WASTAGE OF FOOD IN HOSTELS

INTRODUCTION TO INNOVATIVE PROJECTS(PHY1999)

PROJECT COMPONENT- REVIEW REPORT

2019- NOVEMBER

SUBMITTED BY:

ANIKET KUMAR:18BIT0214

DECLARATION

The report has been written in my own words and wherever anything is referred, proper references are being given. There is no such case of plagiarism included in this report.

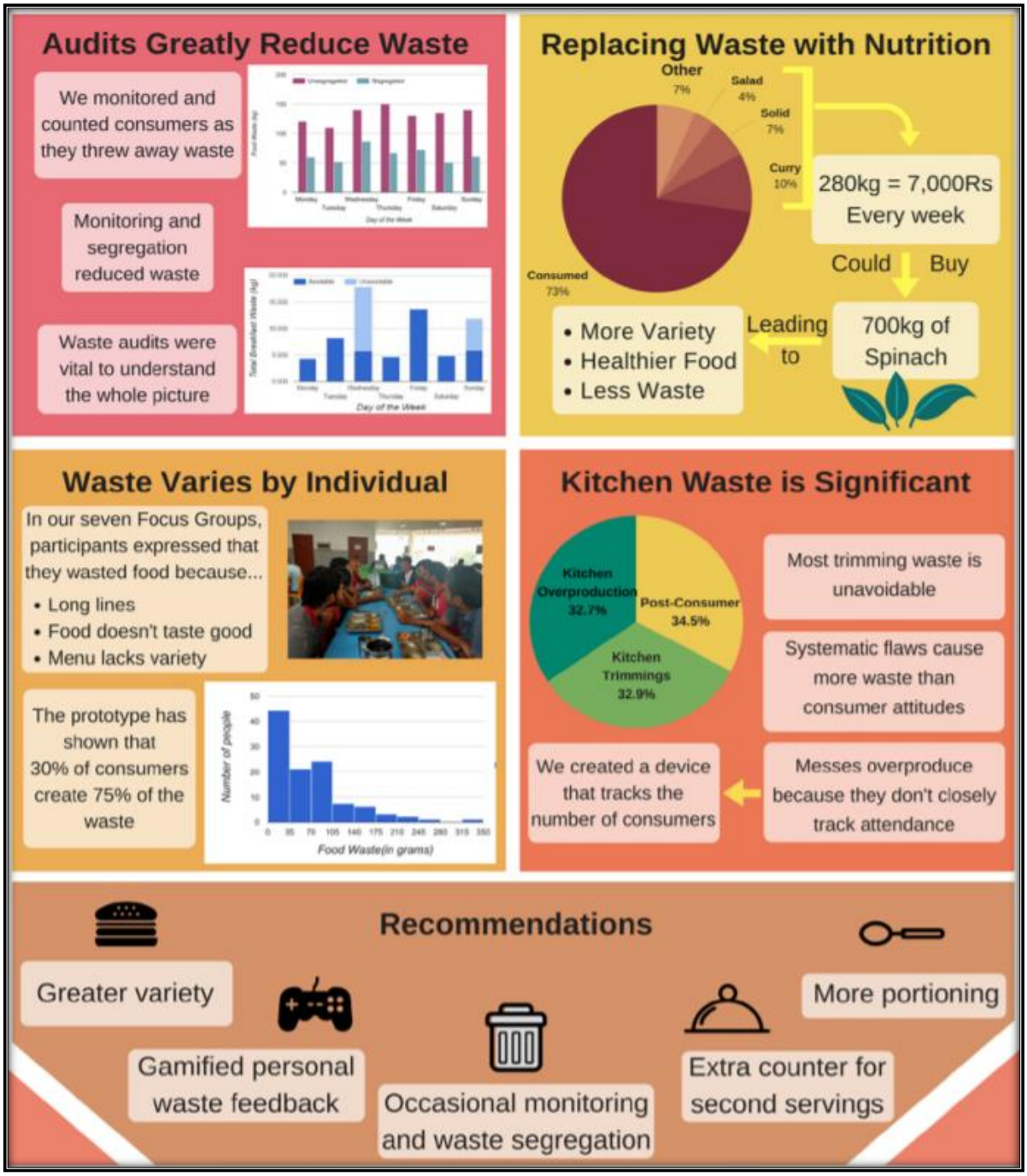
Contents

Abstract

The goal of our project was to research mess hall food waste at VIT, Vellore and provide recommendations to reduce it. To realize this goal, we conducted waste audits on consumer and kitchen waste, and held focus groups with students and staff that eat at VIT's mess halls. We identified that Southern Indian foods, self-served foods, and vegetarian main courses are wasted most heavily. Our research resulted in the recommendation of assorted methods to reduce food waste, including more food portioning, frequent waste auditing, and greater variety of food options.

Disposal of kitchen waste is a serious environmental problem all around the world as these wastes are generated in large quantities in highly populated and urban areas and due to its inappropriate disposal and lack of reuse. India has number of universities having large campuses in which they have hostels, colleges, messes cafeteria and staff colonies. They generate large amount of organic waste. Lots of money and manpower is required for its safe disposal. The aim of this investigation is to analyze the feasibility to create an organic waste processing facility in VIT University to produce biogas which will be more cost effective, eco-friendly, and reduce carbon dioxide & methane emissions. The present investigation involves theoretical and experimental estimation of biogas from kitchen waste of the students mess in university campus. The anaerobic fermentation of kitchen waste such as mixed food waste, uncooked waste and fruit waste was attempted using plastic digesters of 20 liter capacity. During this period, the temperature, solar radiation has been measured. All collected biodegradable food waste samples were used without mashing and shredding to homogenous size to find out the percentage of organic material broken down in that condition. Proximate and ultimate analysis for theoretical estimation has been made. We found that from experimental results biogas yield is 0.16834m3/kg. However, using ultimate analysis theoretical estimation indicates biogas yield is 0.9689m3/kg. This indicates that, there is a large gap between theoretical estimation and experimental results in the yield of biogas because no shredding has been done.

Summary


Audits Greatly Reduce Waste
We monitored and counted consumers as they threw away waste
Monitoring and segregation reduced waste
Waste audits were vital to understand the whole picture
Day of the Week
Replacing Waste with Nutrition
Other 7%
Salad 4%
Solid 7%
Curry 10%
Consumed 73%
280kg = 7,000Rs Every week
Could Buy
700kg of Spinach
Leading to
• More Variety
• Healthier Food
• Less Waste
Waste Varies by Individual
In our seven Focus Groups, participants expressed that they wasted food because...
• Long lines
• Food doesn't taste good
• Menu lacks variety
The prototype has shown that 30% of consumers create 75% of the waste
Number of people
Food Waste(in grams)
Kitchen Waste is Significant
Kitchen Overproduction 32.7%
Post-Consumer 34.5%
Kitchen Trimmings 32.9%
Most trimming waste is unavoidable
Systematic flaws cause more waste than consumer attitudes
Messes overproduce because they don't closely track attendance
We created a device that tracks the number of consumers
Recommendations
Greater variety
Gamified personal waste feedback
Occasional monitoring and waste segregation
Extra counter for second servings
More portioning

1. The Problem of Food Waste

Food waste is a global concern that impacts sustainability and world hunger. Annually, the world wastes 1.3 billion metric tons of edible food, almost one third of the total food produced ("Save Food: Global Initiative on Food Loss and Waste Reduction", 2017). The food wasted could feed 3.48 billion people, easily more than enough for the 795 million hungry individuals in the world ("Hunger Statistics", 2017). As this food decays in landfills it emits greenhouse gases equivalent to 3.3 billion metric tons of carbon dioxide into the earth's atmosphere ("Food Wastage Footprint: Impacts on Natural Resources", 2013). India produces an annual 105 million metric tons of food waste, which is nearly 40% of its total food production, at a cost of 8.3 billion dollars (Biswas, 2014). That amount of money equates to 4% of India's gross domestic product (GDP). Even though India produces more than enough food to feed its own population, 15%, or 195 million people, are undernourished ("2016 Global Hunger Index", 2016).

The mess halls at the Vellore Institute of Technology, Vellore (VIT Vellore) have excessive food waste production. Previous studies at VIT, Vellore have determined that the messes waste on average over 775 kg of food each day, which is enough to feed over 540 people. Food waste leads to financial loss, has a negative impact on the local and global environment, and is contrary to the university's mission of educating students about sustainability.

The mission of this project was to research mess hall food waste at VIT Vellore and provide recommendations to reduce food waste. To achieve our overarching goal, we completed a study focusing on all points of the process of food preparation and consumption at VIT Vellore. We determined the magnitude of food wasted at each point, as well as the systematic and human causes of food waste. Based on our data and understanding of food waste at VIT Vellore, we developed and proposed specific methods to reduce food waste.

2. Background

VIT has different type of messes for Students. In VIT Vellore the caterers for all the 5 types of messes are Darling Vellore and PR Vellore and various other cateres. There are Five Types of Messes in VIT for Students namely South Indian Veg, South Indian Non Veg, North Indian Veg and North Indian Non Veg and Special Mess.

Multi-cuisines catering to vegetarian and non-vegetarian variety of Indian and International food items are made available to the students coming from diverse states and countries, within the hostel blocks. The spotlessly maintained vegetarian and non-vegetarian dining halls in the hostels serve wholesome, nutritious food to students. Students can also choose from a limited list of special food items on registering at a restaurant style mess. Fast food outlets are also attached to both the Men's and Women's Hostels.

A spacious Visitors' Lounge has recently been added for the benefit of visiting parents/guardians, supplementing the residential guest house facilities available. The spotlessly maintained and spacious vegetarian and non-vegetarian dining halls in the hostels serve wholesome, nutritious food with the help of a unique steam cooking facility. Foreign students can also choose from a limited list of special food items. A Chinese mess is functioning separately.

For those who want to try out different cuisines, a variety of hygienic food facilities are available on campus. A popular eating spot is the 600 square meters Food Court, that serves delicious non-vegetarian and vegetarian food at reasonable prices. Fast food outlets are also attached to both the Men's and Women's Hostels.

Most of the food, such as rice, dal, salad, and potatoes, are self-served and consumers can take as much or as little as they would like. However, there are a few food items that are portioned out to consumers by the mess workers. These foods include fruits, juice, paneer dishes, non-vegetarian (non-veg) items like chicken and boiled eggs, and a few other foods. After the consumers eat their food and are ready to dispose of waste, they proceed to a centralized waste area, where there are counter designated for food waste as well as there are sinks to wash up after eating.

VIT Vellore has instituted a mess committee that consists of different members. This committee is responsible for managing the menu for the mess halls. They communicate with the mess contractor to choose dishes that taste good and use ingredients that fall within the contractor’s budget. The committee members monitor both messes in order to make sure that the mess managers and workers are complying to the mess committee’s rules. The mess committee sends out a survey once in a semester to students about food quality and the overall mess experience. Once these surveys have been analyzed, the mess committee can recommend changes to the managers in both mess halls in an attempt to make consumers happier. The mess committee is also responsible for creating campaigns to reduce food waste in the mess halls.

2.1 Previous waste reduction efforts at VIT Vellore

In VIT Vellore many years history, only a few waste reduction efforts have been undertaken in the mess. The most obvious effort consists of a series of posters located above the sinks in the mess hall that encourage consumers to waste less food. Using consumer education tools like posters has been proven to work in other universities around the world, so this was an easy and obvious first step to reduce food waste in the mess halls. In fact, at the University of Kansas, using educational posters in their dining halls caused consumer food waste to be reduced by fifteen percent (Whitehair et al., 2013). However, the posters being used in the our mess appeared to reduce food waste for only about two weeks, before food waste returned to baseline levels (A. Singh, personal communication, 24 March, 2017). Despite this, the posters have been left in place for over one and a half years. All the messes also have a chalkboard installed where a daily estimate of the total food waste produced is written. Some other ideas about how to reduce food waste in mess halls will be mentioned.

3. Methodology

The mission of this project was to research mess hall food waste at VIT Vellore and provide long-term recommendations to reduce food waste. To complete our mission, at each point of the process of food preparation and consumption at VIT Vellore, we:

1. Determined the magnitude of food wasted

2. Explored why food is wasted

3. Developed methods to reduce food waste

3.1. Determining the magnitude of food wasted at VIT Vellore

Our first step was to audit kitchen and consumer waste in various messes. To categorize consumer waste, we required consumers in the messes to segregate their food waste into different waste bins based on food type.

We conducted 'monitored segregation' surveys at DR Special Mess (4 days) and DR Non-Veg Mess (7 days) where we observed behaviour at each meal, counted the number of meal takers and weighed the waste produced for each of the foods on the menu. During these ‘monitored’ waste audits, we observed that consumer waste was less than in former weeks because of our presence and the mere act of segregating waste. To isolate the impact of the act of segregation on waste reduction, we continued to enforce waste segregation in Special Mess without being present at the mess in order to remove the impact of our presence (‘unmonitored segregation’). The protocols for each type of waste audit we performed are located in Appendix B.

During our initial survey with monitored segregation we also measured the waste created by the kitchens. This included leftover food and kitchen trimmings. Additionally, in the DR mess we measured the weight of food that was served. Our final task for this objective was to measure the waste created by each individual consumer. This was achieved with the help of the cameras installed at the mess near the plate submission counters. We were able to monitor the waste created by each and every individual.

3.2. Exploring why food is wasted

To determine why food is wasted, we conducted focus groups with mess consumers and interviews with a variety of stakeholders. Our focus groups were used to determine consumer attitudes about why food is wasted.

Seven separate focus groups were conducted with students in each class year, as well as campus guards and faculty that eat in the messes. Groups were selected from attendees at snack time. Typically, all group members were chosen from the same table of friends to ensure that all members were of the same school year. Focus groups allow participants to express original ideas about the causes of waste and about potential reduction methods and thus they allowed us to observe trends and common food waste perceptions. We were also able to use individual responses and group dynamics to develop an understanding of the cultural significance of food waste at VIT. The questions we asked during these focus groups are:

Interview Questions:

I. Mess Committee:

1. What is the mess committee responsible for?

2. Why did you decide to become a part of the mess committee?

3. Has the mess committee ever encouraged students to waste less food?

4. What efforts has the mess committee done to reduce food waste?

5. How successful have these efforts been?

6. Do you think our method of segregating food has been successful? Do students like the system?

7. How does the mess committee decide menu items?

8. Do the mess workers often listen to the mess committee's suggestions about changes in the mess?

9. How many people are assigned to each mess?

10. Can you share any survey feedback with me?

II. Mess Workers (Cleaning/Serving Staff):

1. Can you tell me about what you do for your job?

2. Can you tell me about the trainings you have received for this job?

3. (if they serve food) How do you decide how much food to serve each person?

4. What patterns have you seen in how much food people take at each meal? (i.e. type of food, day of week and time of day)

5. How much food is leftover at the end of every meal?

6. What patterns have you seen in how much food is wasted?

7. Do you notice that different amounts of students eat at each meal?

8. Do you think a prototype for smart dust bins would be successful in the mess halls?

9. Would you be able to maintain the prototype?

III. Mess Chefs:

1. (introductions, etc.) How long have you been a cook?

2. How long have you been cooking at VIT Vellore?

3. Can you tell me about what you do as a cook at Vellore?

4. Where did you learn how to cook?

5. Can you tell me about the trainings you have received for this job?

6. In general, do you believe that wasting food is a problem? Why?

7. Do you believe that reducing food waste is important for sustainability?

8. How much food does the kitchen waste?

9. Why is that food wasted?

10. Where do you throw your food away?

11. How could this kitchen reduce waste?

12.(Describe waste-type waste sorting monitoring system) How much extra work would this system take for you to use?

13.(Describe food-type waste sorting system) How much extra work would this system take for you to use?

14. Do you have any suggestions for food waste reduction in your kitchen?

IV. Mess Managers:

1. What are your duties as (job title)?

2. How do you define food waste?

3. How do you track food waste?

4. What units do you use to measure food waste? (i.e. mass, volume, money, etc.)

5. Is food waste a problem at VIT Vellore?

6. What economic, environmental, and social impacts does food waste have at VIT Vellore?

7. How do you measure these impacts, if any?

8. Have any efforts been put in place to try and reduce food waste?

9. (if no efforts have been made) Why haven't any efforts been made to reduce food waste?

10.(if some efforts have been made) Can you tell us about the success of previous food waste reduction efforts?

11. What training do chefs receive?

12. How do you decide what to cook?

13. How are student preferences considered in meal decisions?

14. How variable are your recipes? Are things always cooked the same way or do chefs use creativity to change recipes?

15. How do you communicate with chefs?

16. Tell me about how you use rewards for employees

17. Tell me about how you use punishment for employees

18.(describe smart dust bin prototype) Do you think a prototype for smart dust bins would be successful in the mess halls?

19. What changes would you make to the prototype to make it more successful or useful?

20. Would your staff be able to maintain the prototype?

V. Dean Secretary:

1. What do you do for your job?

2. How are you involved with the messes?

3. Why does VIT Vellore have so many mess contractors?

4. How are mess contractors chosen?

5. How do you decide if you will renew mess contracts?

6. What role do the mess contractors have in mess decisions? What role does VIT Vellore have?

7. What rules must the mess contractors follow?

8. Do the people who deliver the food have a contractual relationship to the contractor?

9. Are there any contractual obligations or incentives for the mess contractors to reduce food waste?

10. What role does competition play in the relationship between the mess contractors?

11. How was the meal plan format chosen?

12. Is it possible for us to have access to information about VIT Vellore's mess budget?

13. Do you have information that you could share about the hierarchy of mess employees at VIT Vellore?

VI. Canteen Manager:

1. What is your role at this canteen?

2. Why was this canteen created?

3. What oversight does VIT Vellore have of your canteen?

4. Do you have the same food supplier as the mess?

5. (if not previously mentioned) How does your establishment work together with the mess management?

6. On average, how many people will you serve in one day?

7. What are your busiest hours?

39

8. Do you notice any specific days/meals when you get more business?

9. What is your most popular item on the menu?

10. What is your least popular item?

11. What kinds of foods are sold more often than others? For example, desserts, meals, drinks, snacks, etc.

12. Have you noticed an increase/ decrease in sales when the contractors of the messes are changed?

13. How closely do you track trends of food sales and canteen attendance?

14. How often do you purchase food?

15. How do you set your prices?

16. What do you do with the food that wasn't prepared?

17. How much food do you waste on average?

18. How do you manage your food waste?

19. Do you notice what foods are wasted most by students at your canteen?

20. What waste do you create in food preparation?

We conducted total of eight interviews in DR Special mess and five interviews in DR Non-Veg mess. In each mess, we interviewed mess workers, mess managers, and chefs. We also received additional information from the managers and chefs throughout our auditing process through informal conversation. Outside of the mess, we conducted interviews with various campus managers and members of the Mess Committee. Due to a need for language translation, our interviews with mess workers, chefs, and managers were fully structured. Our other interviews with university administrators were semi-structured, allowing interviewees to express their personal experiences and new ideas about food waste that we had not encountered or considered.

3.3. Developing methods to reduce food waste

To analyse food waste reduction methods, we first synthesized our data and observations to identify trends and points of further inquiry. Based on this information, we performed a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis of the dining services at VIT Vellore. This analysis was used to identify specific qualities of VIT's dining services that effective food waste reduction methods would take advantage of, as well as any weaknesses or threats to possible reduction methods. After conducting the SWOT analysis and analysing data, possible recommendations were generated.

4. Results and Discussion

This chapter discusses the results of our data collection and observations, and our corresponding analysis. The possible recommendations that follow from our data are found in the following chapter.

4.1. Consumer, kitchen leftovers, and kitchen trimming waste are equal

Our data collection for four days in DR Special mess shows the approximate contribution of consumer, leftovers, and trimming waste to total waste, seen in Figure below.

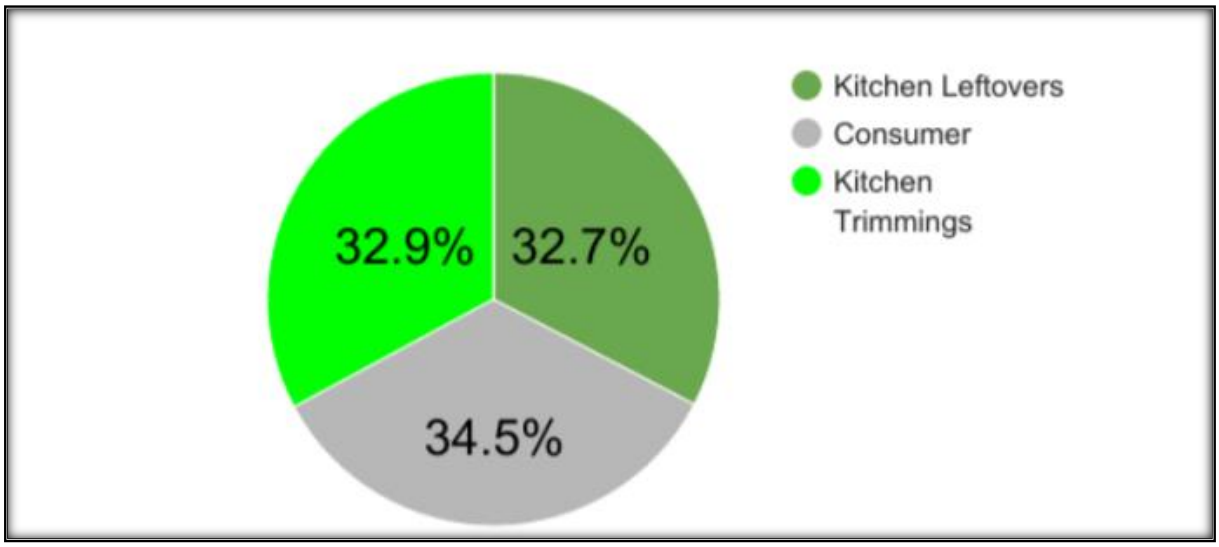


Figure: Contribution of different waste types to total waste.

It is notable that most trimming waste is unavoidable. Thus, most avoidable waste comes from leftover and consumer waste. That said, we did find that the trimming practices in the messes, and especially Special mess, lead to some easily avoidable waste. For example, Figure below shows avoidable carrot and cucumber trimmings from DR Special mess. Our interviews with mess managers and mess workers indicated that in both messes, neither the head chef nor the staff cooks have formal training on waste reduction, which may be a cause of the presence of easily avoidable trimming waste.

Figure: Cucumber and carrot trimmings from DR Special mess, including some relatively large chunks of avoidable waste

Our interviews and data collection have shown that the likely main cause of leftover waste is that mess managers have no reliable way of knowing how many students to expect at each meal.

Some meal attendance trends are consistent and apply to both messes. For example, Saturday lunch and dinner have lower attendance. Students in our focus groups have expressed that they frequently miss Saturday dinner and sometimes lunch because they travel off campus to eat (see Figure below). Despite these common trends, both mess managers have expressed that they do not know exactly how much food to prepare because students do not always eat at their assigned messes, and because special events on campus may draw students away from the messes.

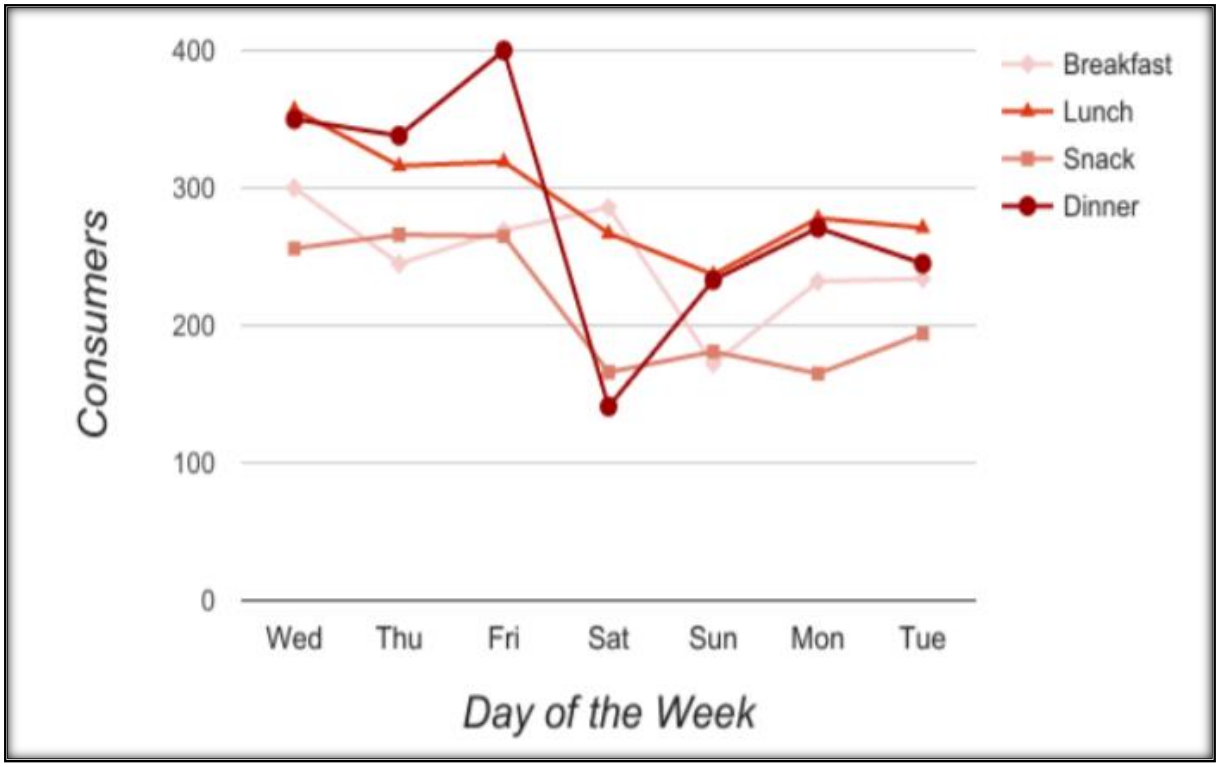


Figure: Attendance over one week in DR Non-Veg mess.

While consumer waste is undoubtedly a significant portion of total waste, not all consumer waste can be avoided. Upon first examination of the initial food waste data collected before the project began, it was determined that Wednesday, Friday, and Sunday breakfast produced some of the largest amounts of waste. When the waste audit was conducted, the data that was collected directly contradicted this assumption. The high amount of waste on Wednesday and Sunday was actually mostly due to unavoidable waste from banana peels and eggshells, which are only served on these mornings. When this unavoidable waste was factored out of the total waste weight for the meal, the avoidable waste was shown to be reasonably low. Figure below shows the total amount of waste produced at breakfast and identifies how much of the waste was unavoidable.

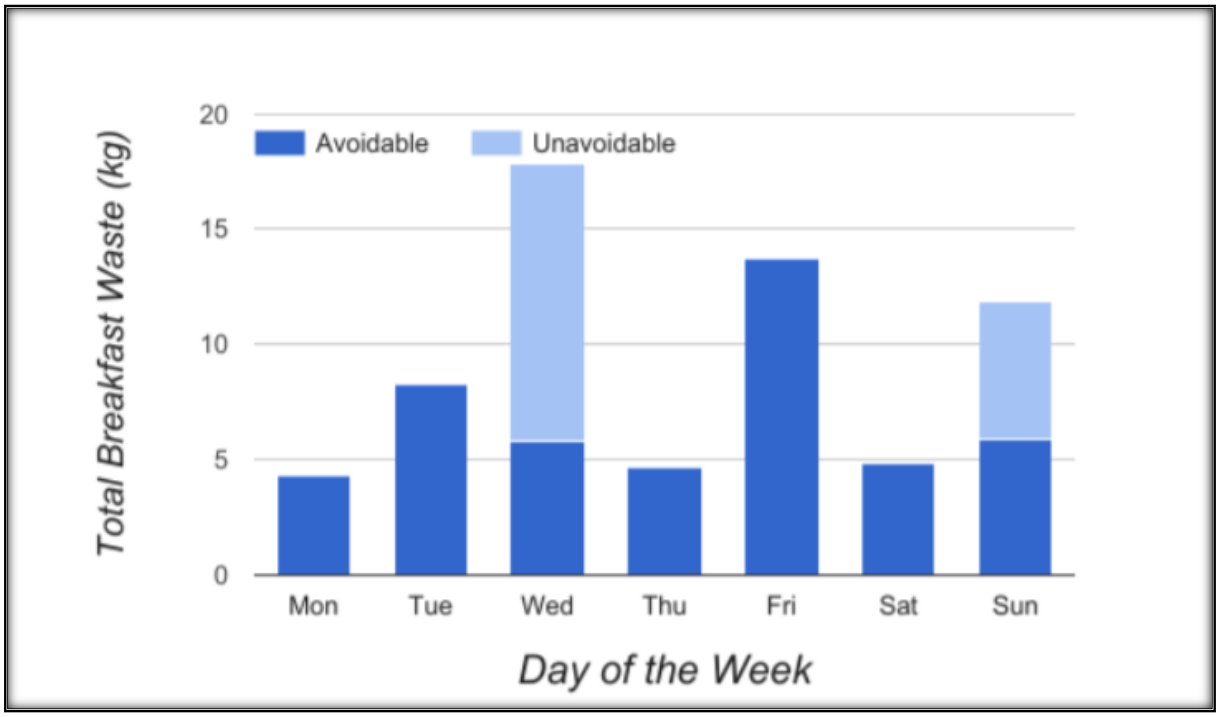


Figure: Avoidable breakfast waste in DR Non-Veg mess

4.2. DR Special(D1) and DR Non-Veg(D2) experience similar waste patterns

As indicated by Figure, located below, both mess halls have very similar waste patterns. D1, indicated by the lighter bars, has slightly less food waste than D2, indicated by the darker bars, despite having more consumers assigned to it. This means poor food quality due to high attendance should not be the main cause of food waste.

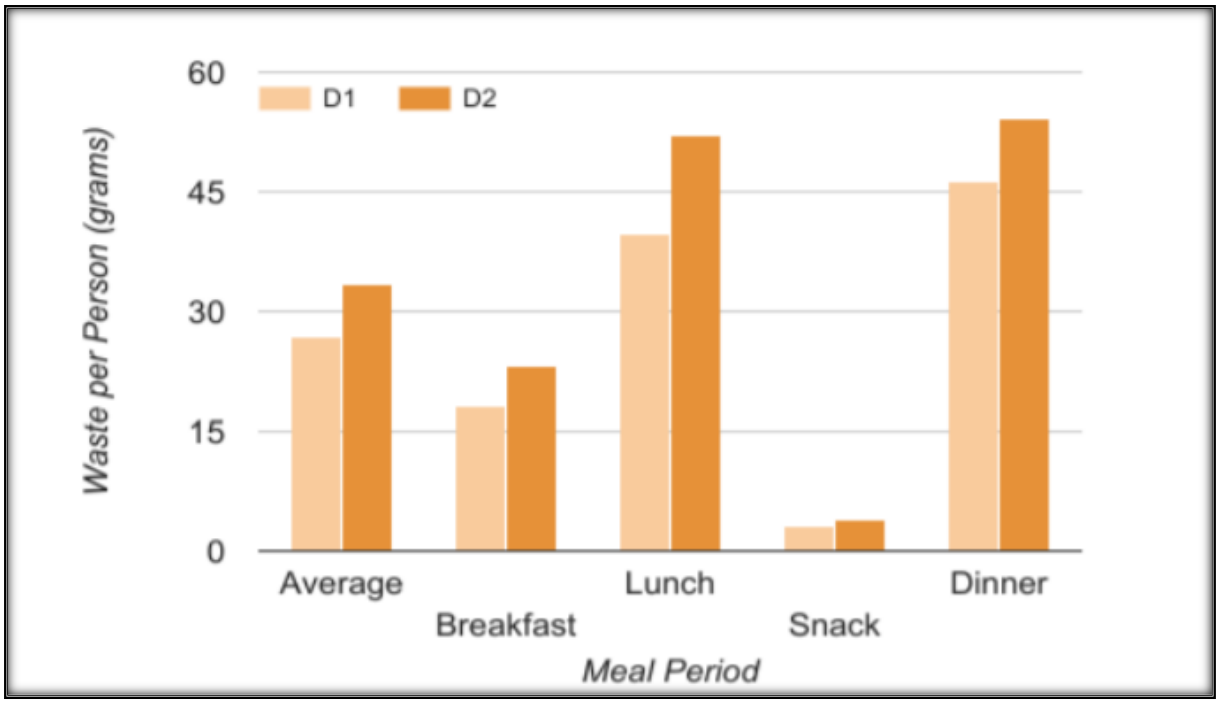


Figure: Comparison of waste in D1 and D2 messes

In order to compare an important staple food at the two messes, we compared the roti waste per person at lunch and dinner. This comparison was motivated by focus group and mess survey feedback indicating that the roti in D1 mess is incorrectly cooked and uses inferior ingredients when compared to D2. As seen in Figure, located below, the average roti waste is almost identical for the two messes (D1 is represented by the lighter bar while D2 is represented by the darker bar).

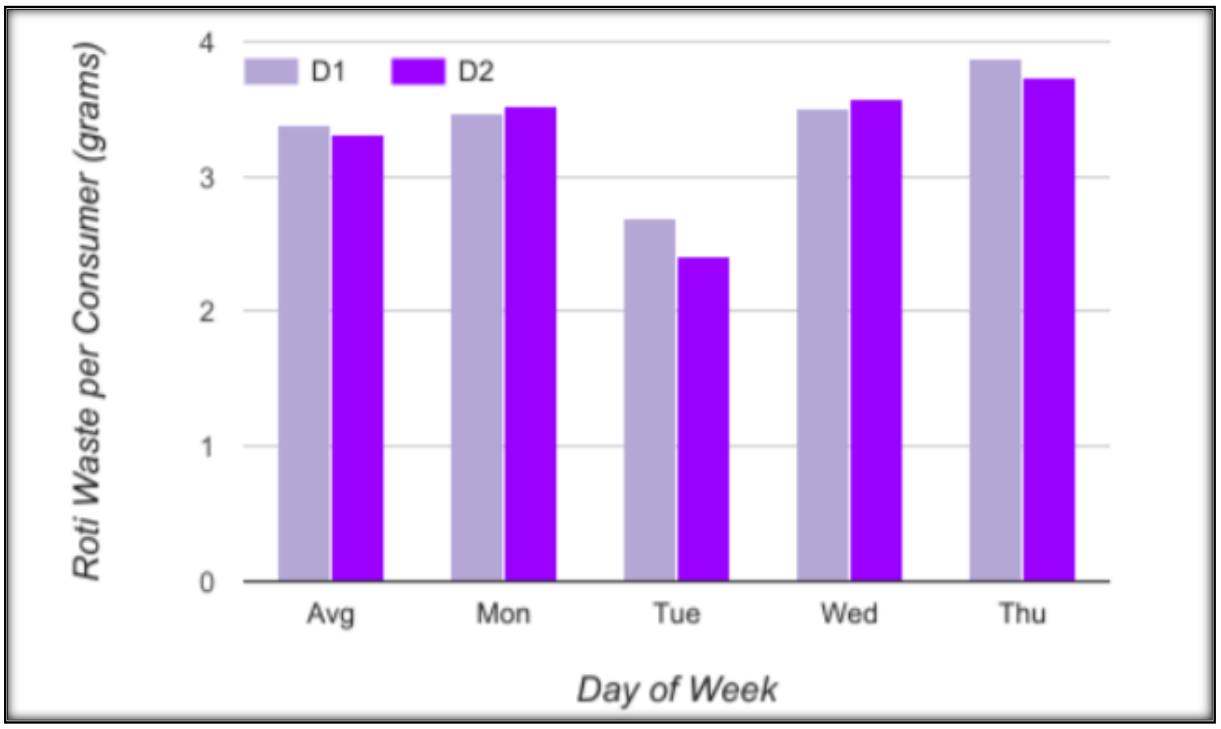


Figure: Roti waste at lunch per person in D1 and D2 mess

This may mean that food quality between the two messes is relatively similar. Most focus group participants seem to believe that one mess has better quality food, but it is not evident based on data that either mess has significantly higher quality food. It may also mean that food quality is not the main cause of waste, if low and high quality roti are wasted in similar quantities. This data gives more reason to believe that mess systems and consumer attitudes are the driving cause of food waste.

4.3. Dips and vegetarian main courses are wasted most

One trend that we identified was the amount of waste produced for each food type. As seen by Figure below, dips and vegetarian main courses are wasted by consumers the most. This is largely due to the repetitive nature of the menu, as well as the excess amount of gravy and dips that students serve themselves in relationship to the solid foods that accompany them.

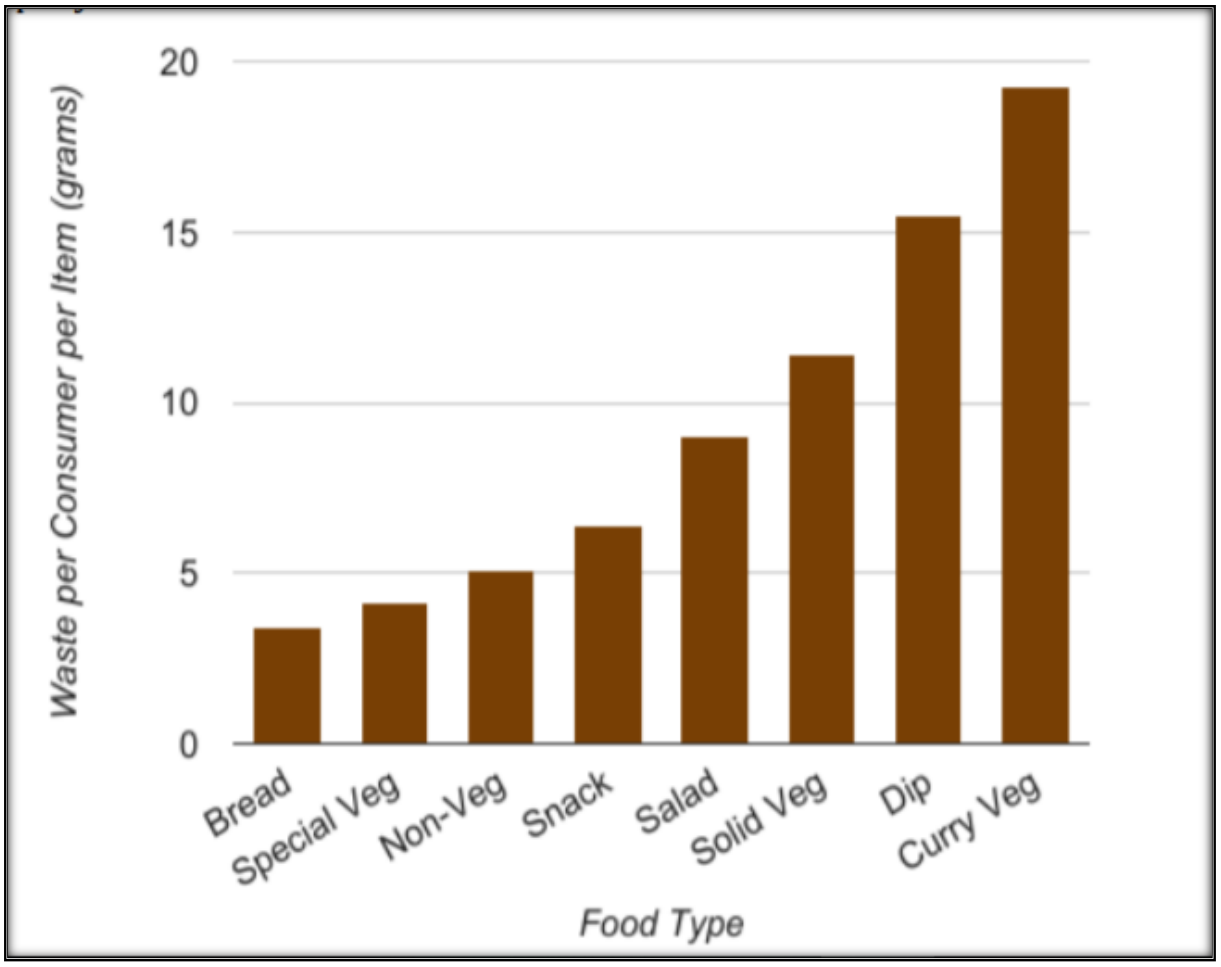


Figure: Avoidable and potentially avoidable waste of different food groups, per consumer, per item.

4.4. Monitored segregation reduces food waste

Based on our monitored and segregated waste audits in the DR Non-Veg mess, it was apparent that having consumers segregate their food waste while we monitor them greatly reduced the total amount of waste produced. This is evidenced by comparing data that we had previously collected data for the first three weeks of October in the DR Non-Veg mess with our monitored and segregated waste audit performed in the last week of October. This relationship is shown in Figure below.

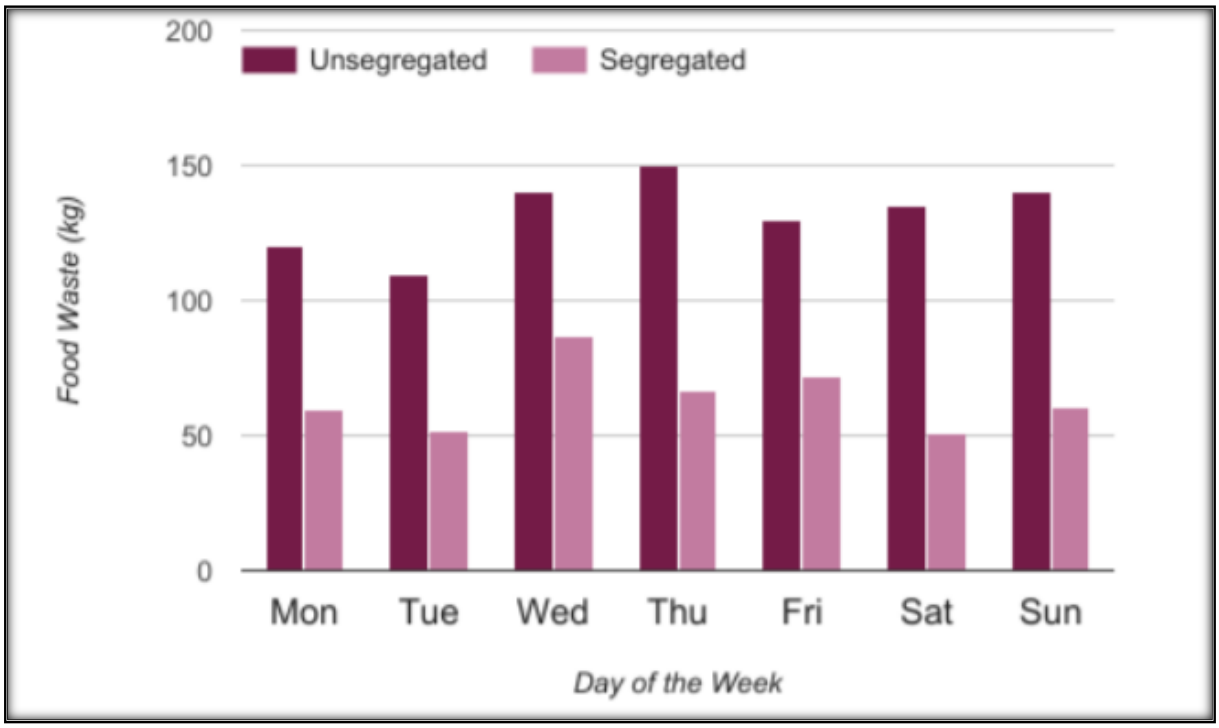


Figure: Segregated and unsegregated waste in DR Non-Veg mess over the course of one week.

Consumer feedback from focus groups and informal communication indicates that these audits may have reduced waste for three reasons. First, segregation is inconvenient, leading people to waste less food in order to avoid sorting waste. Second, it's embarrassing to be watched while disposing of large amounts of waste. Third, people were scared that we would punish them for wasting food, because they did not know exactly why we were watching them dispose of waste.

Thus, we also conducted tests to isolate the effects of monitoring and waste segregation. We performed an unmonitored but segregated waste audit in the DR Special mess hall, and found that consumers produced an average of 19.31% more waste than they did during the monitored and segregated waste audit previously performed in the DR Special mess hall. We also performed a monitored waste audit without segregation in the DR Non-Veg mess hall and found that consumers produced an average of 37.94% more waste than they did during the monitored and segregated waste audit originally performed in the DR Non-Veg mess hall.

4.5. Portioned foods are wasted less

As previously mentioned, most foods served in the mess are self-served by the consumers themselves. However special and/or expensive foods are often portioned by a mess worker. These portioned foods include non-veg items, sweet items, paneer, and bananas. Our waste audits have shown that at all mealtimes in DR Non-Veg mess, self-served menu items are wasted more than portioned menu items by consumers, as shown in Figure below.

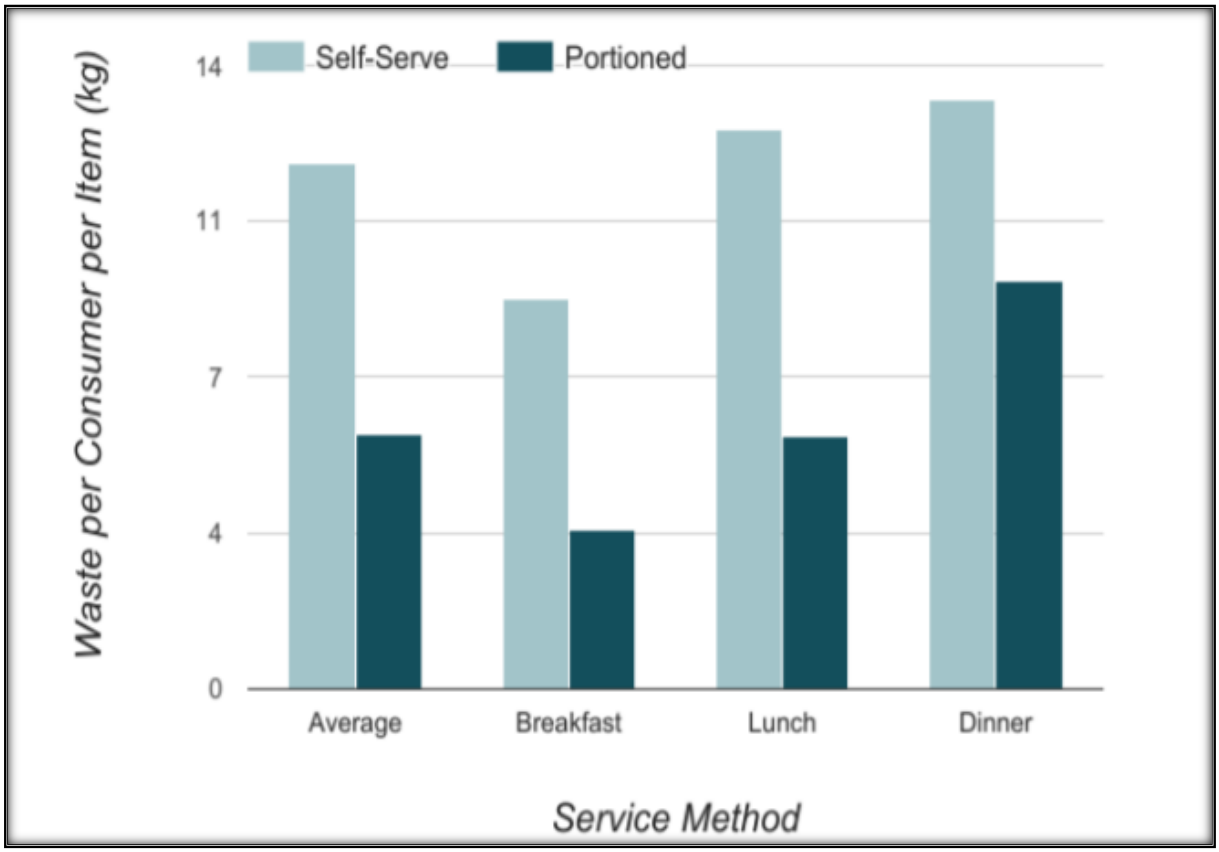


Figure: Avoidable consumer waste in DR Non-Veg mess for self-served and portioned items

This trend also holds for leftover waste in DR Special mess (see Figure below). It is notable that waste production is clearly much more variable for leftover waste, because portioned foods are wasted almost as heavily as self-served foods at lunch, but much less at breakfast and dinner.

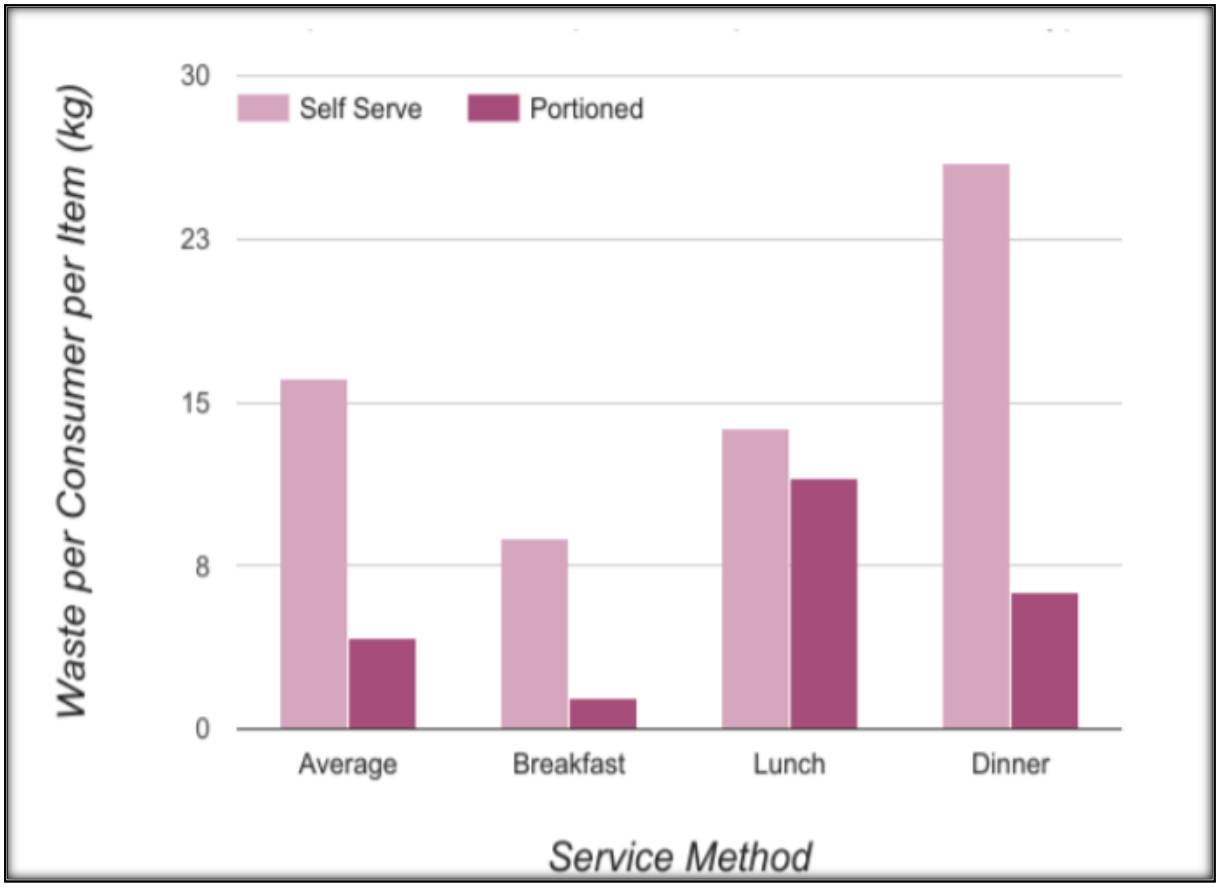


Figure: Avoidable leftover waste in DR Special Mess for self-served and portioned items

We hypothesize that this difference is in part a function of the appeal of portioned foods. Portioned foods are often more expensive, causing the mess staff to ration the quantity, thereby causing students to waste less of it. Students may also waste less of this food in an attempt to avoid the long lines more than one time. Focus group participants indicated that when lines are long, consumers do not want to stand in the long line more than once. Thus, they take too much food, and cannot finish it if they become full or do not like the taste.

4.6. South Indian breakfast items are wasted more

Three days a week, both messes serve breakfast dishes native to South India. Many students in our focus groups commented that “these dishes are not cooked properly and do not have a good taste”. Through the waste audits that we have conducted in both mess halls, we have found that South Indian food is wasted more than North Indian food during breakfast, which is the only meal where South Indian food is prepared, as illustrated in Figure 18. However, this could also be due to the fact that these foods are inherently heavier than other items served.

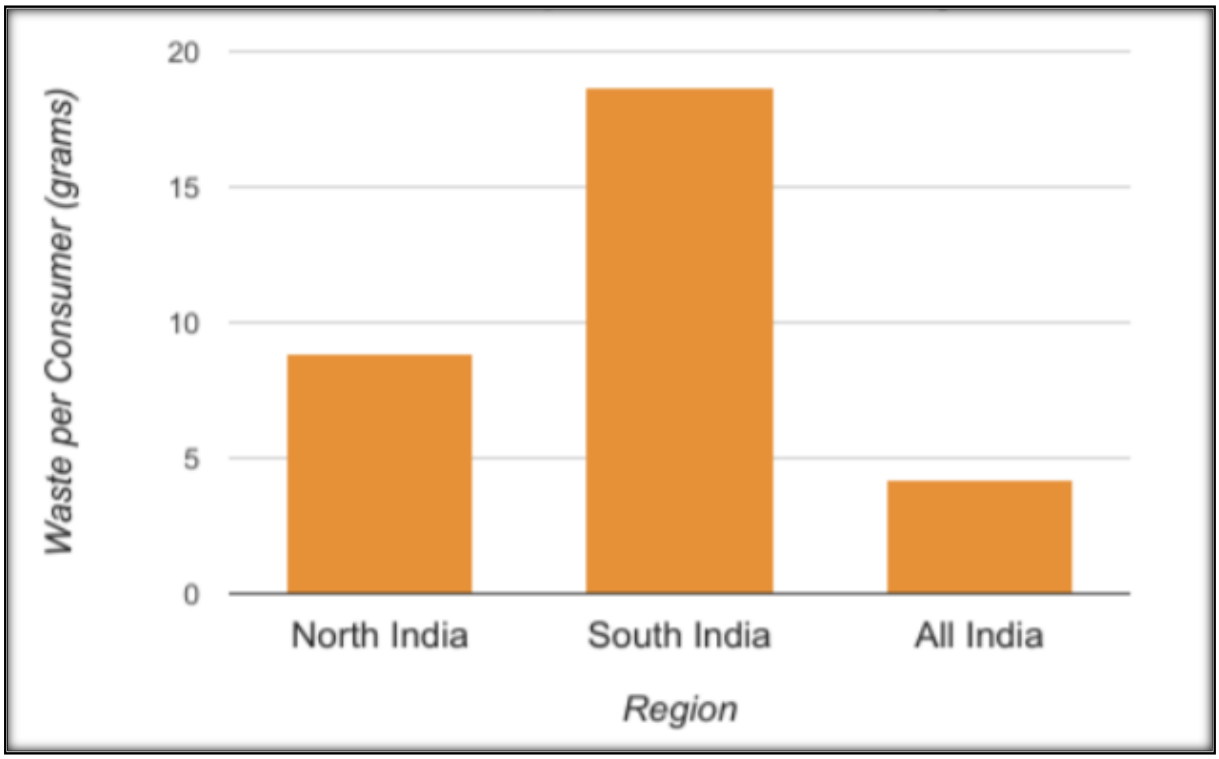


Figure: Waste based on food region at DR Non-Veg mess.

4.7. Improving the VIT Vellore mess hall system

After gathering both quantitative and qualitative data, we conducted a SWOT analysis on VIT Vellore's mess system (see Figure).

Our analysis indicates that the campus food and food waste systems are generally strong in using campus-wide feedback, as evidenced by surveys sent out to all students asking for mess feedback. Additionally, the mess committee and campus administrators have strong control over the mess contractors. However, the mess system is especially weak because of its limited and repetitive menu as well as the very low budget that the mess contractors are given.

There is great possibility for change using competition between the messes and by increasing the contractor's budget. However, any methods that are implemented must be dynamic enough to avoid the plight of former food waste reduction methods that failed after several weeks.

4.8. Almost one-third of the cost of food is wasted

By determining the composition of food waste, we were able to determine the cost of waste and relative cost of different types of waste. Using local wholesale food prices, we estimated the cost of all consumer and leftovers waste to be about almost Rs 6000 per day, between both messes, totalling to almost 15 lakhs being wasted throughout one school year. However, this number only takes into account the cost of raw materials. Therefore if the costs of labour and transportation were taken into account, the total amount of money being wasted would be even higher. The breakdown of consumer and leftover waste of raw materials for each mess is shown below in Figure below.

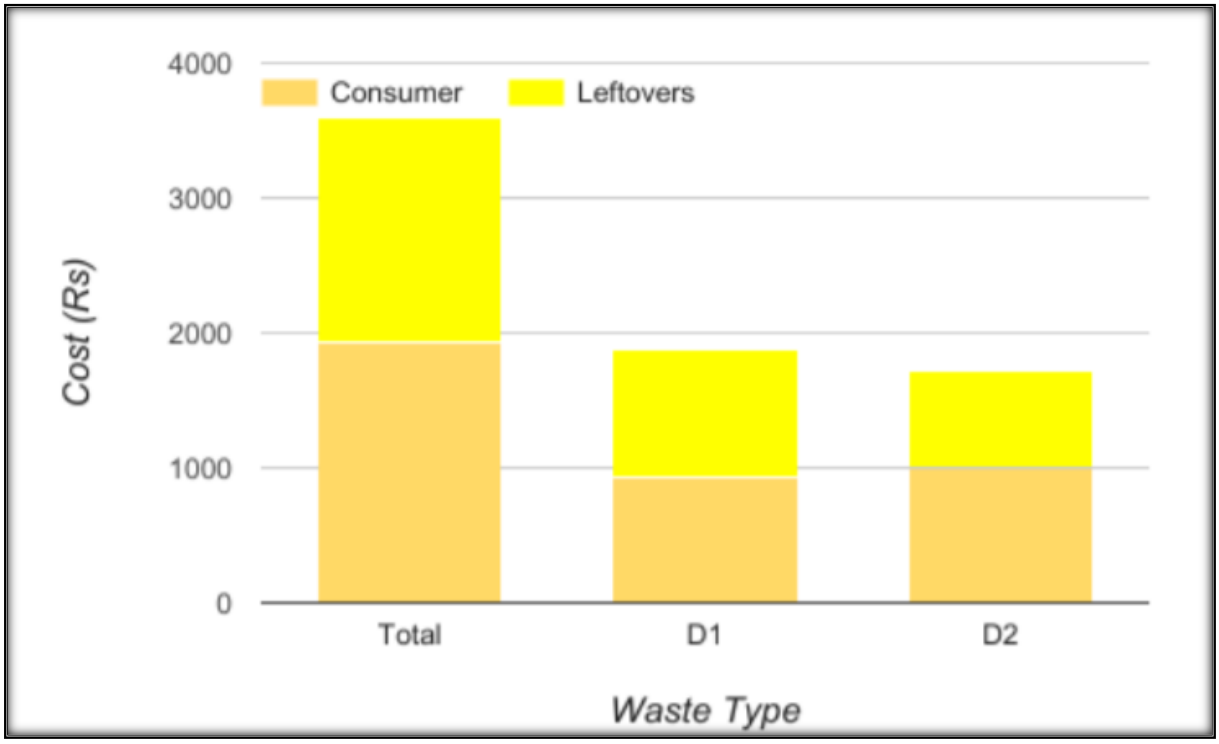


Figure: Cost of daily consumer and leftover waste in DR Special and DR Non-Veg mess

Based on how much food is purchased for DR Non-Veg mess, we calculated that by weight, approximately 28% of the cost of food is wasted through consumer and leftover waste. We assume that if waste reduction measures are taken and less food is wasted, less food will need to be purchased and prepared, and money will be saved.

Figure Below shows that total cost (over one week) spent on food waste of various types. It is interesting that non-veg items incur so much cost. This analysis is potentially misleading because although the cost of non-veg items like eggs and chicken is high, when items such as chicken and egg curry are served, most of the waste is the liquid associated with the curry. Thus, the actual cost of the waste of these items is much less than the cost of the complete recipes. Similar to the breakdown of waste per person shown in Figure below, curry and solid dishes are two of the largest bars.

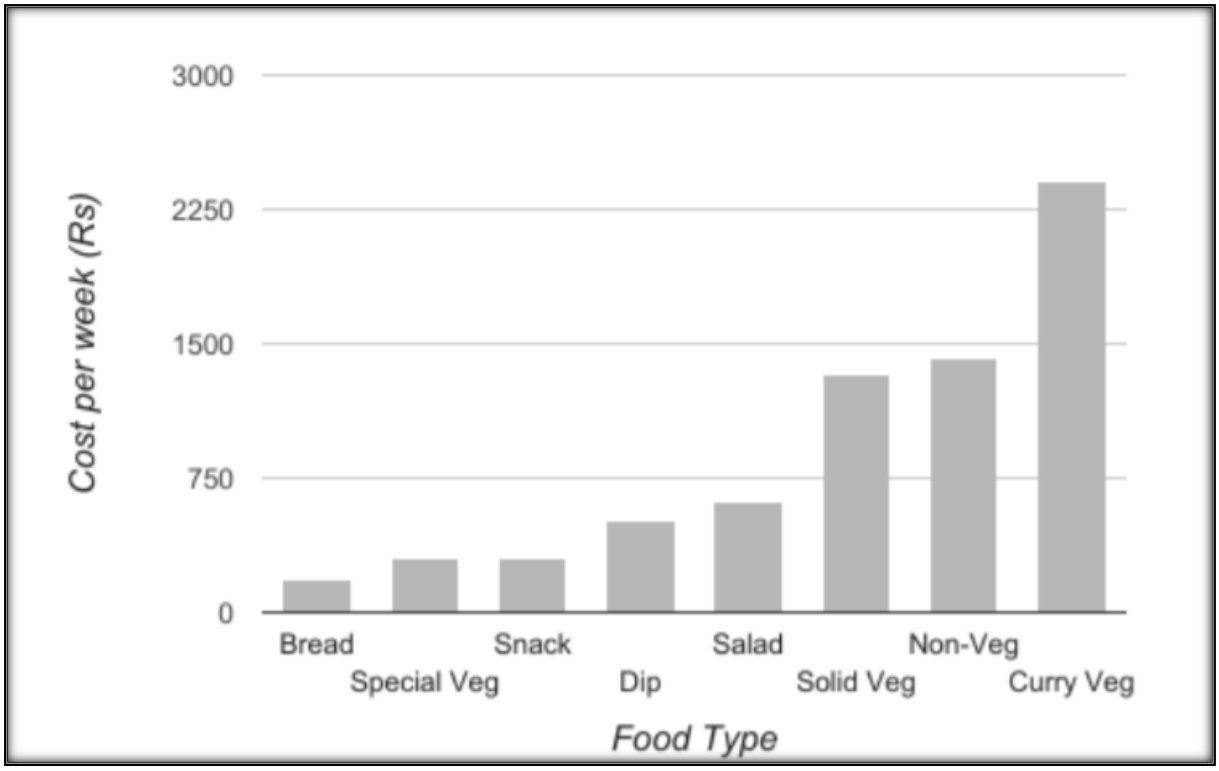


Figure: Total cost per week of different types of food. The total cost accounts for both consumer and leftovers waste in both messes.

5. Conclusions and Recommendations

After analysing food waste at VIT Vellore's two mess halls, our team was able to determine several recommendations for the university based on our data collection. We conducted waste audits in both mess halls, ran focus groups with mess consumers, interviewed mess and campus administrators, and determined a set of recommendations for the university to implement in the future. Some of these recommendations regard systematic changes, like increasing the price of the meal plan and tracking attendance in each mess hall. Other recommendations involve more training for the mess staff about portion sizes and food waste reduction, as well as introducing more variety to the menu. We have presented these recommendations to members of the Mess Committee and mess managers, in hopes that they will take further action to reduce mess hall food waste.

5.1. Recommendations for mess managers

These recommendations can easily be implemented by the manager and/or head chef at each mess. They may require some assistance from the Mess Committee to organize new programs, so these recommendations are also relevant for the Mess Committee.

Track attendance at each mess hall for each meal

Currently, the mess managers at DR Special and DR Non-Veg mess can roughly estimate from experience how many students will attend a meal and how much food they will eat. However, nearly half of the food waste produced comes from leftovers of food in the kitchen. This is in part because of this unreliable system for predicting attendance. We recommend that both messes begin to use quantitative methods, such as the sensor we created, to understand exactly how many diners attend each meal. This will allow the managers to cook based on an exact average attendance for a given menu or meal period.

Implement a program to track mess worker's waste individually

As seen in our waste audits, especially at DR Special mess, large chunks of edible vegetables are often disposed of with other trimmings. As other colleges like WPI often have training for their cooks on reducing trimming waste, we believe that this would be an appropriate step for VIT's messes to undertake. A potential further step could be to implement a program where the waste that each mess worker creates is monitored. This would allow chefs and managers to identify those that need further training or reassignment based on high waste production.

Adjust current recipes

As identified by focus group participants and our observations, the gravy or curry from liquid-based dishes is heavily wasted. In order to improve the quality of curry dishes and correspondingly reduce waste, we recommend that the mess chefs cook thicker curries and lower the ratio of liquid to solid components in curry dishes. This should prevent the wastage of liquid components of curry dishes.

5.2. Recommendations for Mess Committee

These recommendations can be most effectively implemented by the student Mess Committee and the administrators that oversee them. However, all of them will require that the committee work closely with mess managers and staff.

Conduct 'monitored segregation' waste audits frequently

As mentioned previously, our waste audits significantly reduced food waste in DR Non-Veg mess. We recommend that waste audits be performed periodically in order to sustain the effect that they have on food waste, and to monitor changes in the composition of food waste. As shown by our audits with unmonitored segregation and monitoring without segregation, these waste audits will be most impactful only if they are both monitored and segregated, but either monitoring or segregation alone would likely be impactful. Our research has proven only the impact of a waste audit lasting for at least four days. We believe that any sort of regular auditing would be useful, but based on our proven results recommend continuous audits lasting for four to seven days.

Raise the cost of a meal plan

The cost of a meal plan at VIT Vellore breaks down to around Rs 98 per day: Rs 28 for breakfast, and Rs 35 for each of lunch and dinner. Focus group participants and a member of the Mess Committee identified that at this cost, there is relatively little expectation of better food or greater variety. Thus, the Mess Committee has indicated that it would like to raise the cost of a meal plan to Rs 100 or Rs 105. However, based on feedback from the head chef at DR Special mess, Rs 110 is the necessary minimum cost to adequately increase taste and menu diversity. The university should undertake significant research into the ability of all students and their families to cover this cost before raising prices.

Increase communication between mess staff and students

As we saw during our week of auditing at DR Non-Veg mess, the manager was not aware of special events happening on campus that decreased mess attendance and in turn raised leftover waste. Thus, we recommend that one duty of the mess committee is to alert the mess managers of special events on and off campus that may draw students away from the messes. This will allow the mess managers to produce less food to account for fewer consumers.

Introduce a personal feedback system

We believe that our existing waste weighing prototype can be improved upon to give personal feedback to users. One possibility is a "gamified" system that uses smartphone or web-based updates to privately alert users of their waste generation. With this system, students could track trends in their waste, see where they fall in the distribution of waste generators, and gain insight on the importance of their behaviour. Gamification has been shown to have potential for positive changes in attitude and behaviour, including in sustainability related contexts (Fijnheer, van Oostendorp, 2016).

Add additional counter for second servings of food

From our focus groups, it is apparent that many consumers take too much food in order to avoid having to wait in the long queue more than once. As mentioned before, the queues to get food can become quite lengthy. To combat this, we propose that each mess hall add a third counter specifically designated for refilling trays. This would allow consumers to be able to take less food their first time through the line without fear of waiting in a long queue for a second serving.

Add more variety to the menu

Based on popular responses in both the focus groups we conducted and the mess survey answers, many students are not happy with the taste of food and repetition of the menu being served. To make consumers at the mess halls happier, we recommend that chefs change the menu more frequently and add more variety to it. This will allow consumers to enjoy a more varied menu and not waste as much food. This will be possible if, as mentioned previously, the mess budget is increased to some valid amount.

References

2016 global hunger index: India. (2016). ().

Biswas, A. K. (2014). India must tackle food waste. Retrieved from

https://www.weforum.org/agenda/2014/08/india-perishable-food-wastepopulation-growth/

Dash, A., Sankaran, K., Shrimali, P., Iyer, P., Upadhyay, S., & Javadekar, S. (2015, November,).

Food for thought. Insight: IIT Bombay's Student Media Body, 6-7.

FAO. (2013). Food wastage footprint : Impacts on natural resources FAO.

Fijnheer, J. D., & Van Oostendorp, H. (2016). Steps to design a household energy game.

International Journal of Serious Games, 3(3) doi:10.17083/ijsg.v3i3.131

Hunger statistics. (2017). Retrieved from https://www.wfp.org/hunger/stats

SAVE FOOD: Global initiative on food loss and waste reduction (2017).

Whitehair, K., Shanklin, C., & Brannon, L. (2013). Written messages improve edible food

waste behaviors in a university dining facility. Journal of the Academy of Nutrition and

Dietetics, 113(1), 63-69. Retrieved from