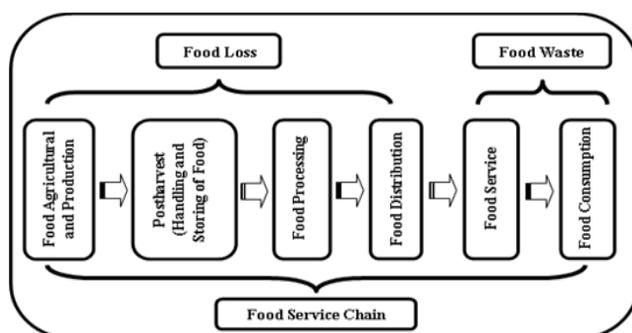
Table 1: FW Categories

FW Category	Definition	Main Reasons	Recommendations
Avoidable FW	Food that can be easily prevented from going to waste.	Over-preparation, improper storage, spoilage, or consumer preference.	Food should be better portioned, managed, stored, and prepared.
Possibly Avoidable FW	Food that may seem inedible.	Insufficient handling and careless.	This type can be repurposed.
Unavoidable FW	Food that cannot be consumed by people.	Non-edible parts of food such as fruit skin, apple cores and meat bones.	This type of food should be directed to animal feeding and other substitute usage.

Source: Developed by the Author

While Gustavsson *et al.*, 2011 defined FW as “*edible products aimed for human consumption but by chance leave the human food chain, being discarded, lost, degraded or consumed by pests instead*”, the European Union Committee (2014) defined it as “*all food and drink discarded throughout the entire food chain*”. For clearer understanding of FW concept, comparison between food loss and food waste should be done as shown in figure 1.

Figure 1: Food Loss vs FW



Source: Developed by the Author

2. FW Management Concept and Practices

FW management is a fundamental to achieve profitability and sustainability. Besides the ethical aspect of FW prevention, it is also related to environmental and economic issues (Ferreira, Martins & Rocha, 2013). European Union Commission (2014) referred to FW management process as “*any efforts done to reduce the quantity of FW and its harmful impacts on environment, society and human health*”. Hollins (2013) summarized the most critical practices related to FW management as follows:

- Menu Planning: Food service outlet needs to provide a wide range of items to satisfy their guests whilst minimizing the FW associated with the less popular items. When such a balance is not achieved, amounts of un-served items may have to be wasted.
- Accurate Demand Forecasting: To forecast the demand, many factors must be considered (e.g. guest preferences, historical sales data, weather, and local and national events).
- Procurement of Food: It is related to both temperature class and delivery size and frequency. The temperature class of delivered food products is critical when determining the length of time ingredients can be stored before they are cooked and served. Delivery size and frequency related to purchasing items in the appropriate prices and

amounts while delivered at the right frequency.

- Food storage and stock management: The poor quality of refrigeration and freezer equipment reduces items shelf life and leads greater quantities of waste. Stock management also involves monitoring shorter shelf life items, such as sandwiches, to be discounted in order to sell.
- Food preparation: Preparation methods and steps impact the types and quantities of waste. In traditional kitchens that depend on raw ingredients to gain advantages of freshness, larger quantities of waste occur during preparation. Modern kitchens substitute raw ingredients with pre-prepared ingredients to eliminate waste. While there are many advantages of depending on pre-prepared ingredients, many criticisms are directed to such style as it leads to more packaging cost, low food quality and freshness, more costs and high energy usage in storage areas. Thus, outlets should balance between two methods.
- Portioning and serving: By Portion size controlling process, food service outlets could minimize plate waste.
- Staff and guest’s behavior: Staff activities positively influenced FW in any food service establishment. Waste management can be achieved through conveying FW reduction objectives and importance to staff. The major problem is related to guests as many people may not have a sense of responsibility about the food they leave when eating out.

RESEARCH METHODOLOGY

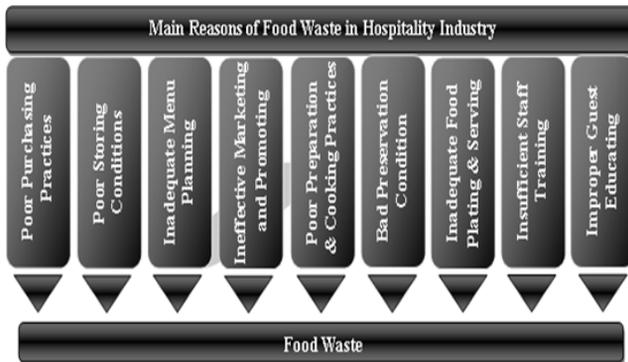
Depending on qualitative approach, the research developed a new universally suggested FW management system “**Waste Analysis and Possible Reduction Opportunities: WAPRO**” that can be followed by various types of food service establishments.

RESULTS & DISCUSSION

1. Waste Analysis and Possible Reduction Opportunities (WAPRO) Concept

To develop a new universally suggested FW management system that can be followed by various types of food service establishments, the research aimed to identify the main reasons and sources of FW in hospitality industry. Such reasons and sources are concluded in Figure (2).

Figure 2: Main Reasons of FW in Hospitality Industry



Source: Prepared by the Author

To present the best management practices that support reduction of FW in restaurants, it is necessary to analyze all opportunities to reduce the amount of wasted food as a primary step, and then determine management practices that can be positioned effectively to reduce such waste opportunities. The result differ from what mentioned by Kuhn, (2011) and Manson, (2012) who indicated that most of the waste happened in back areas.

According to results and depending on literatures, the research developed a new suggested FW system that can be followed by various types of food service establishments. This system was called Waste Analysis and Possible Reduction Opportunities (WAPRO) and introduced in table 2.

Table 2: Waste Analysis and Possible Reduction Opportunities (WAPRO)

WAPRO	Procedures	Reasons	Suggestions
Purchasing	Policies of food purchasing must be reviewed. Major modifications should be achieved.	<ul style="list-style-type: none"> - To prevent excess and unnecessary purchasing. - To avoid food spoilage. - To only order what is needed and when it is needed. 	<ul style="list-style-type: none"> - Determine repeated cases of over-purchasing to be avoided later. - Depending on pre-cut foods and pre-prepared vegetables to reduce preparation waste. - In case of special and mass purchasing (such as in banquets), trying to depend on a “just-in-time” purchasing system.
Storing	Appropriate storage and issuing system must be applied.	<ul style="list-style-type: none"> - To avoid food spoilage. - To reduce unnecessary purchasing. 	<ul style="list-style-type: none"> - Storing raw foods according to the proper preventive conditions. - Storing raw foods in a manner that helps issuing older products first depending on FIFO technique. - Updating a computerized storing and issuing system to find items when needed and monitor levels of inventory of each food item. - Depending on “smart shelves’ system” that flashes when stock levels decreased from the safe level and when products are nearing their expiration dates. - Date all raw vegetables and other perishables on the day you received them accurately. - Arrange your storage areas in the way that facilitate staff movement and products access to minimize waste caused by spoilage and breakage. - Store tomatoes isolated from lettuce because tomatoes emit a gas which turned lettuce brown. - Check expiration dates periodically to determine items that neared to be expired. Such items can be donated to a food bank as a part of your restaurant’s social responsibility program.
Menu planning	Menu analysis should be done. Menu items overlapping should be achieved. Food portions should be modified.	<ul style="list-style-type: none"> - To eliminate frequently uneaten items. - To help repurpose leftovers. 	<ul style="list-style-type: none"> - Classify wasted items in buffets and quantify each to identify items that regular wasted and reduce the quantity of those items. - Monitor leftover of side dishes in restaurants to minimize the portion of regular wasted items. - Eliminate repeated waste food items from menus and substitute them with other popular items. - Develop some menu items that depend on the use of raw food items that wasted from other meals. - Introducing many alternatives of portion sizes, especially in maim courses. - Introduce smaller sizes of side dishes. - Providing 3 menus; small, medium, and large menus. Encourage guests to order from menu that suite his/her actual needs. - Special of the day and chef’s choice menus should be offered to enable the establishment to use ingredients that should be used immediately. - Offer smaller portion sizes for children.

Food Marketing and promoting			<ul style="list-style-type: none"> - Implement a “Buy One Get One Free – Later” strategy in promoting food products. - Taste side table can be provided to make the guest choice more effective. - Dealing with side orders, garnishing, sauces and dressing according to “ask first” policy. - Attention should be given to special of the day and chef’s choice menus’ presentation. - Special care should be considered when using up - selling techniques to achieve the balance between selling more items and generating fewer wastes.
Food Preparation and Cooking	Leftover in kitchen and other preparation areas should be repurposed. Improper cooking should be avoided.	- To reduce possibly avoidable FW.	<ul style="list-style-type: none"> - When possible and safe, turn leftover into turnover. - Reuse day-old bread for meat and poultry breading. - Reuse leftover vegetables as a pizza topping and as a base for soups and sauces. - Leftover of Fruit items could be used in preparing juices or as a topping of desserts. Unused fruits should be directed into sauce and chutney. - Meat, poultry, and fish bones could be used as a base for soups and stocks. - Depending on sophisticated cooking method in narrower limits. - Minimize the size of bowls that used in reheating items like soups and sauces to avoid waste. - Develop a daily preparation chart to minimize over - prepping. - Adequate maintenance of cooking equipment should be done.
Food Preservation	Cooked food should be properly stored.	- To reduce spoilage.	<ul style="list-style-type: none"> - Try to prepare foods when ordered as possible. - Preserve cooked foods according to the proper conditions. - Sort preserved food that is not served as completely edible for more than one day and completely edible for only today and distinguish them from other foods that can be used as another item’s ingredient. - Preserved items should be labeled truly.
Food Plating and Serving	Service tray/package system should be modified, and tray/less system should be approved.	- To reduce plate waste.	<ul style="list-style-type: none"> - Smaller packages can be used in fast food restaurants. - Lower numbers of trays can be used in dine-in restaurants. - Smaller sizes of trays can be used in buffets. - Depend on edible parts of food in plate garnishing. - Garnishing should be only provided when request depending on the “ask first” policy. - Portion size flexibility system can be implemented as more than 2 sizes should be offered (small, medium, and large). - Encourage guests to take his/her leftover by wrapping and presenting it when departing the restaurant. - Especially in cafeteria style and open buffet, develop and implement a pay by weigh pricing strategy. - Reduce quantity of each item displayed at open buffets and restock items periodically. - “Offer Vs Serve” strategy should be applied regarding set menus (minimum 3 main set menus might be offered to guests to choose one). - Serve a standard small portion of side dishes and be flexible to offer a second quantity upon needed. - Providing smaller plates in buffets and encourage guests to come back to refill. - Smaller bowls should be used in salad bars with guests’ chance to revisit this station to refill their bowls when needed. - Check the opportunity of some FWs to be directed to animal feed.

Staff Training	Staff training should be done frequently and continuously to cover all sides of needed skills and performance.	<ul style="list-style-type: none"> - To eliminate FW caused as result of improper purchasing, storing, and issuing, preparation, cooking and serving. 	<ul style="list-style-type: none"> - Train storing staff to manage food inventory in the way that prevent spoilage. - Avoid over preparation. - Ensure staff knife skills to avoid food preparation waste. - Train order takers to encourage guests to order smaller sizes. - Train servers to collect and wrapping leftover for guests in an attractive way that encourage them to take away and re-consume. - Train order takers to provide a clear and accurate description of meal size, cooking method and ingredients. - Decrease the size and amount of presented bread, salads and vegetables and give guests the chance to order extra free quantity when needed. - Relate a percentage of tips distribution to staff FW management efforts. - Quantify the waste of every working section daily to prepare a monthly report and give bonus to succeeded section accordingly. - Top 3 waste items should be discussed weekly with staff, recommendations should be presented and progress on such items should be reviewed. - Staff should be trained to help guests in ordering the right amount of food.
Guest Educating	Encourage guests participate in waste preventive program.	<ul style="list-style-type: none"> - To eliminate avoidable plate waste. 	<ul style="list-style-type: none"> - Encourage guests to take items and quantities that they can consume. - Encouraging signs can be developed and posted at buffets to motivate guests to fill in plates with only enough food according to their appetite. - Place signage on dining tables to encourage guests to order smaller sizes as possible "Use Less, Waste Less". - Encouraging guests to take their leftover which is known as "doggy bag" system for later consumption or to present it as a meal for others who suffer from hunger. - Encourage guests to provide their feedback and try to consider their recommendations about waste reductions.

Source: Prepared by the Author

2. The Main Steps for Implementing WAPRO System

In general, FW in food service establishments should be monitored during all steps of food handling cycle in both commercial and institutional food service environments. To prevent FW in any food service establishment, WAPRO system should go through 3 main steps:

Step 1: Classifying areas of FW: Generally, the majority of FW may cause due to over ordering, over preparation and poor storage. WAPRO system aims to eliminating FW occur through food service establishment from all areas involved in food handling. For FW controlling purposes, WAPRO classified food handling areas into:

- Back-of-the-House areas: Such as storages and kitchens where raw food represents the majority of FW.
- Front-of-the-House areas: Such as dining rooms and buffets where Plate waste represents the majority of FW.

Such a classification helps WAPRO tracking and monitoring FW all over the food service establishment and facilitates controlling of FW to cover all areas of food handling processes. Other advantages of such classification can be concluded in how it introduces a tool for WAPRO to categorize FW and presents an explanation of the primary reasons of FW generation.

Step 2: Tracking FW: Most traditional FW approaches begin with this step. The step of tracking FW in WAPRO involves 3 main points to achieve:

- Tracking the amount of FW.
- Monitoring the type of FW.
- Exploring the reason of FW.

Traditional approaches of FW management depend on quantifying the FW and trying to reduce. Tracing FW as a 2nd step of WAPRO depends on determining the quantity of FW from all type of food ingredients and exploring reasons of each to eliminate sources of waste. To achieve such a tracking, FW record sheet should be

developed to post actual waste from each food item during all stages of food handling processes.

Step 3: Developing WAPRO Map: Once areas, amounts, types, and reasons of FW are determined, WAPRO develops a map of key sources of FW. Such a map differs from food service organization to another. The WAPRO map helps preventing FW sources. This step is the most complicated process that needs extensive efforts to be achieved. When achieving such a step-in accurate manner, accurate WAPRO map would be developed to eliminate sources of FW.

These results agreed with results of Williams & Walton, (2011), Gunders, (2012), Kim & Morawski, (2012), Wansink & van Ittersum, (2013) and Ishdorj *et al.*, (2015).

CONCLUSION

As food service establishments are in need to follow an accurate system to control FW amounts generated during their operations, this research developed a new suggested FW system that can be followed by various types of food service establishments. This system was called Waste Analysis and Possible Reduction Opportunities (WAPRO). Following such a system helps in controlling most FW opportunities and reducing their amounts to minimal rates.

RECOMMENDATIONS

The research provides several recommendations that can be listed as follows:

- Offer à la carte menu, even during mealtime, to enable guests to choose what they prefer.
- Beside offered larger portion sizes, offer smaller portions at a lower price to encourage guests to choose the size that fit their needs.
- Determine quantities and types of wasted food periodically to re-plan menus and make necessary modifications accordingly.
- In open buffets and cafeterias, post reminding signs to encourage guests to manage their plate.
- Give the guests an opportunity to revisit any station in open buffets and cafeterias to refill their plate.
- Set a FW reduction target and encourage both guests and staff to achieve it.
- Food establishments' operators should consider the accurate meal portioning, the full assistance for guests in food selecting and ordering, the continual tracking and monitoring of FW and the flexibility in food choices in regards of both types and portion sizes.

- Restaurants should encourage their guests to participate in waste reduction through their social media activities on face-book and twitter.
- Establish an appreciative culture related to waste management. This activity can be achieved successfully by building an internal culture that fully believes in economic, environmental and social benefits of applying waste management system, creating an appreciative environment that acknowledges any waste reduction activity and behavior, determining key efforts areas for waste management and assure that they are rewarded and providing new creative ideas and methods for waste management should be rewarded.
- Depend on smart Equipment whose technology supports not only the best introduction of food items but also presents maximum yields.
- Choose smart menu designs that can play a role in waste reduction.

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