FOOD SUSTAINABILITY: AN INITIATIVE OF IHM PUSA

***Alok Shivapuri[1] and Shweta Misra[2]**

[1]Principal, [2]Faculty, Institute of Hotel Management, Catering & Nutrition, Pusa, New Delhi

ashivapuri@rediffmail.com

ABSTRACT

Background: *Food waste is a big issue which needs to be tackled by the hospitality industry. The impact of food waste is not just financial. It has an enormous impact on the environment; it affects the overall atmosphere of the world. The study details out the various measures taken by the Institute of Hotel Management, Pusa, New Delhi in reducing food waste at various levels of food preparation.* **Objective:** *The objective was to reduce production and plate waste.* **Methods:** *Various methods such as sensitizing students, involving human resource, portion control measures, introduction of Root to Stem concept, combo meals, vegetarian cooking and inventory management were implemented to control food wastage.* **Results:** *With introduction of Root to Stem concept, 33% of vegetable and fruit cost was reduced in the month of March 2016. The average plate waste for 550 students was just 141 gm.* **Conclusion:** *The industry can also look into the idea of re-designing its menu and also innovative concepts such as "Root to Stem" cooking to cut down on the amount of food being thrown down the drain.*

Key Words: *Food waste, Plate Waste, Food Processing, Root to Stem, Vegetarian cooking, Combo Meals, Inventory Management.*

INTRODUCTION

Food waste is a big issue which needs to be tackled by the hospitality industry. The impact of food waste is not just financial. It has an enormous impact on the environment; it affects the overall atmosphere of the world. Environmentally, food waste leads to wasteful use of chemicals such as fertilizers and pesticides; more fuel used for transportation; and more rotting food, creating more methane – one of the most harmful greenhouse gases that contributes to climate change. According to Shindell et al (2009), Methane has a global warming potential 86 times that of CO_2 on a 20 year time frame. The vast amount of food going to landfills makes a significant contribution to global warming. Some of the statistics regarding food waste are given below:

According to Jacquot (2008) UN Food and Agriculture Organization (FAO), the Stockholm International Water Institute and the International Water Management Institute, huge amounts of food - close to half of all food produced worldwide -- are wasted after production. The U.N. Food and Agriculture Organization (FAO) (2011), estimate that 1.3 billion tonnes of food are wasted annually. According to Christian (2013) the Barilla Center for Food & Nutrition (BCFN), the total amount of food wasted in the U.S. exceeds that of the United Kingdom, Italy, Sweden, France, and Germany combined. In addition, the U.N. Environment Programme (UNEP) (2010), estimates that global food production accounts for 70 percent of fresh water use and 80 percent of deforestation. As per Pal (2015), food production is also the largest single driver of biodiversity loss and creates at least 30 percent of global greenhouse gas emissions. As per The Culinary Exchange (2015), one-third of the world's food supply is wasted this adds up to around 1.6 billion tonnes of food worldwide on an annual basis. Even more shocking is that when thrown away, around 1.3 billion tonnes is still edible.

According to The Culinary Exchange (2015), the equivalent price of the world's annual food waste comes out to around 1 billion dollars. According to United Nations Water Organization (2013), irrigation now claims close to 70 percent of all freshwater appropriated for human use. This water also gets wasted if the food is wasted.

Fruits and vegetables account for the largest category of wasted food, according to Gunders (2012). This surpasses seafood, grain products, meat, and dairy products.

According to a report published by The Culinary Exchange, (2015) 28% of the world's agricultural land is used to produce food that will be wasted or lost. Also, composting at home could save 330 pounds of food waste per household each year from going into landfills compared to 20 pounds of food waste per person per month in the U.S.

According to the United Nations Development Programme (2015), up to 40% of the food produced in India is wasted. About 21 million tonnes of wheat are wasted in India and 50% of all food across the world meets the same fate and never reaches the needy. In fact, according to the agriculture ministry, Rs. 50,000 crore worth of food produced is wasted every year in the country. India ranks 55 in Global Hunger Index (2015) as per The Economic Times. According to a survey by Bhook (An organization working towards reducing hunger) 2013, reported that 20 crore Indians sleep hungry on any given night. In 2013, Honourable Minister of Food Processing Industry, Mr. Sharad Pawar informed that the value of annual wastage of fruits and vegetables was estimated at Rs 13,309 crore. However, if the wastage value of rice, wheat, cereals and others are taken into account, it would go up to Rs 44,000 crore a year. Due to lack of adequate storage infrastructure, fruits, grains and vegetables worth Rs 44,000 crore go waste every year. According to Sharma (2012), food wastage in India is less than 40%, i.e., 5.8 to 18% in fruits; 6.8 to 12.4% in vegetables and 4.3 to 6.1% in cereals.

As per Gunders (2012), 40% of all landfill content comes from food waste in US. According to Environment Protection Agency (2016), food waste is the second largest category of municipal solid waste (MSW) sent to landfills in the United States, accounting for approximately 18% of the waste stream. That is over 30 million tons of food waste that the U. S. sends to the landfills each year. Of the less than 3% of waste currently being diverted from landfills, most of it is being composted to produce a fertilizer.

The David Foundation (2014) reported that about 20% of Canada's methane emissions (a greenhouse gas that traps more heat in the atmosphere than carbon dioxide) come from landfills. Gooch et all (2010) suggests that more than half (50 per cent) of the estimated $27 billion of food wasted countrywide ends up as unwanted leftovers dropped into household trash bins. VCMC report also came out with the fact that 8% of food is wasted in Canada

Fischer 2015 reported Food Waste Reduction Alliance found that approximately 80 billion pounds of food are discarded into landfills in the United States every year; restaurants account for 37 percent of the waste that hits landfills. Additionally, rotting food in open landfills releases large quantities of methane, a greenhouse gas with 20 times more warming potential than carbon dioxide.

Controlling portion size is a way to reduce waste. "Portion control in a buffet operation is an art. Careful calculations are necessary to prevent over production" (Dunbar, 2006). Dyson, Food & Technical Affairs Adviser, British Hospitality Association 2014 said, "Better inventory management (e.g. Use of FIFO racks) reduces the waste of date-expired meals."

As per guide Managing Food Waste in the Hospitality and Food Service Industry published by Resource Efficient Scotland (2014) the following steps may be taken to reduce food waste in the Hospitality Industry: Purchasing, ordering and menu design, thinking carefully about menu design is one of the key ways to reduce waste and help realise cost savings, storage, handling produce properly is the first step to ensure that product shelf life is maximised as bruised or damaged fresh products will result in extra waste. Check produce on delivery and return anything that is damaged, storing fresh products and raw ingredients in the most appropriate environment will increase their usable life, continually rotate produce by putting the newest product at the back of the shelf so that the oldest automatically gets used first, clearly label products with their purchase and best before dates, to help with accurate ordering try to place all the items of the same type (e.g. cans) from the same supplier on one shelf or in one area. This way you can easily see what you need, try to work towards 'just-in-time' delivery rather than pre-ordering in quantity. This will help to minimize storage costs and spoilage.

In refrigerators and cold stores, have a selection of airtight containers for storing food and keep labels handy to mark dates. Store dairy products, cooked meat, raw meats, fish and fruit and vegetables separately. Label food with the date going into the freezer and keep a list of frozen produce. Food frozen on site should always be chilled in an appropriate piece of equipment, for example a blast chiller.

Preparation: The way food is prepared can prevent waste and make a big difference to profit margins. Try to avoid excess trimming of fish, meat and vegetables. Order pre-cut and trimmed items where possible, particularly when returnable transit packaging is offered to reduce waste packaging. Offer "skin-on" boiled, baked and roasted potatoes to reduce the amount of peelings you throw away. Try to avoid pre-preparation of food which will spoil quickly, and store leftover food safely for use the next day where appropriate. Get creative with trimmings and excess to make pâtés, soups and stocks. Freeze excess berries for coulis or smoothies, and excess bread can be made into bread crumbs or croutons.

According to Black (2015), There's another way to prevent food waste: using imperfect or ugly produce. Hard as is it is to believe, millions of pounds of perfectly edible fruits and vegetables hit the trash heap every year because their size, shape or color don't match the food industry's stringent cosmetic standards. In the new documentary about food waste "Just Eat It," one farmer noted that anywhere between 20 and 70% of his fruit is discarded in the field because of small blemishes that have no impact on flavor.

Appalled by such statistics, Compass Group, one of the nation's largest food service providers, and its subsidiary Bon Appetit Management Company, launched a pilot program last year to rescue these fruits and vegetables. Called Imperfectly Delicious, the program already has salvaged nearly 10,000 pounds of produce for its kitchens in California and Washington.

At Taste Restaurant at the Seattle Art Museum, tiny carrots were blended into soup. Small onions were roasted whole. Lumpy potatoes and oversize leeks bolstered a creamy turnip soup that was already on the menu. Imperfectly Delicious produce accounts for about 10% of that restaurant's fruits and vegetables.

According to a study from Harvard Law School and the Natural Resources Defense Council, 22 percent of food waste comes from fruit and vegetables. Of the fruit and vegetables bought, 52 percent of them is discarded and only 48 percent is consumed. Thus, concepts like Root To Stem can be utilized by hospitality sector, kitchens and hospitality educational institutes to minimize on food waste.

Food Wastage Footprint: Impacts on Natural Resources (2013) is the first study to analyze the impacts of global food wastage from an environmental perspective, looking specifically at its consequences for the climate, water and land use, and biodiversity.

After reviewing the literature available of food waste, it becomes a prime responsibility of all human beings especially who are involved in hospitality sector to come together to minimize food waste and work towards sustainability of food. Such initiatives can help reduce green house gases, reduce economic and indirect losses and hunger of million people. Keeping in mind the issues the current study objectives were:

- To minimize the plate waste.
- To minimize the food waste during processing.

METHODOLOGY

To minimize plate waste in the Institute: the study was conducted in the dining hall of the Institute of Hotel Management, Pusa, New Delhi, during the lunch service. The lunch is served to approximately 1000 students on a daily basis. The menu provided is t*able d'hôte* and cyclic. The food is prepared by the students of III/IV semester of B.Sc. (Hospitality and Hotel Administration), as training food in Quantity Food Kitchen. The study was carried out for two months (Feb 2016 – Mar 2016). Different activities were carried out like sensitization of students, Involvement of Human Resource and practice of Portion Control by adopting different measures.

In the institute, there are 10 food production labs which are Advance Training Kitchen (ATK), Quantity Food Kitchen (QFK), Basic Training Kitchen (BTK), CCK, Craft Course Food Production (CCFP), three Bakery labs, a Confectionary Lab and Mess Kitchen. To study the wastage at the time of processing Quantity Food Kitchen (QFK) was selected as it caters to all the students of the institute. In QFK, the students are trained to handle bulk cooking. The study was conducted during the months of February and March 2016, under which various measures were adopted such as Forecasting of expected head count for lunch, Inventory Management of stock, application of Root to Stem Concept and production of Vegetarian Cuisine were introduced.

RESULTS AND FINDINGS

A number of activities were carried out to minimize the plate waste in the Institute:

Sensitization of students through awareness drive:

Audio visual – 22 Posters were made and displayed to create sense of responsibility amongst students about the food they leave. Using Public Address system by announcing facts in a program "Kya aap jante hai" at 10.30 AM every day. 10 E-posters displayed on LED of the institute which are installed in the lobby and dining hall.

Human Resources - Faculty on routine basis were deputed for mess duty to keep a check on the plate waste. On an average 7 faculty are on duty in the dining hall during lunch service, out of which one of the faculty monitors the plates of students to check for any food waste. Along with faculty, student volunteer were also put on duty to control plate waste. The plate waste like whole spices and condiments were collected in the bin. The bin waste after the lunch service was measured. This practice was done for a month (March 2016).

Jones, (2009) reported that the percentage of food waste in fast-food restaurants is about 9.55 % and in restaurants with full service 3.11 % of the total amount of purchased food. The study identified that the plate waste from dining hall after feeding on an average 550 students (Table 1) during lunch service

in the month of March 2016 was on an average 141 g per day which is very nominal compared to the wastage mentioned in literature review by Padmanabhan (2015) wherein the food waste was 10-12 kilos per day for 1000 school students.

Table 1: Average Students per day having Lunch

Duration	**No. of Students had lunch**
Week 1 of March 2016	2253
Week 2 of March 2016	3852
Week 3 of March 2016	2157
Week 4 of March 2016	1104
Total Students	9366
Average students per day	550

Standard plate with 5 divisions is used for serving: One of the research done under Cornell university suggested that people serve more when serve on a large dinner ware, and serve less when serving on a small plate. In a study conducted at a health and fitness camp, campers who were given larger bowls served and consumed 16% more cereal than those given smaller bowls. The plates provided in the dining hall at Institute of Hotel Management, Pusa, New Delhi, are stainless steel plates with 5 compartments (3 compartments of 4.5 inches diameter; 1 compartment of 27 square inch area and the main compartment of 51.61 square inch area. The measurement of the main compartment is 21.5 cm length and 15.5 cm breadth). A standard dinner plate is has an area of 78.54 square inch. If comparison is done between the sizes of a standard dinner plate with the size of the main compartment of the dining hall plate, the dining hall plate is much smaller. This suggests the students are not over served and this helps in reducing the waste from the plates.

Another study conducted by Wansink (2009) spurred the Small Plate Movement that promotes utilizing 10″ diameter plates to decrease the amount of food people eat, without having an effect on their perceived fullness or satisfaction. A person tends to over-serve onto larger plates, and because people consume an average of 92% of what they serve themselves, larger plates lead to larger food intake. A two inch difference in plate diameter — from 12" to 10" plates — would result in 22% fewer calories being served, yet it is not drastic enough to trigger a counteracting response. If a typical dinner has 800 calories, a smaller plate would lead to a weight loss of around 18 pounds per year for an average size adult.

Usage of standard size ladles for portion control: For portion control, standard size ladles were used for serving. For example for serving dal, ladle measured 150 ml. This helped in reducing wastage from the plate by not over serving. Tuppen (2014) reported about consumer survey conducted by WRAP

showed that 41% of those surveyed blamed oversized portions for leaving food. Breyer 2012 reported about an info-graphic showing that today's average restaurant meal is four times larger than it was in the 1950s.

According to Indian Dietetic Association Database, the recommended uniform size of serving of food items in hospitals canteen for a medium sized Katori is 125 ml and for a large serving spoon (karchi) is 50 ml by volume. According to Indiancurry.com, in 1990s, food nutritionists decided to use a standard-Katori to describe a serving-size which was 150 ml by volume for an average Indian adult.

Introduction of combo meals: Combo meals were introduced for the month of March 2016. Combo meals, such as Rajma Chawal, Chhole Kulche, Kadhi Chawal etc., reduced the number of items on buffet and simultaneously provided satiety to the students.

In this study, plate waste can be defined as the amount of edible food not consumed by the student. WRAP's (The Waste and Resource Action Programme) Love Food Hate Waste campaign (2009) had carried out research into the behaviours, attitudes and barriers of consumers around the food wasted when eating away from home. The research found that people who leave food don't feel a sense of ownership or responsibility about the food they leave.

According to the Cornell University Food and Brand Lab (2010), on average, diners leave 17 percent of their meals uneaten and 55 percent of edible leftovers are left at the restaurant. This is partly due to the fact that portion sizes have increased significantly over the past 30 years, often being two to eight times larger than USDA or FDA standard servings. Gunder (2012) researched Kitchen culture and staff behavior such as over-preparation of food, improper ingredient storage and failure to use food scraps and trimmings can also contribute to food loss. "All-you-can-eat buffets" are particularly wasteful since extra food can't legally be re-used or donated due to health code restrictions. The common practice of keeping buffets fully stocked during business hours (rather than allowing items to run out near closing) creates even more waste.

To reduce the food waste at the time of processing food in Quantity Food Kitchen (QFK), the following activities were carried out:

Taking head count of the students on a daily basis: During the first period, (9:00AM to 9:50AM) duty is assigned to a person who takes round of all the classes and records the students present in each class. The form used for recording this data has following column heads: Course name; Students present; Students will be present for Lunch and Signature of the faculty. This information is given to the faculty responsible for Quantity Food Kitchen where the food is prepared for the dining hall. This report gives the precise forecast of the number of students who will be present for the lunch, so that lunch is not over or under prepared.

Following Standard Purchase Specification: Purchase of ingredient is given on contract, the contractor is provided with the purchase specification. In case, if any ingredient is not mentioned in contract or not commonly purchased then the chefs of Food Production Lab (QFK) writes details of the ingredient required.

Checking at the time of Receiving: At the time of receiving, all the ingredients were checked by the Store In-charge. The ingredients not matching the specification, i.e., damaged/decay/rotten were rejected and returned.

Proper Storage: Just in Time (JIT) inventory management was followed in the institute. Ingredients were ordered only when required. First In First Out (FIFO) system was followed in storing ingredients and the cooked items. Some of the examples of following FIFO system were: each grocery packet was marked with the date of purchase so that it was easy to identify which of the packet needs to be used first, when the milk was purchased, the latest packets of milk were kept in basket which was kept below the basket containing older packets of milk, the cooked items which need to be stored were marked with date of preparation on the cling wrap.

Root to stem cooking: The concept of "Root to Stem" of cooking was introduced in QFK. This resulted in drastic reduction of waste generated from Quantity Food Production Kitchen from 20 kgs to 2.5 kgs. The success of implementation of this concept was seen from the reduction of purchase cost of vegetables and fruits from last 3 years (March 2013, March 2014 and March 2015) to this year for the month of March 2016, which was approximately 34% (Table 2). These figures suggested that minimum scrap was generated in QFK and the vegetables and fruits were utilized to its maximum for feeding staff and students. Weinberg, 2007, suggests: "Don't over-peel fruits and vegetables, know how to work with cheaper cuts of meat for stews and soups, and utilize all parts of fish, meat, or vegetables in stocks, purees, and dips. The more one knows about how to maximize food use and minimize waste, the more profitable he will be."

Table 2: Comparison of Costing for Vegetables (March 2013-2015 vs March 2016)

Period	Cost
Average cost of purchase of Vegetables and Fruits for the Month of March (2013-2015)	Rs. 1,33,127/-
Cost of purchase of Vegetables and Fruits for the month of March 2016	Rs.88,315/-
Reduction in Cost	**34%**

Following Standard Recipe: The standard recipes were used for all items prepared in QFK. This ensured that the ingredients give the same output every time the recipe is used, helping in the maximum utilization of ingredients.

Cooking using Combi Oven: Combi Ovens were used in cooking. This helped in the reduction of oil consumption by three fourth. Even the wastage of oil was eliminated which was left out after deep frying.

Absorption Method used for cooking rice: Drainage method of cooking rice results in grain wastage as few of cooked grains are also drained out along with water.

Introducing vegetarian cuisine: For one month (March 2016) in the Institute, only vegetarian food was prepared. Vegetarian food has higher yield by weight than meat product. On an average, the yield of meat as per Fabbricante and Sultan is much less, for example, for Shoulder of beef yield is 45%; Neck of beef yield is 55%; by Gerrard and Mallion in the book The Complete Book of Meat, the yield of neck end of pork come to 14% of carcass weight, against average yield of 81% of vegetables taken from chef recourses. com (for example, Tomato yield is 95%; Onion yield is 89%). The institute reduced the wastage of food at the time of processing by going vegetarian. By going vegetarian, not only the utilization of resources were done to the maximum but also this helped in reducing cost by Rs. 1,25,000/- per month.

Table 3: Comparison of Costing for Meat Items (March 2013-2015 vs March 2016)

Period	Cost
Average cost of purchase of Meat Items for the Month of March (2013-2015)	Rs. 1,25,865/-
Cost of purchase of Meat Items for the month of March 2016	Nil
Savings by going Vegetarian	**Rs.1,25,865/-**

CONCLUSION

The study conducted in the institute helped in reduction of waste from plate and at the time of processing. The study focused than if we focus on reduction of waste, it helps in optimal utilization of resources by increasing yield of ingredients, overall reduction of cost and also the problem of disposing waste. Hospitality industry wastes a large amount of edible food on a daily basis as they lay high emphasis on eye appeal of food. However, it is evident with this study that by increasing awareness and controlling portion sizes, the amount of food waste can be drastically reduced. The industry can also look into the idea of re-designing its menu and also innovative concepts such as "Root to Stem" cooking to cut down on the amount of food being thrown down the drain. Such Initiatives should be shown to NCHMCT & NCHMCT should circulate to other IHM's to adopt such practices in their institutes.

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