Case study

Food waste audit in selected Hostels of Rajasthan University, Jaipur

ABSTRACT

"Food waste" refers to items that are fit for human consumption but thrown away by the consumer, it is one of the most significant problems faced globally, that contributes to social, environmental, and economic problems. It leads to higher rates of food insecurity, causes atmospheric pollution, results in a lot of capital wasted on inputs. Throwing away food can also mean that resources such as water and energy it used to produce it have been wasted. In the University and college hostels contribute to food wastage in a humongous scale on daily basis. Recently, the **Food and Agriculture Organization (FAO) of the United Nations Environment Programme (UNEP)** released the **Food Waste Index Report 2021.** It revealed that **17% of all food available at consumer level** (11% in households, 5% in food service and 2% in retail) **was wasted** in 2019 and around 690 million people had to go hungry. The two main objectives of study were To assess the food waste produced by girls hostel and develop a strategy on institutional food waste management.

Locale of the study was two out of seven girls hostels of Rajasthan University namely Mahi and Savitri hostel were selected randomly with the help of random number table. Total number of respondents were 500. Observation method was used to collect data on daily basis by the researchers. In which 41 days of food was audited from Mahi Girls Hostel and 29 days from Savitri Girls Hostel. The study revealed that the majority of leftover from thali in the breakfast of mahi hostel 61.00 per cent as well as Savitri hostel 75.90 per cent in the range of 1.0 to 3.0 kg. Whereas the study also concluded that the majority of leftover from thali in the lunch of mahi hostel 39.00 per cent and from Savitri hostel 89.70 per cent in the range of 3.1 to 6.0 kg and 1.0 to 3.0 kg respectively. In the context of dinner majority of leftover from thali in mahi hostel 46.3 per cent and Savitri hostel 51.70 per cent in the range of 3.1 to 6.0 kg was found on the basis of the results. It can be concluded that a lot of food is wasted in each hostel per day. It is a serious issue but less talked about. To combat this problem, we can make both the staff and the students aware about the issues and also make them realize the outcomes of food wastage.

Keywords: Food Waste, Food Security, Reducing Strategies, Sustainable Consumption.

INTRODUCTION:-

Increasing population across the world and limited resources have made wastage in the food production and consumption supply chain an important issue. Okazaki, Tum, & Flachsbart (2018) defined food waste as "any by-product or waste product from the production, processing, distribution, and consumption of food". On one hand there is focus on the idea of circular economy, which many economists and planners are advocating, and its role in the minimization and prevention of waste generation, On the other hand every step in the food supply chain, and especially in the hotel, restaurant, and café (HORECA) segment is being closely inspected, so that wastage can be reduced at various levels and sustainable levels of consumption can be created (Genovese, *et al*. 2017). This literature review analyzes some of these issues, including the circular economy, wastage in the food supply chain, and social and economic factors in the India leading to such wastage. Globally, increasing volumes of food waste along with the recent Sustainable Development Goals of food security, environmental protection, material and energy efficiency are the key drivers for efficient food waste management. Recently, the **United Nations Environment Programme (UNEP)** released the **Food Waste Index Report.** It has revealed that **17% of all food available at consumer level** (11% in households, 5% in food service and 2% in retail) **was wasted** in 2019 and around 690 million people had to go hungry. (**Food Waste Index Report 2021**). 'Food loss' refers to reductions in the quantity of food sustained in the food supply chain after harvest before it reaches the state in which is it presented to the consumer. **(Olah, *et.al.* 2022).**

Leftover waste:- While large amounts of food are wasted during preparation, some amounts are also wasted after consumption as leftovers are often thrown out. Leftover food is also sometimes consumed by pets which decreases the potential quantities that could have been consumed by human beings. Like preparation waste, leftover waste is also increased by the wide variety of food items available to consumers in the industrialized nations which often leads to buying in excessive quantities (Lebersorger & Schneider, 2020). A study of food waste in the hospitality sector by Papargyropoulou et al. (2016) revealed that buffet and customer **plate leftover** in a large restaurant can be as high as 40-45% of the total amount of food served on average, although the amount of waste decreased with an increase in the number of customers due to economies of scale. Buffet service was found to be more wasteful than a la carte service (although buffet had lower amounts of preparation waste), which according to the authors revealed that food waste was determined by the type of service offered, eating habits and cultural

values of consumers. In addition buffet service was observed to contain much higher proportion of leftover waste compared to other types of services offered.

Food security refers to the availability of food and one's access to it. The World Health Organization defines three facets of food security: food availability, food access, and food use. India faces a threefold challenge to achieve food security; to match the rapidly changing demand for food from a larger and more affluent population to its supply; do so in ways that are environmentally and socially sustainable; and ensure that the poorest people are no longer hungry. This challenge requires changes in the way food is produced, stored, processed, distributed, and accessed. Food security cannot be achieved merely through increasing agricultural productivity. Attention also needs to be given to measures to reduce wastage.

Why is food wastage a problem?

i. 25% of fresh water used to produce food is ultimately wasted, even as millions of people still don't have access to drinking water. When you calculate the figures in cubic kilometers, this is a bit more than an average river (Poonia, et.al., 2022).

ii. Acres of land are deforested to grow food. Approximately 45% of India's land is degraded primarily due to deforestation, unsustainable agricultural practices, and excessive groundwater extraction to meet the food demand (Poonia, et.al., 2022).

iii. 300 million barrels of oil are used to produce food that is ultimately wasted. (Poonia, et.al., 2022).

- **9 things to do-**Here's what one can do on a more personal level to contain the food wastage:

i.) Plan out your meal and make your shopping list to determine what you actually need for the week. About 20% of what we buy in urban India ends up being thrown away. You could in the week after cut down on the surplus and soon in two or three weeks you will have a precise list of your family's weekly consumption. You have no idea how amazed you will be at how much you buy and what you actually consume. Needless to say that the difference is but naturally wasted.

ii.) Buy in quantities you can realistically use. Avoid impulse buys. It will more or less find the bin.

iii.) If you cook at home, make sure you cook keeping in mind there is no excess. You can always complete your meals with a few fruits rather than keep some extra food in the refrigerator. It's a lot better and a healthier practice too.

iv.) Select according to their shelf life. Use the green vegetables first. Don't throw out fruits and veggies with 'aesthetic only' blemishes. Use canned and bottled food before expiry dates.

v.) Reuse the refrigerated left-overs (if any) for the very next meal.

vi.) Even if food gets spoilt then compost it.

vii.) If you work in an office that has a canteen, check with them on how they manage excess food. Cooked food, especially since it has a low shelf life needs to be managed better and faster. Check with NGOs who offer to transport excess food to the needy.

viii.) If you host a family get together either at home, a marriage hall or throw a party at a hotel, make sure you plan for the food to be transported to a place like an orphanage or an old age shelter.

ix.) Make finishing your plate a habit. Try to inculcate it further to as many possible.

How Can Help to reduce Food Waste

- Feeding India, which was founded with the object of eliminating hunger, aims to connect hunger and food waste as solutions for each other. Started in 2014, it now operates in more than 30 cities across India. It believes in feeding mouths, not bins. They collect the food waste from individuals, weddings, canteens, and other events and redistribute it to the needy, free of cost. Anyone can get involved to donate and become a volunteer.
- Robin Hood Army, a similar organization, operates not only in India but also in Pakistan. Annamrita (formerly ISKCON Food Relief Foundation) provides mid day meals to school children.

Objective of the study:-

- **To assess the food waste produced by girls' hostels in University of Rajasthan**.

Systematic review of literature:- A literature review is a comprehensive summary of previous research on a topic.

Bhandari (2017) revealed in her case study that Majority of the students were found to leave food in their plates. Male students generally tend to waste more food than their female counterpart. Similarly, tendency to waste food was more in the buffet system. Taste of the food and differences in food habit along with tendency to take more than required were cited as main reason for wasting food. Students were found to have over reliance on the use by dates printed on the packets.

According to the Food & Agriculture Organization (FAO), food waste refers to the "disposal or alternative use of food that is safe and nutritious for human consumption" (FAO, 2018).

Poonia, *et al*. (2022) founded that The TISM hierarchical model portrays the most important and least important drivers of household anti-food waste behavior. It establishes that fundamental knowledge and socio-cultural norms are the most critical factors to drive the

consumers. Marketers can focus on designing effective interventions to enhance the essential knowledge of the consumers and orient the socio-cultural norms towards anti-food waste behavior.

RESEARCH METHODOLOGY:- The methodology may include publication research, interviews, surveys and other research techniques, and could include both present and historical information. A Methodology does not set out to provide solutions but offers the theoretical underpinning for understanding which procedure, set of procedures can be applied to a specific case. Research methodology encompasses concepts such as research designs, target population, sample size and sampling procedure, data collection instruments and data analysis procedure. INDIANS waste as much food as the whole of United Kingdom consumes – a statistic that may not so much indicative of our love of surfeit, as it is of our population. Still, food wastage is an alarming issue in India. Our street and garbage bins, landfills have sufficient proof to prove it. In India the University and college hostels contribute to food wastage in a humongous scale. In the hostels of colleges and universities a huge amount of food is wasted on a daily basis.

The survey was conducted in University of Rajasthan Jaipur. Locale of the study was girls hostels of Rajasthan University. Out of total 07 girls hostels, 02 hostels namely Mahi and Savitri girls hostel were selected randomly with the help of random number table. Total number of respondents in mahi hostel are 300 and Savitri hostel have 200 students, thus total number of students are 500. Method of data collection is survey method on daily basis by the researchers. **Project 12-** To understand the basic objective of developing a strategy on institutional food waste management, to obtain the data of leftover from Thali in breakfast, lunch and dinner in two girls hostels for **70 days** Survey was conducted. In which 41 days of food was audited from Mahi Girls Hostel and 29 days from Savitri Girls Hostel. With the objective of study To assess the food waste produced by the girls hostels.

After the survey, Results were obtained regarding leftover food in plates per day and thereafter the data for 70 Days was audited and integrated, Descriptive statistical tools and techniques were used for analysis of data to understand the frequency of data presented in Kilograms, Percentages and Days.

RESULT AND DISCUSSION:- The below tables depict the data collected from 2 university hostels, named University Mahi Girl's Hostel and University Savitri Girl's Hostel. The collected data helped in assessment of the waste produced by hostels. The assessment covers three areas

(1) leftover food by thali or plate, (2) garbage by mess, and (3) leftover food in mess. Tables shows the data on leftover food by thali that was not consumed by girls or thrown into the dustbins and left their food on the plates as it is. The data collection was completed in 70 days, we have covered the above-mentioned hostels. The audit was done in Mahi hostel for 41 days and the rest 29 days in Savitri hostel.

Table:1 Breakfast, Lunch & Dinner Leftover from Thali by Mahi Hostel N:41

S.No.	**Leftover by Thali in Kgs**	**Frequency/ Percentage shows the number of days**		
		Breakfast	**Lunch**	**Dinner**
1	< 1.0	6 (14.6%)	0 (0%)	0 (0%)
2	1.0-3.0	25 (61.0%)	14 (34.2%)	17 (41.5%)
3	3.1-6.0	3 (7.3%)	16 (39.0%)	19 (46.3%)
4	6.1- 9	0 (0%)	8 (19.5%)	5 (12.2%)
5	> 9.0	7 (17.1%)	3 (7.3%)	0 (0%)
	Total	41 (100%)	41 (100%)	41 (100%)
Chi-square value		12.782	4.986	0.617
p-value		**0.00***	0.98	1.35

$p \leq 0.05$

ON APPLYING CHI-SQUARE TEST, IT WAS DETERMINED THAT LEFTOVER FOOD BY THALI IN MAHI HOTEL WAS BETWEEN 1 TO 3 KG, AND WAS SIGNIFICANTLY (p=0.00) HIGHER AT BREAKFAST IN 25 DAYS.

Table number-1 shows the data regarding leftover food from the thali at breakfast time, and lunch and dinner time at the Mahi hostel. The data has been presented in terms of frequency and percentages. The second column of the table depicts the approximate kgs of leftover food by thali, for this, we have used different (kgs) ranges for representing the data clearly. Frequency shows the number of days according to the ranges followed by the percentages as well. The above table depicts that out of 41 days, 25 days are those days where we measured breakfast food wastage in the range of 1 to 3 kgs. The table also shows that 14.6 percent of days (6 days) were those days where we collected waste very minimum and the range was less than 1 kg. 7 days were the days where the wastage was at the highest rate which is more than 9 kg. The table

also depicts that out of 41 days, 16 days are those days where we measured food wastage in the range of 3.1 to 6 kgs.

The table also shows that 34.2 percent of days were those days where we collected waste of 1 to 3 kgs at lunchtime. Only 3 days were the days where the wastage at the highest rate which is more than 9 kgs.

The data leftover thali data at dinner time. The above table depicts that out of 41 days, 19 days are those days where we measured wastage in the range of 3.1 to 6 kgs. According to the data, 41.5% (17 days) of days were those days where we collected food waste of 1 to 3 kgs. For the rest 5 days, we saw the maximum wastage which is between 6.1 to 9 kgs.

Table:2 Breakfast, Lunch & Dinner Leftover from Thali by Savitri Hostel N:29

S.No.	**Leftover by Thali in Kgs**	**Frequency/ Percentage shows the number of days**		
		Breakfast	**Lunch**	**Dinner**
1	< 1.0	0 (0%)	0 (0%)	0 (0%)
2	1.0-3.0	22 (75.9%)	26 (89.7%)	12 (41.4%)
3	3.1-6.0	3 (10.3)	3 (10.3%)	15 (51.7%)
4	6.1- 9	0 (0%)	0 (0%)	2 (6.9%)
5	> 9.0	4 (13.8)	0 (0%)	0 (0%)
	Total	29 (100%)	29 (100%)	29 (100%)
Chi-square value		1.209	4.788	18.023
p-value		0.33	2.49	**0.05***

ON APPLYING CHI-SQUARE TEST, IT WAS DETERMINED THAT LEFTOVER FOOD BY THALI IN SAVITRI HOTEL WAS BETWEEN 3 TO 6 KG, AND WAS SIGNIFICANTLY (p=0.05*) HIGHER AT DINNER IN 15 DAYS.

Table- 2 shows that in more than 75% of the days it was found that in breakfast leftovers food from thali is minimum, it belongs to the range of 1 to 3 kgs. The maximum food wastage was found in 4 four days which is more than 9 kgs. In 3 days, we found the leftover food in a range of 3.1- 6 kgs.

The table also shows the data regarding leftover food from the thali at lunchtime at the Savitri hostel. The data has been presented in frequency and percentages. The table shows that 26 days were those days the leftover food from thalis was found to be 1 to 3 kgs. Only 3 days

were those days where wastage found was 3.1- to 6.0 kgs. Dinner leftover data was collected for 29 days by Savitri Hostel. Table number-6 represents that for more than 50 percent (15 days) of the days we found the wastage around 3.1 to 6 kgs, and for 12 days were those days wasted was measured between 1 to 3 kgs. Only 2 days were those days where found the maximum leftover food, which was between 6.1- to 9 kgs.

Table:3 Breakfast, Lunch & Dinner Leftover from Thali by Hostels N:70

S. No.	Leftover by Thali in Kgs	Frequency/ Percentage shows the number of days		
		Breakfast	**Lunch**	**Dinner**
1	< 1.0	6 (8.6%)	0 (0%)	0 (0%)
2	1.0-3.0	47 (67.1%)	40 (57.1%)	29 (41.4%)
3	3.1-6.0	6 (8.6%)	19 (27.1%)	34 (48.6%)
4	6.1- 9	0 (0%)	8 (11.4%)	7 (10.0%)
5	> 9.0	11 (15.7%)	3 (4.3%)	0 (0%)
	Total	70 (100%)	70 (100%)	70 (100%)
Chi-square value		22.788	18.332	4.802
p-value		**0.05***	0.44	**0.05***

ON APPLYING CHI-SQUARE TEST, IT WAS DETERMINED THAT LEFTOVER FOOD BY THALI IN BOTH MAHI AND SAVITRI HOTEL WAS BETWEEN 1 TO 3 KG AT BREAKFAST IN 47 DAYS AND WAS 3.1 TO 6 KG AT DINNER IN 34 DAYS. AND BOTH WERE SIGNIFICANTLY (p=0.05*) HIGHER.

Table- 3 depicts the data of 2 hostels, regarding leftover food by thali during breakfast, lunch, and dinner time, which shows that in breakfast 6 days were those days where we found the wastage less than 1 kg. The above table depicts that out of 70 days, 47 days are those days where we measured breakfast food wastage in the range of 1 to 3 kgs. 11 days were the days where the wastage was at the highest rate which is more than 9 kg. The table also depicts that out of 70 days, 6 days are those days where we measured food wastage in the range of 3.1 to 6 kgs.

At lunchtime, the table also shows that more than 55% of days were those days where we collected waste of 1 to 3 kgs. Only 3 days were the days where the wastage at the highest rate which is more than 9 kgs. On the other hand, in 19 days, we found the wastage by thali in the range of 3.1-6.0.

The data leftover thali data at dinner time, the above table depicts that out of 70 days, 34 days are those days where we measured wastage in the range of 3.1 to 6 kgs. According to the data, 41.4% (29 days) of days were those days where we collected food waste of 1 to 3 kgs. For the rest 5 days, we saw the maximum wastage which is between 6.1 to 9 kgs.

Suggestions: -

There is not yet a national food waste prevention and reduction directive to be adopted by the various actors in the food chain in developing countries (Dora et al., 2021). In addition, Teigiserova et al. (2019) pointed out that there is not yet a clear and universal definition of food waste, which makes it difficult to characterize and adequately treat it in rich and developing countries. In this context, it is necessary to implement policies focused on the prevention of food waste to control the current problems of food insecurity. Also, the management and recovery of food waste can represent opportunities to reduce poverty and unemployment in our society.

Many messes don't end up using a lot of the food made, thus wasting not only the money but also resources. Cook with leftover ingredients. This is the way to Prevent the wastage of a lot of food every month. Little pieces can be stored in the refrigerator and reused. When Food is brought in bulk and don't use the entire lot, you Have to throw away the unused food, because it will get spoilt. So buying items like dairy and meat in bulk should be avoided.

For example, in Brazil, there are some laws on the donation of food by retail food establishments to needy people or charities, which can help in reducing food insecurity in Brazil (Brazil, 2020). In addition, there are numerous Non-Governmental Organizations that recover and sell imperfect food from retailers to the population at cheap prices (Creus, 2018). Similar kind of policies may be adopted in India also. Many NGO's are functioning at independent level in leftover food in India .In this regard that they collect food from restaurant and leftover from parties and distribute to needy peoples. This can be taken up by government. in an organized manner.

Also the unusable leftover food can be used for vermicomposting, and produce vermicompost may then be used for organic farming. The organically produced food products are good for wellness and health improvement. Therefore our attempt is to create a road map for "waste to health".

CONCLUSIONS

Food waste represents an alarming situation that needs to be solved. In fact is a danger for our planetary system accompanied by food insecurity pointed out by international institutions, scholars and professionals. From this perspective, the stop food waste model appears as a solution to eradicate food waste problems, transforming the latter into raw materials through a closed and regenerative cycle.

Besides, the government needs to implement in schools and colleges a specific education in favour of vermicomposting at every door step and its benefits in the valorization of food waste in a country's economy and health and wellness .Additionally, researchers point out that financial incentives for sending surplus food into anaerobic digestion facilities can help in the current strengthening of circular thinking that serves in the regeneration of food waste.

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