University of British Columbia

Social Ecological Economic Development Studies (SEEDS) Sustainability Program

Student Research Report

Cost-benefit analysis of Pre-consumed Food Waste and Development of a Food Waste Baseline: A Food Waste Recovery Initiative

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EXECUTIVE SUMMARY

Pre-consumer food waste (PCFW) is the food waste associated with the preparation of ingredients in dishes and other food products to be sold for consumers. Food waste is a large issue that contributes to global greenhouse gas emissions, and its impact can grow exponentially with the expected increase in the human population by 2050. To help reduce PCFW, the implementation of circular economies should be employed. This can help eliminate waste from ending up in landfills. Our project responds to UBC's Community Action Plan 2030's (CAP 2030) aim to reduce campus food waste by 50% before 2030. This research is the first step in meeting this goal and will develop a food waste baseline at Open Kitchen (OK), a residence dining hall at the University of British Columbia through a cost-benefit analysis of PCFW based on its monetary and environmental costs.

Our analysis will employ various methods including, literature reviews, in-depth interviews with key staff at UBC Food Services, and quantitative analysis of waste data collected both historically at Open Kitchen, and data collected specifically for this project by Food Services (FS) staff. This analysis aims to provide a clear insight into current practices being done to reduce PCFW.

Key promising practices identified from the literature include: limiting self-serve stations and container sizes, staff training on food storage and handling, and incorporating more plant-based menus. These promising practices fall in line with the identified gaps noted in the interview which include: waste occurring mostly at side and salad bars and that there is no standard acceptable amount of food waste set. The results from the cost-benefit analysis show that the greenhouse gas emissions from 2021 are higher in comparison to 2020, and economic costs are highest during September and October for both years.

Recommendations are made based on immediate, short (6 months) and long (over 1 year) term goals for UBC Food Services. These include amending the existing food waste recording system, setting acceptable monthly food waste goals and the routines to track them, as well as providing the framework for conducting food waste audits at other locations.

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LIST OF ABBREVIATIONS

AAD = All Access Dining

C+CP = Campus and Community Planning

CAP 2030 = Community Action Plan 2030

FIT = Food Intel Tech

FS = Food Services

FWR = Food Waste Reduction

GHG = Greenhouse Gas

GWP = Global Warming Potential

OC = Optimum Control

OK = Open Kitchen

PCFW = Pre Consumer Food Waste

UBC = University of British Columbia

ZWAP = Zero Waste Action Plan

1. INTRODUCTION

1.1 RESEARCH TOPIC

Our research topic looks at UBC FS' efforts to achieve a circular economy and support UBC's CAP 2030 and ZWAP in the coming years. The main lens for doing so is reducing PCFW at the scale of operation and proposing strategic steps to reduce economic costs and GHG emissions associated with food waste.

The research aims to assess the PCFW generated at Open Kitchen and establish a food waste baseline at Open Kitchen (OK) that quantifies the GHG emissions associated with the food waste. The food waste baseline will help answer the research problem for this project: supporting UBC FS in minimizing its food waste and developing its Food Waste Reduction Strategy.

1.2 RESEARCH RELEVANCE

Food waste brings significant environmental and economic challenges globally. From a monetary perspective, food waste costs more than billions of dollars every year in Canada (UBC Sustainability, 2021). According to the report from United Nations Environment Programme (2021), an estimated 17% of produced food, which is equal to 931 million tonnes of edible foods, ends in waste (with 11% at the household level, 5% in food services, and 2% in retail). From the environmental perspective, food waste is considered the third-largest source of greenhouse gas emissions (United Nations Environment Programme, 2021), which accounts for about 6% of total global greenhouse gas emissions (Ritchie, 2020). Thus, food waste burdens not only food production but also exacerbates environmental issues, making it a significant contributor to the three planetary crises including climate change, biodiversity loss, and pollution (United Nations Environment Programme, 2021). There is an urgent need to improve our food waste management system and maximize the utilization of food waste to alleviate the burden of massive food waste.

In a larger sense, retail food stores and food services in B.C. lose an estimated $1.3 billion worth of food per year, 57% more than the estimated profit in those sectors (Too Good to Go, 2021). This underlying cost may eventually increase our taxation from social, economic and environmental perspectives (FAO, 2014). Simple operational controls can help operators mitigate waste and increase profit. Thus, there are many economic, social

and environmental reasons to reduce food waste (Buisman et al., 2020). As communities consider options for managing their food waste streams, an understanding of the volume, composition and variability of these streams is needed to inform the decision-making process and potentially justify the capital investments needed for separation and treatment operations (Lombardi & Costantino, 2020). A systemic investigation of the operation process in a food sector also allows for the estimation of embodied resources in food that is wasted, demonstrated herein for GHG emissions (Arneth et al., 2019).

Our project aims to establish a completed PCFW waste baseline in Open Kitchen and identify possible improvements in the FS waste management system. With the success of the exemplary base, this built module might be adopted by other UBC Food Outlets in the future. Furthermore, the project may result in new policies or practices that may refine the resident dining experience, as well as demonstrate the university's innovative strategies to improve sustainability and reduce GHG emissions.

These policies will help UBC achieve a circular economy by revitalizing value from often thrown out materials and fuel other ventures within a large organization. In the context of PCFW, Open Kitchen has used some of the ingredients considered as waste in other dishes and readily provides them as compost material. From our literature review, some of the key policies that can help reduce PCFW include: limiting the amount of waste in receptacles, mandating food waste reporting, incentivizing participation in food recovery initiatives, and reviewing label and food safety requirements (Government of Canada, 2019). The promising practices which can address those policies include: calculating waste and consumer demand, limiting self-serve stations and container sizes, staff training on food storage and handling, and incorporating more plant-based menus as those ingredients have lower GHG emissions.

Future work for this research can help advance UBC's CAP 2030 and further benefit FS and students by contributing to advancing broader societal issues. With the circular economy becoming a more popular concept, this idea provides unique avenues for building social capital of the UBC community by further advancing the discussion around sustainability.

1.3 RESEARCH CONTEXT

In response to the Emergency Climate Declaration on UBC's campus in 2019, UBC committed to forming a new Climate Action Plan for 2030 (CAP 2030) aimed at reducing GHG emissions on campus. Food systems waste at UBC accounts for 29,000 tonnes of CO2 emissions per year (UBC Board of Governors, 2021). It is the second-highest emissions category in the extended impact emissions areas, just after commuting (UBC Board of Governors, 2021). To address reducing food systems emissions, the Climate-Friendly Food Systems Action Team was created. The team set the following goals: reduce food systems-related GHG emissions by 50%, and shift 80% of recipes to a more climate-friendly alternative.

The Climate-Friendly Food Systems Action Team defined a Climate-Friendly Food System as follows:

> "UBC aims to operate within a climate-friendly, just and accessible food system, which means being committed to operating within planetary boundaries by reducing our GHG food system footprint and enhancing food system resiliency from production to end disposal and recovery, while producing positive outcomes for people, animals and planet" (Nanayakkara, 2021).

Alongside these initiatives lies the Zero Waste Action Plan (ZWAP), which hopes to create zero waste on campus. ZWAP began in 2010 and has led tremendous efforts in transforming waste sorting on campus. These efforts contribute to reducing GHG emissions by ensuring that waste is sent to the appropriate facilities for decomposition.

Our project is affiliated with the SEEDS Sustainability Program's Circular Food Cluster project which came to be in 2021. This cluster aims to develop a Food Waste Prevention and Reduction Strategy through the integration of smaller projects like this one. The cluster noted that while many previous initiatives on campus to reduce food waste had existed, food waste had never been measured at the source. Food Services (FS) keeps a record of food waste estimations, but further data is required to accurately assess the amount of pre-consumed food waste generated. This need must be met to effectively measure the success of food waste reduction initiatives in order to align with the goals outlined in the CAP 2030.

OK and other UBC Food Services locations are actively trying to reduce the amount of pre-consumed food waste generated already. In our initial project meeting, FS personnel identified key actions to prevent food from being wasted, which included saving extra raw foods to be used in a different recipe and saving excess foods that had yet to be served. Increasing our understanding of existing successes and potential areas of improvement will be a key objective for this project.

1.4 RESEARCH PURPOSE, GOALS AND OBJECTIVES

The purpose of the project is to support UBC FS minimize food waste by building a GHG emission baseline and making further recommendations to develop a broader Food Waste Reduction Strategy for other FS outlets at UBC.

The project goals for this project include:

- Measure pre-consumed food waste generated at OK.
- Establish a food waste baseline at Open Kitchen according to the amount of waste generated.
- Quantify GHG emissions and costs associated with the PCFW.
- Identify gaps in current food waste prevention strategies at OK.
- Suggest strategies to enhance food waste prevention at OK that can be scaled to other UBC FS locations.

The project objectives for this project include:

- Assess the OK's PCFW from past records by sorting food waste by type (and its associated GHG emissions) and documenting monthly trends of food waste to establish the food waste baseline.
- Quantify the GHG emissions using online Global Warming Potential (or GWP) values.
- Quantify the cost of food waste generated at OK through the creation of a cost-benefit analysis.
- Identify existing methods to reduce and prevent food waste at OK and their priorities surrounding the prevention of food waste.
- Identify challenges and opportunities associated with enhancing food waste reduction practices at OK.
- Provide insight on the development of a PCFW strategy that can be scaled to other UBC FS locations.

2. METHODOLOGY AND METHODS

2.1 RESEARCH METHODOLOGY

Our research methods focused on community-based planning to allow collaboration between various partners in the community that were also experienced in relatable yet diverse topics. That is, experts in GHG emissions, management, food waste, and the chefs of UBC OK worked with this in the project. It was important to take a community approach as it tailors the solution of developing the food waste baseline for future food waste management development to the community's characteristics and merits (Ai & Zheng, 2018).

The methodology of this project was designed based on the Community-Based Action Research (CBAR) principles which aim to address the practical concerns in the community via a close collaboration between researchers and community members who have certain concerns (Burns et al., 2011). In this research, we collaborated and engaged with diverse partners and community members to reach a community consensus on improving the monitoring of OK's food waste reduction through social action and change (Institute of Civic and Community Engagement, n.d.). OK is the key stakeholder of this project who provides us with the primary data and proposed the issues elicited during their production. A dynamic research process was implemented as constant consultation regarding the trajectory of the project was taken, and new input from the community was incorporated. The project was started with an intensive literature review and interviews with the clients and key stakeholders which will contextualize this project within the UBC community. In this focus, we maintained transparent communication by sharing our findings and seeking advice for the next steps, as well as food recovery solutions. The goal and scope of this research were carefully determined to reflect the needs of the community partners, and the results and findings can be delivered as practical solutions for improving the food waste reduction interventions in OK.

2.1 RESEARCH METHODS

For this research, various methods were used to help develop our cost-benefit analysis. Those methods will be outlined in the following subheadings.

2.2.1 SECONDARY DATA COLLECTION

Review of Historical Data

First, we analyzed historical monthly food waste measurements at Open Kitchen (OK) recorded by Operation Control (OC). OC records all data at FS locations at UBC, including sales data and the quantity of PCFW. For more specific details, a sample of the records can be seen in Appendix 3. The dataset we received identified the food type wasted, the price associated with the food item, and the amount of waste in kilograms between April 2020 and January 2022. Microsoft Excel graphing was utilized to analyze the data. This data allowed us to calculate the cost of food waste each month. Additionally, we identified the GHG emissions associated with the weight of key ingredients wasted in the list of sales data provided. The data was sorted in Microsoft Excel into specific food items. Then, emissions factors from the literature were assigned to each food category (Clune et al., 2017). The proportion of GHG emissions per key ingredient was recorded in a pie chart to help visualize the results. This data helped generate a cost-benefit analysis for food services based on their environmental cost. To calculate the GHG emissions, we built off of the work of Maji (2019) and found GWP for identifiable food waste, from zucchini to rice to fish and chicken. These ingredients have associated with GHG emissions, which can be used to quantify the total amount of GHG generated from the total food waste.

Data analysis will be completed using Microsoft Excel to highlight emerging trends. The formula for calculating the GHG emissions follows the formula highlighted by Maji, 2019:

$$\sum_{s,i} GHG_i \quad = W_i \; x \; emf_i$$

- Where GHG_i = GHG emissions from the total amount purchased of each food item,
- W_i = Weight of each item (in kilogram) or volume in litre
- Emf_i = emission factor associated with each item (emissions per kilogram or litre of item).

This calculation will provide the summation of GHG emitted from a single item's GWP, allowing us to determine how much each item is wasting per unit and which item in UBC OK causes the highest amounts of greenhouse gas emissions.

GHG Emissions Database

Using a literature review of GHG emissions values, we assigned an emissions coefficient value for each food ingredient. Clune et al. (2017) provided a meta-analysis of different Global Warming Potential (GWP) coefficients for various ingredients' median and mean values. For our purposes, the GWP resembles the emissions factor used for our cost-benefit analysis as both values show the emissions associated with a food item in the same units. GWP is represented as the amount of carbon dioxide (in kilograms) emitted per kilogram of food. This research uses the median value of the coefficients as it provides a baseline value to estimate how much GHG emissions are associated with each ingredient.

Additionally, whenever possible, using North American values for the associated ingredient as there may be regional differences based on the variation of inputs such as fuel, energy, and additives (like fertilizers) can cause variation in GWP (Clune et al., 2017). The emissions coefficient is calculated per kilogram, meaning that the food waste audit data would need to be converted into the same weight unit to conduct the cost-benefit analysis as appropriately and accurately as possible.

Literature Review on Existing Practices

Individually (5 separate efforts), we conducted literature reviews to identify policies and promising practices related to food waste audits, food waste prevention, and food waste reduction. The UBC Summons database and google scholar were used to obtain relevant literature. Search queries included "pre-consumed food waste," "reduction OR prevention," "food service locations," "universities," "food waste policies," and more. The findings from this search were compiled and categorized into key policies and promising practices that can be recommended in addition to the work UBC FS has been doing to reduce PCFW.

Food Waste Audit

Next, FS employed Food Intel Technology (FIT) to conduct a food waste audit. The purpose of the Food Waste Audit is to help food services gain insights into trends and major contributors to food waste. The audit work provided the amount of waste according to food type, and the FW category, or reason for the waste. The criteria used to design the audit, including a two-week measurement period completed by kitchen staff, aligned with the common practices identified in Cook et al.'s "consensus pathway" for food waste audits (2022). Considerations to the ease of measurement for an already busy kitchen staff was incorporated.

To complete the audit, Food Services staff measured the weight of food waste generated at each mealtime according to food category over a two week period. Specifically, FIT provided a weighing station with a tablet that allowed the user to document the food types including vegetables, staple grains, mixed ingredients, meat, and dairy. Additionally, the user can select the cause of the food waste, with categories such as spoilage, preparation, buffet, and plate waste. For our project, plate waste was not recorded. FIT provided a PCFW report automatically based on the data inputted by FS staff.

The sample of the report we received only provided the daily average amount of FW, FW per cover, the proportion of PCFW, carbon reduction, savings equivalent, food saved, type of food waste and its daily average, waste category, and location of the food waste. A subset of these categories had no data. This report is included in Appendix 3. This data was not used to quantify OK's GHG emissions, as OC was deemed to provide a more accurate picture of the types and quantities of PCFW.

2.2.2 PRIMARY DATA COLLECTION

The primary data collection was three interviews with key representatives of our primary client, UBC's Food Services. We decided on conducting interviews as they provide a more in-depth exploration of current efforts being done as well as insights for future recommendations. A total of 12 questions (further outlined in Appendix 1) were asked to the interviewees which include: the current ways PCFW is utilized and how the coronavirus impacted the amount of PCFW.

The three interviews were anonymized and transcriptions of the interviews can be found in Appendix 2 below. Consent and an interview debrief were done before the interview to explain the boundaries of anonymity to the interviewees before beginning the interview. Responses were coded into a matrix on an Excel sheet that documents the frequency of similar responses across all responses to a respective question. From this, we determined the most significant responses with the most frequent responses from multiple interviewees. An example of this matrix could be found in Figure 4. In the case where all responses were distinctly different, all responses were considered to be significant for that respective question.

2.3 METHODS OF ADMINISTRATION

When preparing for our interviews, members of the team contacted key partners and scheduled times based on their availability. Depending on their preference, the interviews were either conducted in-person (with visits to dining halls) or online through Zoom calls. The outreach process began in late February, with all the interviews conducted by mid-March of 2022. Once the interviews were conducted, audio recordings and written transcripts were documented within 48 hours and made available to our team.

3. RESULTS

3.1.1 LITERATURE REVIEW

Based on the individual literature reviews conducted, we compiled a running list of the policies and promising practices to reduce PCFW in FS locations. We identified the following policies as being the most relevant to our project's objectives:

Table 1: Policies Relevant to Project Objectives

Policies	**Reference**
Limit the amount of waste in waste receptacles	City of Richmond, 2021 Martinez, 2021 Peats, 2019
Routine food waste audits, and continuous waste reporting	The Greenest City or Healthy Scholars Program, 2021 Martinez, 2021
Allow food donation beyond its expiration date	Peats, 2019

The following promising practices were identified as having the most relevance to our project's objectives:

Table 2: Promising Practices Identified for Project

Promising Practices	**Reference**
Conduct a food waste audit	Lefadola et al., 2018 Martinez, 2021 Wilkie et al., 2015
Omit buffet style serving stations	Lefadola et al., 2018

Adjust menus to be more plant-forward	Koduri, C., 2022
Train staff on food waste prevention and reduction	Lefadola et al., 2018 Papargyropoulou et al., 2019 Priefer et al., 2016 Smart & Moreira, 2021
Adopt the first in- first out approach, a inventory management system focusing on using ingredients ordered first	Lefadola et al., 2018
Utilize a demand forecasting tool	Lefadola et al., 2018 Papargyropoulou et al., 2019 Painter et al., 2016 Priefer et al., 2016
Reduce the amount of food placed in serving containers	Lefadola et al., 2018
Reduce food portion sizes	Lefadola et al., 2018 Martin-Rios et al., 2018 Priefer et al., 2016 Smart & Moreira, 2021
Engage in food recovery	Martin-Rios et al., 2018 Martinez, 2021 Messner et al., 2020 Peats, 2019
Invest in innovative alternative uses for food waste	Martin-Rios et al., 2018
Proper food storage practices	Lefadola et al., 2018 Priefer et al., 2016

3.1.2 INTERVIEW FINDINGS

Across the 3 interviews we've conducted, we found some interesting things to note.

The detailed interview transcripts are included in Appendix 2. The current practices FS conducts include training sessions for newly recruited kitchen staff to minimize waste (especially when preparing ingredients to cook), actively looking at sales data for ordering ingredients and meal planning for the week, and repurposing, donating, or composting leftovers or PCFW. The FS team has been working closely with Vancouver Food Runners, a charity dedicated to recovering edible food that would've been thrown out and allocating them to members of society that can benefit from such food. The FS team mentioned they also actively look to repurpose potential PCFW into other dishes that can be served, with one example of using the smaller pieces of vegetables into stocks and other ingredients.

Some areas for further investigation were noted. The areas accruing the most waste were identified as the side and salad bars. The types of foods wasted most often were noted to be rice and other grains being wasted the most. While interviewees identified that some food waste was always expected in FS locations, no maximum PCFW threshold exists. UBC FS has relied on OC to actively record specific food items wasted (either during the preparation or service phase) with its specific quantity and unit cost. Opportunities for increasing FS staff's motivation to reduce PCFW via understanding GHG emissions associated with waste were identified.

Current Practices

Same FWR practices across locations			n/a
Knife skills/training to reduce waste	encourage waste reporting	encourage staff to use older items first	
Adjust and consistent portion sizes			
Adjust size of serving containers			
Inventory	monthly	2-3 times/day walk through of veg, prepped items, meat	
Meal planning (cross utilization of ingredients)			
Meal planning (plate waste considerations)			
Meal planning (Plant forward)			
Sales data across locations helps predict ordering			
Ordering	6 days/week	5 deliveries/week - maintain freshness, minimize inventory	
Sales data used to predict how much to prepare			
Make stock from unavoidable food waste			
Suvi/cyrovac storage			
Reuse things they overprepped			
Sharing excess across locations			
Have a special for foods that they need to move			
Food waste reporting			
Food Recovery (Food Runners and Sprouts)			Sort daily, sprouts pickup 1x/wk
Composting			
AAD - will be trayless and have smaller plates		spike at first, reduction in the longterm	

Gaps in Reducing Food Waste

Heavy waste at salad bar and sides bar			
rice, pasta, potatoes = large proportion of waste			
Expired/packaged foods = expensive waste			
Calculate GHGE in OC			
Have a benchmark of acceptable/unacceptable cost of waste			
Using env. harm as a motivator for staff to reduce waste			
Understand plate waste/what consumers pick around			
Explore procurement and transportation emissions			
Encourage consumers to eat ugly produce			
Buy less food as a household			

Figure 4 is the Qualitative Data Analysis of Interviews with Current Practices and Gaps from each interviewee. This is concluded based on what we heard and analyzed from the interviews. As shown in the figure, it included the currently existing policies and practices that we have learnt from the interviews with the staff of UBC food service. And then we concluded this figure to show what's the gap that Open Kitchen can still improve on. For instance, we have noticed that waste occurs mostly at the side and salad bars, rice, pasta, and potatoes are the most wasted foods, and there is no standard acceptable amount of food waste set and so on.

3.1.3 FOOD WASTE AUDIT DATA ANALYSIS

Results and Graphs

The graphs (Figures 1 to 2) were made based on food waste data Open Kitchen collected from April 2020 to January 2022, with the addition of data from Food Intel Tech (or FIT, from February to March 2022). The following graphs show the monthly GHG emissions, monthly costs of food waste, and breakdown of total GHG emissions based on food type categorized by key ingredients. These graphs are made with the food waste audit data taken from the OC tool used by UBC FS. These graphs directly refer to Figures 1 to 3 at the start of the report.

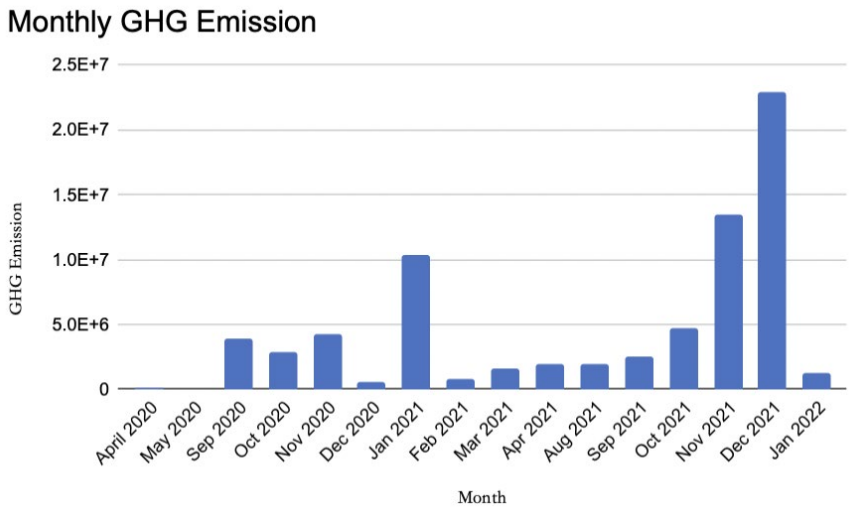

Figure 1 is the monthly GHG emission caused by food waste. The x-axis represents the month from April 2020 to January 2022. The y-axis represents the GHG emission in kilograms (eg. 5.0E+6 means 5*10^6 or 5000 tonnes). As shown in Figure 1, there are more GHG emissions in 2021 compared to 2022, especially in November and December. It will be really useful for future studies to analyze what happened during those two months that generated huge GHG emissions. The GHG emissions in January of 2021 were significantly higher in comparison to the previous and following months.

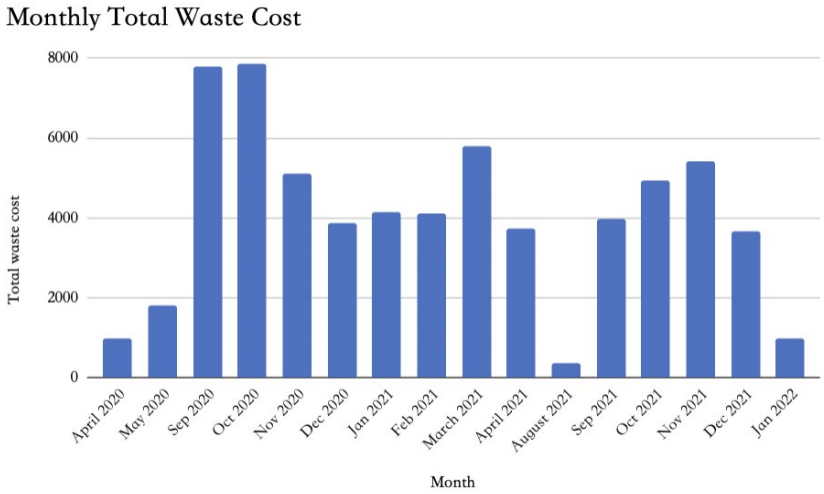

Figure 2 represents the monthly total waste cost. The x-axis represents the month from April 2020 to January 2022. The y-axis represents the cost generated by food waste in Canadian dollars. As shown in Figure 2, we have observed an obvious seasonality trend. There are more costs generated by the food waste during the winter session (starting from September to December) with the total costs starting to increase from September and reaching its peak (highest point) in October and November. In 2020, the peak occurs in October which is $ 7842.42. In 2021, the peak occurs in November which is $5417.35. We can observe an improvement in reducing the food waste cost from 2020 to 2021. In addition, the monthly cost generated by waste is related to the total consumption each month.

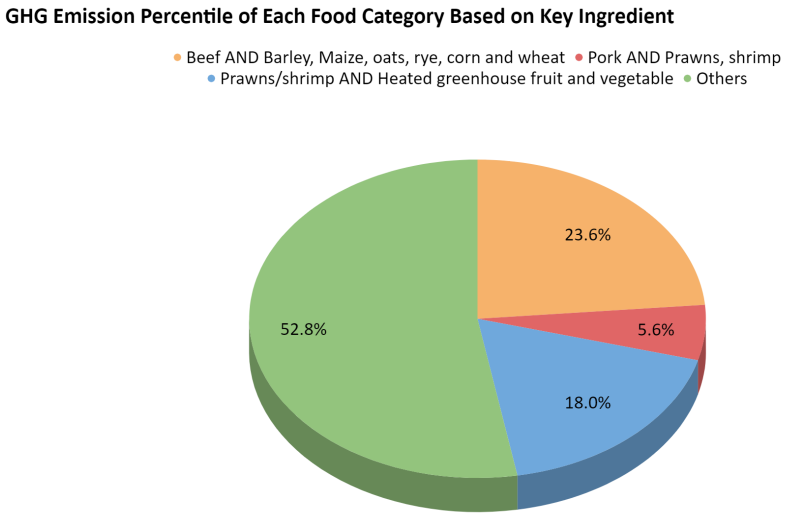

Figure 3 is the pie chart showing the Greenhouse Gas Emissions Percentile of Each Food Item Based on Key Ingredients. There are 334 food categories in total. Beef accounts for 23.6% of the total greenhouse gas emission. prawns/shrimps with heated GHG vegetables and fruits account for 18.0% of the total greenhouse gas emission. Pork accounts for 5.6% of the total greenhouse gas emission. The other 331 food items together account for 52.8% of the total greenhouse gas emission.

FIT Results

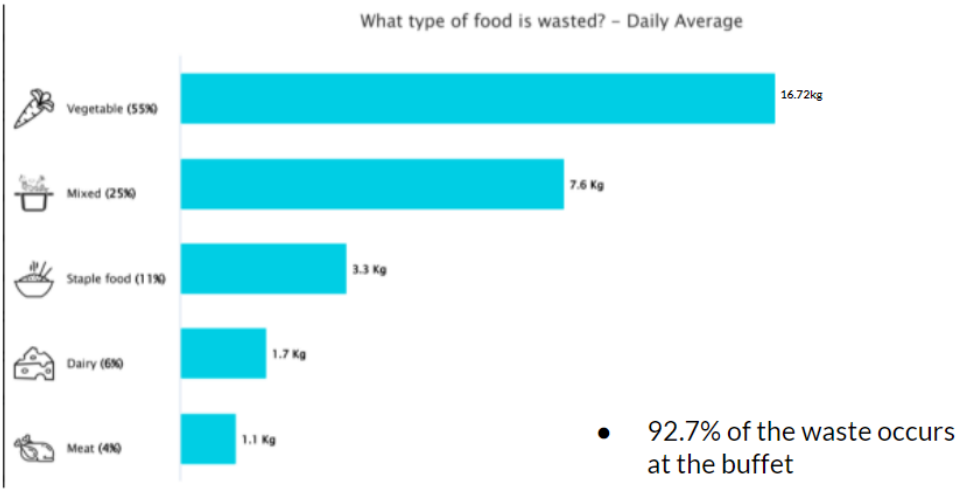

Figure 5 shows the most relevant findings from the FIT report. FIT was used as a pilot tool from February to March and shows the average amount of food waste produced daily (as kilograms) into various categories. The food categories are generally separated into vegetable, mixed, staple food, dairy, and meat. From February to March of 2022, vegetables were wasted the most, which is 16.72 kg per day (55% of the total). Meats was wasted the least, which is 1.1kg per day (4% of the total) on average. When analyzing the categories of food waste, FIT also identified 92.7% of waste as coming from the buffet-style serving stations. The remaining 7.3% of waste occurred as a result of food spoilage.

4. DISCUSSION

Many policies and promising practices in our literature review were reported to have already taken place in our FS interviews. Notably, FS was already tracking their PCFW, and tracking sales data in OC to inform meal planning strategies. Considerations for an increasingly plant-forward menu were a priority for FS. Staff training to reduce PCFW took place when new staff were trained to work at FS locations. Staff use the first in-first out

approaches to ensure that foods purchased earlier are used before foods ordered later. The amount of food placed in storage containers was reduced near the end of mealtimes and was placed in smaller containers to keep buffets looking plentiful. Excess food was stored in vacuum-sealed containers to ensure freshness and was repurposed into new meals whenever possible. FS was also engaged in food recovery initiatives, notably donating excess foods to Sprouts, an on-campus, low-cost cafe, via Food Runners, a food recovery app. These findings were reported by management and head chefs, and observations or discussions with day-to-day staff did not take place to confirm or investigate their prevalence.

This left only a few of our literature review's key findings as unreported. Most of the remaining suggestions moved beyond day-to-day operations within FS, including a mandate on the amount of waste in waste receptacles, allowing food donation beyond its expiration date, and investing in innovative alternative uses for food waste. Pros and cons regarding the buffet-style serving stations emerged. Despite contributing to PCFW (quite significantly, as noted by FIT's report with 92.7% of waste coming from these stations), these buffets give consumers greater autonomy over the type and quantity of food they would like, while also freeing up FS staff to work on other things.

Elaboration of Insights from Interviews

Other key insights emerged from our interviews with FS staff. Notably, great motivation for minimizing PCFW already existed among management, as wasted food is wasted money for FS operations. Considerations for minimizing FW were noted to be ingrained as part of any chefs' occupational training. This largely contributes to the extensive measures already in place for FS to minimize their PCFW. Further promising practices already identified within the interviews included routine inventory checks, sharing excess foods with other FS locations on campus, marketing chef specials to move foods that will be going bad soon, and composting foods that cannot be recovered.

Some areas for improvement were identified in these interviews. There is a need for FS staff to set a maximum threshold for monthly PCFW. Despite FS's extensive PCFW tracking, analysis of this waste had not taken place prior to this project. Staff identified this data as a potentially powerful tool to incentivize staff to reduce the amount of PCFW they generate by appealing to environmental concerns associated with PCFW GHG emissions. Setting these benchmarks, and sharing FS's progress towards meeting these goals through routine staff

training and data sharing is the next step FS should take to continue mitigating their PCFW. Another area identified as needing further exploration was an understanding plate and post-consumer food waste. FS staff mentioned that this was likely a much larger contributor to FW and associated GHG emissions on campus.

In-Depth Exploration of Data Analysis

A key assumption was made in calculating the GHG emissions associated with food waste. The food items listed did not include the list of ingredients in those food items, so the calculations were done based on assumed key ingredients used in making the food item. For example, a ham and cheese breakfast wrap's key ingredients are ham and cheese, so its GWP is based on those two ingredients. This was a slight hurdle in that the accuracy of the findings may not entirely reflect the true GWP factor. However, it is important to note that most of the PCFW were individual ingredients, which made GWP calculations easier and more accountable.

The main findings from our data analysis also aligned with the assumptions FS staff identified in our interviews and discussions during our collaboration. First, let's discuss meat. Meats was identified in the literature to be the food category with the highest associated GHG emissions. It is also an expensive food commodity. FS has been financially motivated to reduce the amount of meat served in order to minimize costs. They have been working on the development of an increasingly plant-forward menu. This can be seen when analyzing the data. Our FIT report identified meat as the commodity that was wasted the least by weight. Our data analysis from OC identified foods with meat as the key ingredient to be the largest GHG emitters. Despite meat products being the largest contributors to GHG emissions, FS's existing motivation to reduce animal-based foods in their menu indicates that these emissions are likely to be reduced over the next few years. FS at present is not ready to omit these foods altogether, as consumer preferences still exist for these products and need to be met.

Additionally, staple grains and potatoes were identified to be the food most commonly wasted in the interviews. This occurs as these foods are difficult to prepare quickly, so staff needs to maintain a surplus to meet student demand. These foods are also less expensive, so the waste has less of a financial impact on FS. These foods are also often served at the buffet-style serving stations in OK, which we have seen to be the site in OK accruing the most waste. Fortunately, these foods also have relatively lower GHG emissions associated with them. Nonetheless, this avoidable waste should be minimized as much as possible.

A third trend that overlapped between our interviews and data analysis was seasonal trends in when foods were wasted most frequently. FS mentioned that waste occurs most often when the FS locations are busiest, as it is more difficult for staff to predict and meet demand. Excess food is often prepared to account for these busier times. More mistakes are also likely to arise when things are busier, such as food being left on the stove, or accidentally spilling something. This accounts for the peaks in PCFW generation documented in fall months at the beginning of the semester, as well as March, near the end of the semester. In the fall, first-year students are excited to eat at FS locations for the first time. As the year goes on, these students become less interested or begin exploring other dining options around town. Near the end of the winter semester, students often realize they have unused money on their meal plan, resulting in an influx of students in March. PCFW is much lower during the summer months when there are considerably fewer students on campus. FS should explore increasing staffing during these months to lessen the burden on FS staff, and decrease the amount of PCFW generated.

While most of our findings aligned with the assumptions of FS staff, there were a few unexpected findings. We did not anticipate such a wide distribution of monthly GHG emissions, especially as seen in November and December of 2021. The spike witnessed in January 2021 was identified as a result of a quick and unpredictable increase in the number of students living on campus. FS mentioned that UBC increased the number of students living in first-year residences during this time after significantly reducing capacity due to the global COVID-19 pandemic. Suggestions for the spikes seen in November and December of 2021 were not provided. Further investigation on the cause of these spikes should be explored. Perhaps there was another change in the number of students frequenting these locations, or perhaps, these locations increased the amount of high GHG emitting foods during this time to provide holiday meals for students who could not return home.

Moreover, we were expecting the monthly food waste cost to have the same trend as the monthly GHG emission. The reason for this assumption was that both calculations are influenced by the amount of food waste in weight. However, we received an unexpected finding that Figures 1 and 2 didn't show the same trend. That could be caused by the inaccuracy of calculation in converting the weights of food into GHG emissions.

A key assumption made in the calculation is the weight for units of PCFW tabulated in the audit data. Some of the PCFW used arbitrary weighing units, which do not have a set weight for them (such as heads of lettuce and number of eggs). To address this, referencing various online sources to get weight (in kilograms) of

those arbitrary units was compiled into the calculation to obtain more accurate GWP factors. As we knew, the wasted food was disposed of altogether but not separated by the food categories as the data recorded. Therefore, the GHG emission calculation is based on the key ingredients of each type of food. And that could generate some inaccuracy.

Together, the data collected in this project provides a baseline for the amount of PCFW generated at OK. The costs and associated GHG emissions were quantified to help inform FS and UBC of the current PCFW climate in order to set more specific goals to reduce costs, mitigate GHG emissions, and avert climate change. Our efforts to identify existing practices to reduce PCFW inform what is already in effect to reduce waste, what can be improved, and what can be implemented. The recommendations suggested in the next section build the framework for UBC's Food Waste Recovery and Prevention Strategy (FWRPS), though we would like to suggest that FS incorporates recommendations from the LFS 450 "Promoting Campus Food Security through Food Recovery: An Evaluation of the UBC Food Recovery Pilot Program" project as part of this plan.

Areas for Future Research

Areas for future research should include further exploration into potential improvements in existing PCFW prevention strategies, as these were only identified by management, and were not validated or observed by other kitchen staff or the research group. Plate and post-consumer food waste should be investigated, as this has not been undertaken by the university yet, and has been identified as a key contributor to the generation of food waste on campus in our interviews. Exploration of other food waste data collection tools should also be considered due to the limitations encountered in our research.

The food waste data collection tools used in our project, OC and FIT both had their positives and negatives. OC has been used historically to document food waste at FS locations. Staff identified this tool as being more accurate when it comes to measuring what and how much is wasted. Additionally, food costs were already calculated within the tool, omitting guesswork required to calculate costs associated with waste from a tool like FIT that records more general categories of food waste. The calculation of the associated GHG emissions was cumbersome and required guesswork on behalf of the student team. More details of the assumptions made will be provided below. That being said, an excel sheet that can be used to make the required conversions from OC to calculate GHG emissions has now been made, and would simply require someone to input the data from OC in the

future. This would allow FS to receive more accurate data without having to pay for an additional tool or change current practices pertaining to measuring PCFW at FS locations.

FIT does have some benefits though. The tool populates waste into neat categories that allow for automatic GHG emission conversions and weight quantifications. A lingering concern though, is that the report our group received from FIT did not include the associated GHG emissions as promised. This could be due to a miscommunication, or an incomplete report. Accessing the report was noted to be a challenge by the staff member responsible for collecting this data. Regardless, an emissions conversion similar to the one we used to analyze OC's data could be adopted if this feature does not exist. Another advantage of FIT is that the user has to document the reason for the waste, whether it be plate waste, buffet waste, preparation waste, or spoilage. This categorization does not currently take place in OC's food waste reporting system. If FIT is to be abandoned, OC should be amended to include this categorization, as it provides valuable insight as to why the food is being composted. Additionally, FIT could be an extremely useful tool for measuring plate and post-consumer waste on campus and could be implemented in future research related to this topic.

A major consideration for the extrapolation of this research for future years is FS's upcoming transition to All-Access Dining (AAD). FS currently operates under a pay-per-item model, where there is a cost associated with each item students consume. In the upcoming fall semester, FS will transition to a swipe-based meal plan, where students pay a flat rate for consuming as much or as little as they want per meal. Food will still be delivered to students under the same model, where there is a mix of entrees, a la carte, and salad and sidebar options. This transition could have implications for the amount of both pre and post-consumed food waste generated at FS locations. Analysis of next year's data compared to this year should be analyzed with scrutiny to account for variations in the data. FS mentioned that we should expect to see an increase in waste at the beginning of this transition, but that once students realize that they can go back for as many extra helpings as they like, they will take less initially. Over the long term, FS anticipates that the amount of PCFW will decrease under this new model.

5. RECOMMENDATIONS

With the mentioned discussion, these are the recommendations that are the most important in actively reducing PCFW at UBC FS.

Incorporate GHG Calculations with OC and other Waste Reporting Tools

Moving forward, UBC FS can readily incorporate the food emissions database our research used there into future food waste tracking tools (either OC or FIT) to quickly and more accurately calculate total GHG emissions based on their ingredients' GWP. UBC FS already has a comprehensive list of ingredients for the dishes they'll prepare monthly, making GWP potentials for dishes easier to calculate. By calculating the GHG emissions of dishes and individual ingredients, UBC FS will have more information to plan their menus and better account for potential economic and environmental losses.

Incorporate Routine Staff Training on FWR

Currently, the FS and other UBC facilities would have their food waste composting at an outside facility using enzymes. UBC's C+CP can help explore reducing PCFW and establishing a circular food system on campus by prompting food waste to be composted locally at the UBC Farm and use the compost to grow foods. With $150,000 worth of food ordered from UBC Farm per term, incorporating compost directly from FS can incentivize the farm to readily provide more seasonal vegetables and plant-based foods to the FS outlets.

5.1 RECOMMENDATIONS FOR ACTION AND IMPLEMENTATION

For more detailed recommendations, they are separated as immediate (applicable within 6 months) and short-term (6 months to 1 year). These recommendations focus on direct action and implementation to actively reduce PCFW.

Immediate Recommendations

1) Determine whether to continue using FIT or amend OC to meet the needs for measuring PCFW

Two tools were utilized to draw PCFW conclusions for the purposes of this project. An evaluation of the pros and cons is explored in the discussion section above. FS should decide which model they would like to scale to other locations. Here are the recommended next steps for either path:

If FS decides to continue using FIT:

- Contact FIT to work out some kinks such as
    - Determining what data is and is not included in the report.
    - Adapting the technology to allow for reporting waste over the weekend retroactively.

- Discuss with OK FS staff to determine who will do the measurement, how many tablets are required at each location, how often will the measurements take place, and other hiccups encountered during this project.

If FS decides to amend OC:

- Discuss a strategy to include a category for the reason associated with the food waste.
- Assign staff to undertake monthly GHG emission conversions in the excel document provided by our research team.

Regardless of the strategy FS adopts, a decision needs to be made quickly in order to allow for the scalability of the PCFW measurement to other FS locations so that they can begin their own PCFW audits under a standardized model.

2) Set the maximum threshold (or baseline) for acceptable monthly PCFW

Our research quantified monthly costs associated with PCFW and identified seasonal trends among months that resulted in more or less waste being generated. A discussion of these trends can be found in the discussion section above. As FS has identified that there are currently no expectations regarding the quantity of food waste, this is an essential first step in preventing and reducing PCFW generation. Data from this study should be utilized to inform what is historically recorded each month, and set targets with the seasonality trends in mind.

Short Term Recommendations

1) Implement routine FW training and data sharing

FS staff identified in our interviews that staff training on food waste reduction takes place in onboard training. Implementing routine training and discussions regarding best practices for reducing food waste should be incorporated into staff meetings. This training could be themed from suggestions found within the literature. For example, knife skills were cited as a means to avoid waste generation in kitchens (Lefadola et al., 2018; Papargyropoulou et al., 2019; Priefer et al., 2016; Smart & Moreira, 2021). Incorporating themes such as this in an engaging way will motivate staff to reduce food waste. A key client in this project also mentioned that discussion

surrounding the environmental impact of food waste could motivate staff to change their behaviour, and that data sharing could also be a powerful way to engage staff in food waste prevention. Considerations for data sharing methods should be explored, as staff could be discouraged to report waste if they are aiming to meet targets. Perhaps the targets set could be used to guide staff training, and the exact progress could be tracked for management purposes only since accurate waste reporting is essential to track progress. Employing a variety of waste reduction training sessions can help UBC FS take practical steps to reduce PCFW.

2) Explore alternatives to buffet-style serving

According to the FIT data, 92.7% of food waste came from buffets. As such, we would like to suggest that FS explores other alternatives to these serving stations. However, OK representatives noted that they don't want to remove buffets entirely, as they believe it provides more choices for students to eat what they want. Additionally, these buffets free up FS staff to accomplish other tasks throughout the kitchen. They also noted that despite the high percentage of food waste coming from buffets, it is important to recognize how much food waste from OK is produced in the first place. This is where the maximum threshold (or baseline) of food waste is necessary to justify ideas for experimentation in buffet sizes and ensure student demands are being met.

3) Amend meal plans to incorporate a more plant-forward menu

Given that meat products made up nearly 50% of all the GHG emissions, FS should continue to adopt a more plant-forward menu. This will be essential to meet the maximum thresholds of acceptable PCFW and its GHG emissions that we suggest FS sets. With UBC's CAP 2030 approaching fast, more plant-based options can readily reduce UBC's GHG emissions associated with food activities. With more research in the recommended areas to build on our findings, these recommendations can further be justified.

5.2 RECOMMENDATIONS FOR FUTURE RESEARCH

With these long-term recommendations (1 year and beyond), there are areas to further look into to inform FWR initiatives moving forward and ensure UBC meets their CAP 2030 goals.

Long Term Recommendations

1) Explore recovery of salad and sidebar food waste through food donations present and provide liability infrastructure

One way to reduce food waste is through recovery and ensuring it's not thrown out. In doing so, UBC FS can look to establish the framework in making food recovery methods (such as donating them to charities) by providing liability waivers and other ideas that may be formed. Looking at fellow educational institutions may be a good start in identifying practical steps in making this a reality. We would like to encourage FS to look into the recommendations made by our colleagues in the LFS 450 "Promoting Campus Food Security through Food Recovery: An Evaluation of the UBC Food Recovery Pilot Program" project.

2) Explore plate and post-consumer food waste

With our research, PCFW and food discarded prior to serving are the primary focus. Future research can look into the plate and post-consumer food waste more as a way to complement UBC FS's sustainability initiatives. This is where more research can be done to explore the habits the UBC community has in consuming food. It's one thing to understand how much food waste can be prevented by the kitchen staff, it's another to understand why food waste is occurring from the consumers' end. Both types of research are equally valuable to address FWR strategies through a systems-thinking lens.

3) Explore innovative alternatives to composting

At present, any food that can not be reused or recovered is sent to the campus's composter. This is one innovation that sets UBC apart from other institutions in its sustainability initiatives, but more could be done. The volume of food sent to this composter is enormous, and the soil produced does not make its way back into UBC's food system, as the farm cannot use the soil since the food composted is not all organic waste. Innovative solutions to this amount of waste should be explored. In our literature review, a series of innovative uses for food waste were explored, including the conversion of waste into edible food packaging that biodegrades when it makes contact with water (Martin-Rios et al., 2018). Exploring innovative uses such as these, and others explored in the Martin-Rios et al. study could breathe new life into some foods that make it all the way through the food system without

ever being consumed. UBC should explore research in this area, and provide funding for students engaged in these research projects.

6. CONCLUSION

To conclude, UBC FS has done great work in reducing food waste prior to our investigation. By being flexible in ordering ingredients, managing inventory and looking at various data (sales and costs), OK has been effective in reducing PCFW. However, there are opportunities to help OK and UBC FS take more proactive steps in reducing PCFW. In recognizing that there is an apparent disparity between the food costs for OK on an economic and environmental understanding on a monthly basis, our research concludes that having an established threshold for acceptable food waste is imperative to help achieve UBC's CAP 2030 goals. Incorporating GHG emissions into the threshold, as well as routine staff training to reduce PCFW is a great start to further bring this conversation on the environmental impacts of food to relevant stakeholders and spark the necessary change to prompt a more efficient and sustainable food system on campus.

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APPENDICES

Appendix 1: Interview Outline or Script for Food Services

Outline/Script for Interview

Main Interview Audience

- Open Kitchen

Explain purpose of Interview

- Learn more about Food Intel Tech (food waste audit tool) and what type of information it provides for reducing PCFW

Address terms of confidentiality

- Information will be recorded by one team member throughout the focus group

Explain the format of the interview

a. Introductions (develop rapport)
    i. Include the roles each member has (and the stakeholder they represent)
b. Ice-breaker
    i. Talk about the following topics:
        1. Favorite food dish
c. Core questions (questions listed below)
    i. What has been implemented so far to prevent food waste at Open Kitchen?
        1. What methods have been utilized in reducing current levels of food waste within Open Kitchen?
    ii. Are there any current ideas the Food Services team has to reduce food waste?
    iii. What kind of food What food ingredient or dish most frequently gets thrown out (bread, meat, vegetables?)
        1. What top factors do you think are contributing to the food waste at Open Kitchen?
        2. Has COVID impacted the amount of food waste generated? How so?
        3. X Do you think there is any inventory surplus, improper storage and handling, or have you noticed lots of food prepared but not served to guests?
    iv. Are there any food waste strategies being used in other UBC food services locations that are not implemented in Open Kitchen?
    v. Is there any data collection on what students prefer, or how many students come in during a mealtime?
    vi. How often do you order food items for Open Kitchen (frequency)? Are different food item types ordered on different cycles?
    vii. What types of information is being collected from food intel tech?

1. How quickly does Food Intel Tech generate data for Open Kitchen?
2. How does this measurement impact regular kitchen activities

viii. What are your expected outcomes in collecting food waste information?

ix. What additional information would you like to see in the cost benefit analysis?

d. Additional comments

i. Open up room for further comments

e. Closing/Wrap-up

i. Open up follow-up opportunities (and additional efforts)

Indicate how long the interview takes

- 30-40 minutes

Tell them how to get in touch (if they want to)

Ask them if they have any questions before starting

Appendix 2: Interview Transcript with Key UBC Food Services Staff

Monday, March 7th

Reporting logs:

done for years, track food ordered

Try to limit (food waste) **at source**
Analyze and inform production and **purchasing reports**: didn't look at waste / mo/yr/climate impact
Chef's focused on reducing food waste bc of fiscal reasons - **can't afford to buy food and not be selling it**
"What gets measured gets done"

Partnering with Intel Tech: will tech yield better results/better information
Working with Rowan and his team to **reduce GHG emissions** (attach a number to food waste)- an interesting process to go through that

LeanPath vs. Intel
LeanPath was originally used, Intel Tech - not a friendly use system?
Never used LeanPath - Thought about using it 5 years ago (Used at UBC Hospital) - **great tool but very expensive, chose not to use it, stick with in house pen and paper methods**.
Food Intel is the first technology tool they've partnered with

Current ideas from staff to reduce food waste:

No new ideas - **learning from what the tech solution could hopefully evolve** into could be the next solution - no **new ideas or processes that they're going to implement**. Food recovery is an aspect of food waste strategy- **parallel seeds project** (Vancouver food runners and sprouts on campus). The more that we can recover is better than composting it and reporting it. Switch to all access dining next year - interesting relationship and potential food waste reduction

Team meetings: **Do you talk about food waste in team meeting** about what food/dish is wasted the most

They do. 2 dif aspects: **Food waste with chefs** (high level) - **focus on procedures that we are using**, accurate recording of the food waste, ordering and production levels, trying to get that right. **W/ front line workers/cooks in kitchen**- the ones producing/prepping food. A **lot of time spent at the start of the year and whenever they have time** - knife skills, **utilize as much of the product as possible**. They are the best resource at the end of the night to see what's wasted - conversations about what is wasted (particular items thrown out each night) bc they are the ones who see it. This info shows up at the food waste logs. **Sometimes they think it's better to waste it and not report it so that they think that there won't be waste**. Management has conversations to highlight that waste is more important to be reported than not

Grains are most wasted: take a long time to cook - hard to turn around and make more if you run out (rice for examples). Also the cheapest ingredients, less of a waste concern (more proteins), carbohydrates/grains wasted more because cheaper

Covid impact

Wasted less food bc less operations, but **not necessarily / person**
Waste is probably higher per person at full operation because ….
Chefs/staff know what to prepare for full operations - when scaling back to account for less people, have to make new plans for less people
Numbers by weight down, but per person kinda up

Inventory surplus/improper storage handling from cooks/chefs, or food prepared but never served? **Buffet style (salad bar**/

Storage: inventory each month, **things don't sit around unnoticed for that long**
Work hard to bring down inventories, don't carry a large inventory of things
Sometimes overorder and have an abundance, there are so many locations across campus and chefs talk to each other, redistribute the abundance to other locations

Monthly inventory checks: Are those frequent enough? Do things expire? Or is one month sufficient:
I don't think it's necessary. **We get delivery six days a week**, they **probably right size the surplus in two days**. **Product moves quite quickly**. Additionally inventory accounts probably not helpful. **Production likely a larger concern than inventory**

Food waste strategies at other locations at UBC not at OK?
No - all one team, have the same strategies

Data collection on when students come during meal time,
Sales figures attached to locations - **business at each location on any given day that is collected from historical sales**.

Excited in **September, want to try new foods**, then slows down as students have exams/get tired of things

March = busy bc no breaks and no exams, also **students realize they have a surplus of money on their plans**

April slower bc classes end and exams start

Food Intel: what's being collected specifically:

Doesn't categorize foods in as many different buckets as they would like. In house pen and paper does a better job of breaking up things on pen and paper. **Asking rowan if the info from food intel is more helpful for climate change**
If not, ask if food intel can expand the categories, or just use pen and paper method

End outcomes for getting food waste info:
Reduce in the first place. Learn from the process: better ordering/production plans. Second goal, info that can be used from a climate lens, **Rowan's team can attach GHG emissions target/number**. FS knows what it means for dollars lost, but not the climate impact. With baseline, we can set targets from year over year.

Cost benefit analysis:
Any info that they are looking for in our cost benefit analysis?
No answer right now. **We already know what it costs us, we know what we paid for and what we wasted**.
What we don't know is the GHG emissions lens, **also never recorded month over month/added over a yearly basis**: Understand how much food waste costs per year and year over year.

Reporting logs: done for years, track food ordered
Try to limit at source
Analyze and inform production and purchasing reports: didn't look at waste / mo/yr/climate impact
Chef's focused on reducing food waste bc of fiscal reasons - can't afford to buy food and not be selling it
"What gets measured gets done"
Partnering with Intel Tech: will tech yield better results/better information
Working with Rowan and his team to reduce GHG emissions (attach a number to food waste)- an interesting

process to go through that

LeanPath vs. Intel
LeanPath was originally used, Intel Tech - not a friendly use system?
Never used LeanPath - Thought about using it 5 years ago (Used at UBC Hospital) - great tool but very expensive, chose not to use it, stick with in house pen and paper methods.
Food Intel is the first technology tool they've partnered with

Current ideas from staff to reduce food waste:
No new ideas - learning from what the tech solution could hopefully evolve into could be the next solution - no new ideas or processes that they're going to implement. Food recovery is an aspect of food waste strategy- parallel seeds project (Vancouver food runners and sprouts on campus). The more that we can recover is better than composting it and reporting it. Switch to all access dining next year - interesting relationship and potential food waste reduction

Team meetings: Do you talk about food waste in team meeting about what food/dish is wasted the most
They do 2 different aspects: Food waste with chefs (high level) - focus on procedures that we are using, accurate recording of the food waste, ordering and production levels, trying to get that right. W/ front line workers/cooks in kitchen- the ones producing/prepping food. A lot of time spent at the start of the year and whenever they have time - knife skills, utilize as much of the product as possible. They are the best resource at the end of the night to see what's wasted - conversations about what is wasted (particular items thrown out each night) bc they are the ones who see it. THis info shows up at the food waste logs. Sometimes they think it's better to waste it and not report it so that they think that there won't be waste. Management has conversations to highlight that waste is more important to be reported than not

Grains are most wasted: take a long time to cook - hard to turn around and make more if you run out (rice for examples). Also the cheapest ingredients, less of a waste concern (more proteins and ___), carbohydrates/grains wasted more because cheaper

Covid impact
Wasted less food bc less operations, but not necessarily / person
Waste is probably higher per person at full operation because ….
Chefs/staff know what to prepare for full operations - when scaling back to account for less people, have to make new plans for less people
Numbers by weight down, but per person kinda up

Inventory surplus/improper storage handling from cooks/chefs, or food prepared but never served? Buffet style (salad bar/
Storage: inventory each month, things don't sit around unnoticed for that long
Work hard to bring down inventories, don't carry a large inventory of things
Sometimes overorder and have an abundance, there are so many locations across campus and chefs talk to each other, redistribute the abundance to other locations

Monthly inventory checks: Are those frequent enough? Do things expire? Or is one month sufficient:
I don't think it's necessary. We get delivery six days a week, they probably right size the surplus in two days. Product moves quite quickly. ADditionally inventory accounts probably not helpful. Production likely a larger concern than inventory

Food waste strategies at other locations at UBC not at OK?
No - all one team, have the same strategies

Data collection on when students come during meal time,
Sales figures attached to locations - business at each location on any given day that is collected from historical sales. Excited in SEptember, want to try new foods, then slows down as students have exams/get tired of things

March = busy bc no breaks and no exams, also students realize they have a surplus of money on their plans
April slower bc classes end and exams start

Food Intel: what's being collected specifically:
Doesn't categorize foods in as many different buckets as they would like. In house pen and paper does a better job of breaking up things on pen and paper. Asking rowan if the info from food intel is more helpful for climate change
If not, ask if food intel can expand the categories, or just use pen and paper method

End outcomes for getting food waste info:
Reduce in the first place. Learn from the process: better ordering/production plans. Second goal, info that can be used from a climate lens, Rowan's team can attach GHG emissions target/number. FS knows what it means for dollars lost, but not the climate impact. With baseline, we can set targets from year over year.

Cost benefit analysis:
Any info that they are looking for in our cost benefit analysis?
No answer right now. We already know what it costs us, we know what we paid for and what we wasted. What we don't know is the GHG emissions lens, also never recorded month over month/added over a yearly basis: Understand how much food waste costs per year and year over year.

Try to push for food waste prevention practices but some staff are neglecting the significance of it but some also see value in that

Thursday, March 10th
T=Team
D=Representative with Food Services

T = Awesome. So, thank you again, so much for meeting with us today. So we're just gonna go through. I mean, you know, a little bit about the project already.
So right now we've just been kind of **conducting interviews and we met with (FS key staff) earlier this week and it kind of had a bit of a challenge** and we'll be meeting with UBC FS Key Staff and UBC FS Key Staff.

T = Yeah. And the next week or so. So yeah. So kind of the **purpose of today is just to get more of an idea about food waste** and **what's already being implemented and Open Kitchen to prevent the food waste from happening**. There may be hopefully like, identify some areas that could be tweaked or improved on or changed in the future to inform the food, waste recovery and prevention strategy developing.

T = So, yeah, that's kind of the main goal today. So our first question is just in general, **what have you guys kind of been doing to prevent food waste already at Open Kitchen?**

D = To prevent food waste while I guess generally in kitchens. That's an **important aspect of our job as chefs and so a lot of it is looking at sales data**, looking at how much of a product we sell.

D = So then you know how much to order (and) how much to prep. So lots of production sheets. You know we have a system that can tell me all the sales information so I use that. **So I use as much data as I can to know how much we're selling, how much to order and how much to prep.**

So we're not under prepping, we're not over prepping, we always try to find that balance and kind of look at it every week and adjust it.

T = Awesome, that sounds great. Yeah, that seems like, you know, it seems like you guys have already been doing a lot to prevent food waste.

D = So, yeah, and food waste like you say. I mean, even though we're a part of this project, it's something that, like **all chefs, you kind of learn that, yeah, you can't, you'll never survive financially.** If you're throwing away, food is already super thin so if you're throwing away food, right?

T = Yeah. Your business is not gonna make it and I guess kind of a follow up to that is, do you feel like management has been (in prioritizing to reduce food waste)? Also, like (how has) this management taken steps as well (in) mitigating food waste like, at like a higher up level.
Would you say? Or I'm trying to think of how that would look off the top of my head.

D = I can't say without an example. I'm sure I don't think like, like staff training or well, that would kind of fall back on us from a chef level, okay? We're the ones that would train, okay. Because I mean that would be part of us getting our employment here is that we would already have a handle on that and then it would trickle down.

D = So **they're gonna assume that if we've run kitchens that we already know how to mitigate waste** and how to minimize it. And then we train down (to the line cook level) from there.

T = Sure that makes sense. Also, I've been quickly asked why. Also the case, when you're, when you're just ordering the food ingredients does that like, kind of happen at the kitchen level?

D = Yeah, so absolutely. It starts with planning. Planning using data ordering prepping.

T = So if I mess just, oh, what management order activities would revolve around managing a kitchen, just because I've because I feel a little bit confused on that. For (ourselves), I mean, is it management's decision (to manage orders) or just (yours in) see(ing) how much to order at that level, and what (management) would be doing to manage.

D = I mean, the only thing (management) would be doing off the top of my head is if he notices big spikes in. So if profits are low, then they're going to start exploring why profits are low. Our sales are low, you know, if food waste is high, then it would kind of come down from there, but, yeah, that and my time here has never been where we had directives from above.

D = It's kind of our responsibility. So UBC FS Key Staff, UBC FS Key Staff and myself, that's part of our (responsibility in managing waste). That gives us, I think, more clarity. Yeah.

T = None of us really have a background. I mean something from UBC FS Key Staff he's gonna definitely be seeing bigger pictures and that, and that's more operational.

D = So if it's really skewed. Yeah, we'll hear from him, but okay, but generally we managed that.

T = Yeah, awesome. All right. Well then **our next question is, are there any ideas** that have kind of been **floating throughout like any food services like your team or management** or anywhere recently been suggested to (reduce food waste)?

D = Reduce food waste. No, not necessarily (as we're) testing this new app (Food Intel Tech). We already do have a system in place so we use a program. I'm sure UBC FS Key Staff talked to you about optimal control so we always call it **OC**. Okay? And **OC encompasses the entire path, the entire lifespan of a food item in a kitchen**.

So what I say is that, I mean, when we purchase it, it goes into OC, okay? **All our recipes are in OC**. **When they go through the point of sale, that's tied to OC**. So we ordered chicken. It's in OC we build recipes based on chicken. So one plate has 140 grams of chicken.

D = Okay. And then every time they ring it through it deducts it off of our inventory. So and then if we waste, if there's chicken that goes rotten, if it's dropped, if it doesn't sell, and we can't do anything with it, we have to enter that into OC. So we already have a component of OC where it's waste, okay?

D = And then theoretically, **then at the end of every month**, **we look at a report that shows anything that's got huge, differentials of what inventory should be and what it actually is**. And then we look at well, where did it go and what happened to it. So that's kind of something that we use, but, and that's a pretty good tool.

T = Okay, already. Yeah. The existing one is to minimize, and then in a kitchen, in any kitchen, there's a certain amount of waste is inevitable. Sure. It's about minimizing, but once food has been out available to the public. **So anything kind of buffet style that becomes waste, right? There's nothing for health reasons.**

D = You can't. You can't recoup that food anyway, right.

T = Are there food safety requirements that require you to turn over the buffets at a certain point?

D = Or yeah there are definitely Vancouver Coastal Health requirements. I mean, the food is on ice or so, it's got to be there hot or cold.

D = It can't be in the middle and it's not so much as long as it's hot. Theoretically, you know, you have a long life but it's just the quality of food diminishes. So for us that's more based on quality as why we've turned food over here. But as long as it stays cold, I mean, theoretically a salad bar if it's cold and it's below 40 degrees, then it could stay there.

D = It's no different than it's sitting in your refrigerator, right. It is still safe, Okay? And, bacteria is not growing on it. So it's the same as hot, right? Bacteria can't grow on it over 40, then, then it's fine, right?
But the quality of food diminishes. So that makes sense. So those are factors more so than I mean, of course our guidelines from Vancouver Coastal Health (regulations) that we follow.

D = Yeah. For us, we go through just a huge amount of food, right? So it also isn't really a problem, right? Yeah. A lot of students come through a lot of students all the time. It's not like a restaurant where you don't know who's coming every day.

T = Yeah, that makes sense. We do know who's coming every day. Pretty much. So, yeah, I feel like most of the literature we found is, like, on buffets and restaurants, not so much university, right?

D = It's very different where it is different. Every single day's a new day.

D = You don't know whereas us, **we can track ourselves and we know Sundays are gonna generally be this busy**. So once again, it goes back to getting all the data that we have available to us and using that data to decide how much food to prepare every day.

T = Sure. Yeah. Okay. So then I guess our next question is, what kind of foods are ingredients? Do you find are the things that are most often thrown out?

D = Yeah. So it's definitely the salad bar. And what we call our side bar. So that's vegetables, Starch: rice, potatoes, those kinds of things.

D = So that's the highest. And **then a lot of packaged, third party foods that we sell because once they, once they're past their best before date, then we don't sell them**. So that counts for a lot. When I look at the daily waste, that's where a huge part is because rice and vegetables like from a dollar bill aren't very high.

T = Okay. But those packaged items are very high, sure. Yeah, that makes sense. Have you ever p**layed around with container sizes like the salad bar** and the side dishes?

D = So for instance, the parfait bar obviously is very busy in the morning. So we use larger containers.
And then as the day goes on, we want to. **We always want to look plentiful**. Sure. So we start downsizing things. Okay, and we throughout the day, that's what we'll do. We won't keep filling a giant container. We'll start bringing it to a small container and filling that smaller container.

D = **So once again just to try to minimize (food waste), it still needs to be there until the end of the night. But of course, but as long as it's available, there is food there, okay? And it still looks plentiful even though we just started using smaller containers.**

T = Yeah, awesome. That's good to know and how has **COVID impacted the amount of waste generated**?

D = I **haven't noticed**. I can't say I've noticed a difference once again **if you use the data** that you have. I know **sales are lower** and **you start ordering less**, **you start prepping less**

So it's really for me about using a lot of data, right? And so it hasn't, I wouldn't say. **I mean, if anything, you also when things get slower**, I **find you have more time to focus**.

D = And so, I would say there's probably a little bit more waste. When it's busier, when we slowed down last year, when only Open Kitchen was open and Totem Park's (canteen) was closed, then **it was a bit even easier to manage**. Okay. Yeah. Because it was slower.

T = Interesting. Yeah. All right. And then, do you think, like inventory surplus, or improper storage and handling contribute to food waste?

D = Absolutely. Yeah. So you need good people as a chef, I always said that. So the walk-in fridges are walk-in, fridges, **like we have one for vegetables**. We have one for prep items.

D = **We have one for meat**. I always call them the **bank vault**, so as long as I've been a chef, it's the bank vault. It's like a lot of your money is there and I walk through them two, three times a day. So I'm always walking through them so that I can react to things.

D = **If I see something, it's been sitting there**, I kind of like, okay, **somebody needs to deal with this**. We need to do something with this, so that's kind of how to minimize this is just (by) being in your kitchen.

T = And it says, so then, would you say that vigilance prevents it all together? Or would you say that even still?

D = Like, sometimes things get tossed. Yeah, but it definitely, it definitely **minimizes and then it's, it's it's staff training**. So using **making sure things are rotated**. So for instance, we have a receiver that receives all our orders. And you know, they have to be very diligent and (detail oriented).

T = So everything has to get rotated no matter what it is, right?

D = Yes. It could be a dry storage item. It's kind of that mindset of these are in cans, so it doesn't really matter if I put the newest one on top of the oldest one, but you can't have that mindset.

D = It's like everything has to be like, pull those out. Put that newest one at the bottom, put them on top. It's like always **first in first out** and then that helps okay.

T = Yeah, awesome. Great. And then is there usually a lot of food that's prepared and then not served?

D = All right. I'm trying to think of an example of when that might happen, you know, and **then it's about**

repurposing or freezing. So we **use sous vide or cryovac bags**. So I'm not too sure if you're familiar but **basically we have a vacuum machin**e. So things go into a food safe bag, you put it in the machine, **it takes all the oxygen out of the bag and then it seals it**.

D = So that extends the shelf life **because oxygen is one of the reasons that food breaks down**. And so, if you remove oxygen from the equation, you buy yourself a lot of time. And then you can also put it in the freezer from there or in the fridge, and you buy yourself more time, okay?

D = Without it affecting quality too much because if there's oxygen inside the bag, then that's when you get freezer burn and these kinds of things. But if you've removed all of the oxygen, it can last a lot longer. **So we use a lot of that to preserve food to store food.**

D = Say, if it's coming back on the menu next week.
So one of our stations has each dish on the menu one day of the week. **So yesterday, butter chicken, and then it won't come up again until next Wednesday**. Okay. So if we have extra butter, chicken chicken, we're going to freeze it.

Okay? We're gonna put it in bags and **we're gonna freeze it and then we'll use it first next week**. Pull it out, defrosted, etc. Yeah, so that's a tool that we have. That really helps minimize how you carry over food from week to week?

T= If we may just like quickly fall up with that: Do you also use vacuum bags, the sous vide method for vegetables as well? Like I know you can do it more readily with meats like to store them.

D = Yeah. They help store them like if they're cooked just kind of, yeah, then if they're cooked.

D = So we have a salad bar so as long as it hasn't been out in public things cooked, t**hen maybe you can use it to make a salad with it or you can make a soup** with it or you can use it in another dish.

S = Right. So it's **about the versatility of those ingredients and knowing what to do with them**. Like, okay. It was on the menu today. But now what are we gonna do with this left over, right? Do you have any limitations with storing extra foods?

D = Like the **inventory situation is like space limitations**. Not no, not in, not really in these three kitchens like in the three residents. And then once again that comes from the staff. So it's about that, and **maybe you run a special**, right? So let's say you have an item, **it's no longer in the menu because our menu changes very frequently.**

D = So most of the stations are safe, vegetarian station and the global (foods) station, those are good examples like vegetarian station has four dishes, okay? And, and it's cascading, okay. So items on the menu for three weeks after three weeks. **So every week one item leaves a new item comes on and then that's on for three weeks**

D = So then **if you have left over, then you can always run it as a special or we can carry it over for one or two more days**. So it's it's same thing. It's as if the menu items are coming to the end of their time. Like let our menu switch on Tuesdays.

D = So let's say we have a little bit lapped so we'll sell it again on Wednesday. Okay. Till we run it out. Okay. And then bring in the new item for instance. So there are lots of ways of kind of and we would know Friday. Oh that

many items coming off the menu on Tuesday.

D = So stop prepping it. And we'll run out the inventory of it that we have, okay? **Even if we run out on Sunday night or Monday morning, and we don't have it for the rest of that day**. At least we've run out of it. So it's always that, that balance.

T = Sure. Yeah. And does the menu planning, responsibilities fall to you or the management? Is it?

D = Yes.

T = So the three chefs right there, their menus, and for the whole year? Okay. Yeah, awesome. And do you like one year doing that? **Like what kind of considerations do you include any more for food waste or general?**

D = Yeah. So many considerations. I mean: Is it seasonally appropriate? **Variety is important**. So even for variety, so, like, square is the station where it's a different menu every day of the week. Okay, that repeats. Okay. So Wednesday, says butter chicken. So, I don't want to have four more chicken dishes, right?

D = I want to have a beef dish. I want to have a pork dish. I want to have, you know, a fish dish. So there's that consideration as well, **flavors**? Right? Maybe I don't want to have five Indian dishes in a week. Make sure right? I want to have a variety of **cuisines** and so yeah.

D = Definitely kind of all of those considerations. Sure. And I guess I would assume then you probably also balanced the remaining ingredients that you might have in the meal planning. Yeah. And, and then we talk a lot about cross utilization. So you don't, you want to minimize, how many ingredients you're bringing into your kitchen?

D = Ingredients that are only used in one dish (leads to) food waste can happen, okay? So if you, I use the example, if you have a pepper or a mushroom sauce for a steak, just as an example, and people don't order that dish. **Well, now you have these mushrooms sitting in the fridge, slowly getting worse**. But if you have a mushroom soup, if you have it on a few stations, then note that food always is, is moving.

D = **So you try to use the ingredients in as many dishes as possible, so it's always fresh, always turning ove**r. Okay. Yeah.

T = And that, sorry I'm going on. I have a list of questions that I just have so many follow-ups for what you say. So another consideration related to greenhouse gas emissions and meal planning that we've come across is obviously resorting more to plant base.

D = Obviously you also have to balance people's food preferences.

T = What extent do you think, on our behalf, that Open Kitchen has more plant-based foods? Like, how effective do you think that would be or practical? Do you think that would be necessarily practical and what's practical for who I guess for?

D = **Because at the end of the day, it's gonna get wasted if the consumers don't (like the food)** I see what you're saying. So. Yeah, I guess it's, it's a slow judge. Sure. Okay, and I mean, we have a dish that's on the menu all the time, on vegetation, the **southwest bowl**, okay?

D = Okay, so it happens to be vegan. We don't advertise it as vegan. We don't promote it as the vegan southwestish. **It's a very tasty dish that happens to be okay**. So I guess when you're, when you're creating these dishes, **like that's the ultimate goal**, is that it's just a very good tasting dish and it just happens to be vegan, okay?

D = But it is, it is something that is important to us here with our food visions and values, is that we are planned forward. We do have plenty of vegan options. We use very little beef because of how significant the environmental mental impact is of beef. So you don't see a lot of beef on the menu.

D = You know, we use **ocean wise fish so those are all also considerations when menu planning like and then we have costs that we need to reach as wel**l. So that's a factor when we're planning. Menus are OC. When you build a recipe you build it eventually you have to build it for one plate.

T = Okay, what you would get and what is the cost of that plate to buy those ingredients. And what do we sell it for? Okay, and it tells you what your food costs will be.

D = We have a range that we try to be in. Mmm, okay. And then if you're not in that range, then you have to look at the recipe.

D = You have to be like it does. The portion needs to be smaller? Do I have to cut back on this? Do I need to change something? If I really want to serve this dish, then we need to look at it well. Where are the expensive components and how can I change that?

T = Okay, so okay, you're definitely a tested Southwest bowl. One of the better ones was at least my favorite fish because I used to live at Orchard Commons. My first year and I would usually just go there just because I really like it. So that's really good.

T = Okay, let me get back to our list here, are there any food waste strategies that are maybe implemented at other food services locations? Like is there variation kind of between the different locations or would you say it's no, it would, it would all be the same, okay, like you mean here on for UBC food services?

D = Yeah, **I guess like resident dining**. Yeah, I know. I think that's all. **We use the same strategies.**

T = The same technology, etc?
D = Yeah.

T = Awesome. And then, you've already mentioned this. I'm we, we found some recommendations like, a booking system, or like a student, like a forecasting system to see what demand looks like at different times of day, but if you already have all that sales data, are there other sources of data you look at?

D = We and we have that too. **Yeah, so we know we can look at our sales of any station of any dish, every hour of the day**. So, but for us, it's, it's **more because of the volume**, we more. Look at it, like, how many we sell in a day or so, you know, going back to the Southwest Bowl like one of the big components is the, it's called sweet potato.

D = Hash, that's a bunch of diced vegetables with spices, etc. So, you know, we make so much of that. So it's, it's about like the patterns that you see in your ordering, right? You know, like, I need to bring in a lot of vegetables,

this many times a week, because this is how much we make.

T = And so you as a chef, you see those patterns, right? And that's, that's it's like, you know, these are my order sheets, right? And it, and it's like, how many do we have on hand? So we used par levels, okay? Right.

D = And that's what tells you how much to order, okay. And you're always every week adjusting the cars, okay? Because maybe ham is on the sandwich, but right now, it's also on the breakfast dish. **So, so there's like, all these factors, as long as you're on top of all those factors**, then, you know, oh, I need to increase my part this week.

D = Oh, I can lower. The **food inventory is really important for this balance of not running out and not because inventories money**. So of not having too much in the fridge, right? **Where you risk the chance of mishandling or miss rotating or it doesn't sell or so.**

T = And then, what could you tell us a little bit more about **how ordering food works**? Like, how often does it?

D = It occurs about five times. So, most orders come from Monday to Friday. Okay, **95% of the food comes from Monday to Friday**. Okay, so some items we order every day.

Okay, we order. Yeah, we order it to arrive from Monday to Friday, basically. Okay. And once again, my philosophy personally is, if I have that many orders, then **I'd rather have a bunch of small orders. I don't need to order, 120, kgs of chicken Monday**, that I know I'll use up till Friday.

D = Why wouldn't I just order like 40 40? **Just spread it out, right**? So it's fresh, it's rotated like all of those things. So that's another, you know, like kind of balancing inventory, finding that sweet spot. Once again, you don't want to run out but you also don't need to have so much in your inventory if you can just order it every day.

T = And then, so I guess next, the next section we kind of have questions about are about the food intel tech (FIT). Sure. So I don't know if you want to be kind of just generally about how it's going for.

D = Yeah, I think it's not working. Okay, **for me personally**. Okay, so I'm the only one testing it, right, and the reason for it is that I already have this system in place, right? **Okay. So it is, and it's a huge operation, so the cooks if something happens, they already have a sheet on their station that they record it.**

D = Okay? **At the end of most nights, one of my first cooks. So basically, like my right hands, they take it in.** They enter it into OC, okay? So we already have a really well established system that everybody on staff is used to and it's also incredibly specific. So if you drop a burger, if it gets burned, you know, they can record one bun and we can put that into OC here. If it's a big, 20kgs of chicken that got rancid, we can put it.

So I would rather have more information than less information. If you have more information, you can still simplify that information, but if you have simplified information, you can't expand on it, right? So for me, OC is very detailed **whereas the food intel is very general. It's just wait, if I drop a burger bun, like am I going to record**?

D = Ah, you know, a 60 gram bun there. I don't know if I'm going to and we're talking about all these kgs of food. Waste sure. **They might not even know what it weighs as a busy cook. Going to weigh that bun, right? Probably not right, but if they can just write on the sheet one bun, right?**

D = That's easy. Sure. And they can do that from all those places right now. I mean, we have one device, I'm the one doing it because it's the test. Yeah. So that's my kind of initial. And then there's just some aspects of the program that I'm not too sure about.

D = And I'm not, I don't know it 100%, but it's hard on our system and OC, I can go back to two weeks. If I find a sheet that I got missed, I can go back to weeks and enter all that. Okay. And with the app I haven't quite figured out if I can even do that.

T = Okay interesting, yeah. So it's kind of like you have to do it every day.

D = Sure. Yeah. **I mean it does have some good features as far as it breaks down breakfast, lunch and dinner**. Okay I'm not sure how important at the end of the day that really is right?

D = Especially in an operation this big, sure. **Ultimately you just want to see the total like how much did we waste this month compared to last month** or this month compared to February of last year? Those kinds of comparisons as those two like how much at breakfast, how much at lunch? How much at dinner? But, yeah, I guess it depends. Could you speak to why, why they chose food until tech then? Like, were you consulted on the decision making? I was a part of it, a little bit with UBC FS Key Staff and it was because it was a trial. I know that I forgot the name of another, more popular app (lean path).

D = Yeah. Okay, so it was very cost prohibitive, sure. So it was very expensive. Yeah, that's all I really knew about it was fit, was, was much more affordable. Okay. Especially as a pilot to pass. Because ultimately if you don't think you're going to save more than a lean path is costing.

D = Why do I spend more money on an app? Then you're throwing away food. Sure. Yeah. Okay. So but that's that, that's just in my I'm not saying that's the only reason but that that's ultimately why we chose to to test sure using a different program.

T = Sure that makes sense. And like do you think there's things from I guess? We don't really know exactly what information it is collecting. So do you think OC would be able to accomplish the same data analysis? Yeah, okay so okay that's good to know.

D = Yeah and I mean it would be more. It's not going to be about weight necessarily. I'm a percent in OC, okay, but it's gonna be about dollars. I don't know, maybe it's more important. Sure. I mean, really when you're talking about wasting food, like why are we measuring it, right? So it is it is it I think it's that you ultimately want to know how much money right?

D = You're throwing away, right? Not necessarily. Once again, I can throw a hundred kgs of rice away which isn't really that much money, right? I don't want to but I'm just saying, hundred kgs of chicken. That's a lot of honey. So I want to know, not so much the weight, but what's the value of that?

T = Okay. All right, interesting. Yeah. That is very good to know. So I guess we're wondering like, well, you kind of mentioned that you don't really know what data, you can kind of see from food until tech is still right. Yeah, okay, yeah, okay. So that kind of like omits our next question.

D = Yeah, I don't know if there's a, if you can, if you can look at it like on a desktop to get all those stats, like I haven't gotten that far. I've just been recording it. Okay. Definitely on the app. There's no way that I found that

gives you a really quick summary.

D = But maybe you need to use it for a long period of time, okay, to get that. So you can see week over week, or month over month or year over year or to compare how you're doing. Okay. Do you think OC could be adopted in a way that we could also calculate like greenhouse gas emissions associated with the waste?

D = I don't know in OC. I doubt it. I know there's a newer version that the Okanagan campus is using. And I know this version is pretty much topped out, (in) it's capabilities.

T = Okay, but the **climate friendly food label project** they are trying to work with (an) app to get some of that info. So, I mean, they, the researchers who did all of the analysis, they have that information, but **how to match those two together**?

D = I'm not sure. Well, good to know something for us to keep in mind.

T = Yeah, we go forward. I have to look at asking a few other people the questions. Sure. Yeah. That's something we can definitely kind of work on awesome. That's good to know because I mean, we don't want to suggest that you keep using a tool that's not working, you know.

D = So yeah. **So that's that's good to know and just to know like I said before**, so John, myself and UBC FS Key Staff, they're not using that right fit, right? So **I'm the only one testing it out**, okay?

T = So then do you think that, if they were to proceed using fit, would it be something that is going to greatly impact the day to day activities of yourself or your team while you would need to?

D = Yeah, **I mean it would be you would either need more devices**. Okay. **Kind of scattered around the kitchen**. Okay, in the key places so that people could record things. I mean I guess that's the pro on fit is that it's very simple, it's just to wait sure. But yeah, you would need more devices and I don't know how the licensing works.

D = If you can run multiple devices off one license or if each one needs its own license. I'm not sure by the, like I say for me, it's a little too general, sure. Yeah, I mean, I guess if it doesn't have any of the financial information like you're talking about and it's kind of impractical for my purposes.

Yeah, maybe not for your purposes, right? Right? But yeah, yeah. But it might be interesting to kind of explore a way that we could kind of expand on what your currently doing. That's yeah. Like oh see the waste section is it gives you a cost? And I mean it wouldn't be that hard to get because most things over the years we've been moving towards recording as much stuff in metric as possible.

D = Okay. So last it used to be all over the place pounds ounces. **All of these things and the three of us for the last two years or so**. Every time we adjust a **recipe at a recipe everything is metric**. So that it's consistent. So as far as I'm just trying to think of a number, I would say, like, 80 to 90% of things in OC going to be based on weight, okay?

D = There's going to be some things that are recorded as each like an orange and Apple, a hamburger bun. A hamburger, those things are just recorded as one, okay, one each, okay, but a lot of things, I recorded by weight. Sure. So, I, that's why I feel like if we need a data from OC, like it would give us a pretty good amount of data.

If you were just looking at kgs, you could also get that from OCD, but it would also tell you the total cost of those kgs. Yeah. And I mean, it probably wouldn't be too hard to calculate, you know, the weight of a hamburger bun and then no and then you would have it.

Yeah, right, or an orange, you. I mean, I do that all the time. I mean, on Google. Now you can get the weight when I create a recipe right, right. **Because a lot of recipes, you're basing it off another recipe as a start**. And so it's like, you know, home recipes.

D = It's like a cup of flour, right? We don't use (arbitrary units like a cup) professional kitchens ever. Talk about a cup of this or it's a weight? Sure. **Because weight is a weight**. Yeah. So, but you can go online and you can find out how much is a cup of flour away, Right?

That makes sense, Right? And it gives you close enough, Right? Yeah, yeah, I think so too. Okay, Well, that's definitely good to know And it does does OC give you like I guess if we were to kind of input those weights for like the items that are listed as one each is it kind of easy to put it into like an Excel document to make those calculations or we have to manually calculate it.

Or Well, I think once you think you'd probably have to first create manually and then right once you had that, right? And once you had it then you just didn't, okay? Okay. And like I say, I would say that's maybe 10% of the items. Okay. Yeah. Okay. All right.

That's very good and some of it even now that I think about it is like the way it exists. We know the way but it's just easier for us to put it down as an each. So for instance like our hamburgers are even though I was talking about metric but they do come five point three ounces, right?

D = But in OC, they're recorded as like if you wasted, it's one. Okay. But we know. Okay, wait because we get that made for us. So we know exactly how much one is okay, right. Okay. So awesome. That's very good to know. Okay. And then I guess they'll last two questions we have here.

The first one is what are your expected outcomes from us collecting this food? Waste information, I guess some you know benchmarks I look at and I've worked in other places where I would kind of share that information with the staff. So I would tell them last week, our food waste was $400, okay?

D = Right this week, it's $300. Great job. Okay. All right. So we kind of and then you realize well what's the, what's the kind of benchmark that we're always trying to be under? Okay, that's acceptable? What's an acceptable amount? So I mean that would be I guess a start is just that kind of benchmark.

T = What is acceptable? You know and maybe comparing it to sales. Okay. So if you yeah, just a percentage of your sales like what kind of is an acceptable number check? Yeah. All right. That makes sense. And then our last one here is more specifically about the cost benefit analysis.

That's part of our project is, is there any information that you would like to see in that cost benefit analysis? Hmm, not sure. Yeah, off the top of my head. Sure. I'm not too sure. Okay, don't worry. Yeah, I don't know. I guess we don't. We don't really know what is wanted for the cost benefit analysis.

D = So, we're, we're conducting. I mean, it seems like you already kind of have a really good understanding of the

financial impact of the food waste that we've been kitchen. So it's, it's, it's kind of, I don't know, I guess I personally feel like it seems like you guys have already doing a very good job with monitoring ways.

D = Well, this is why I think we were hesitant. I knew about this app before we decided to use it here. Okay? Just from another organization that I'm involved in, and, and we kind of were like, you know, **I don't know who the right target is for that, there are people that it would be very beneficial, maybe people brand new and opening a new restaurant.**

And, but like, I say, it's part of, I mean, even when you're trained as a cook, when you, if you go to school, you got a culinary school. I mean, that's something that you learn about, you learn about food costs and you learn about, right? So those ingredients cost you 30 cents and you dollar and then you have to pay your staff and then you have to heat the building and then you need to buy plates.

D = And so next thing you know it's like where's the dollars gone and that's what I mean about. **You can't afford to throw away food and so it's in grained and you like every day all the time plus usually chefs** and cooks are already very passionate about food and don't want to throw food away, right?

So because they love food. So it's already such an important part of our kind of DNA

T = Sure as it cooks so yeah all right **do you think like a higher up like with this like the costs knowing the cost of food waste?** Do you think it would impact policy at UBC?

D = Perhaps if they were more aware of this? **Like I don't know. I guess I don't know what the policies are**. I mean everyone's trying to reduce food waste right? And there are almost other areas where I think more opportunity exists.

D = So you know, this **idea of like ugly produce and like those are great and that's kind of cultural like getting people's mindset changed** right that it doesn't have to be this pristine thing, right? That, it's still acceptable and doesn't have to look perfect and for it to be sold, right?

D = Because that's where I think a huge amount of food waste is and then I think in the home is a huge amount of food waste, like over buying is a huge problem. I ate a lot of food. It gets wasted, right? Never gets touched, never gets here, right?

D = And then one thing we can't really measure. Here is what happens once it's out of here. Yeah, I mean we could but it would once again, it would take resources, right? Like we would have to wait for compost bins every day or something like that. To see what's, whereas in a small operation.

D = You usually, the area where the dishes come back, is the same place where you're cooking, right? And so a good chef is always looking at those plates coming back into the kitchen, going to the dish area, right? What's on that plate? Okay, so if you see beets time and time again, then you're like, maybe we should get those beets, right?

D = Or you see rice, then you're like, oh, maybe we're giving too much rice. Nobody's finishing all the rice. Okay. So, you kind of see it all the time and you can react. Whereas here, I mean, it's once again, there's, there's the, the amount of acceptable food waste when it's this big of an operation is, is a different story, but, but the percentage wouldn't be different.

T = Okay, that makes sense. So, yeah, I guess, sorry. I thought of one more question. So, I know UBC FS Key Staff has talked a little bit about switching to all access dining. How do you like, how do you envision that will impact food waste from the pre-consumer end of things? I think I will make it lower.

D = Okay, yeah. Okay. **So right now we're very I don't want to say where a slave to OC, but we're kind of** a slave to it for sure. Because everything needs to have a recipe, we need to account for it when it comes through. So it's a little bit harder for us to take something and make something else with it, okay?

D = Because that takes time sitting down creating a recipe putting it in OC and **then the supervisors have to program it into the point of sale so that they can hit the right button that takes everything out of image with all access dining all of that's gone**. Okay. We don't need to create recipes anymore.

Okay? Because our students are gonna come in, they can take whatever they want. They're gonna leave. Nobody's ringing through like, oh, you have this and you had this. And you had this and you had this. No. So I think it should minimize food waste, okay? I mean before it gets out here.

D = Yeah, that's the thing and I'm hopeful, of course. I mean, what we've heard is that that first little while there's more waste. Okay. **Because I think it's a different mindset for students or the guest and they can't believe i**t. And so they're taking lots and then they realize, oh, okay, I don't need to do this because I can just keep going back, right?

And that's the experience we're hearing from the research is good and tapers off, okay? And **students realize, oh, okay, it's okay, I can go back whenever I want I can get as much as I want.** So I don't need to take six plates right now.
T = Okay. So we'll see. We'll see. I never worked in this environment. Sure. But that's the research that we've heard. Okay, yeah, interesting. Which is hopefully helpful. Yeah, we'll have less waste and yeah, easier for us to repurpose and do those kinds of things. Okay. Yeah that's good.

D = That's good to hear. Yeah, it's interesting. I mean, I guess it's interesting because it'll be so different I guess next year from this. Yeah. **And then we'll just do the same thing as this, right? But, it'll be a production sheet.** So once again, it'll be like, we made 120 kgs of butter chicken and we ran out.

D = Okay? So then we adjust for next time. Oh, we made 140 or we had all this left over, right? Oh, well then. So we'll have production sheets, which will be, how much did we make? How much should we have left over? Or did we run out? Okay, let's adjust that now and we'll have to constantly be adjusting these production sheets.

T = Actually you do have a couple of follow up questions. So something that you mentioned earlier was having chefs put on chef specials to help. Yeah. Sounds like bringing on some of the produce that were already in storage a little too long and just needs to be pushed out and I was wondering how chef's specials and just like those are strategies impact the food ordering because part of the food ordering process from what I'm hearing is the sales.

So like how do you take into account those ingredients that have been kind of sitting or haven't been used as much from storage and just like being sold out just because it's a special and you know oftentimes more students will just like gravitate towards that. Like I it is a bit of a long with the question but you get served, the current main ideas.

T = I'm trying to ask in terms of how those perhaps inflated numbers of sales are sales of the shelf specials, like, influenced the ordering? Well, you've already purchased it, you already have it in your inventory, right? And so

you're kind of it, you're kind of just utilizing because the other part of OC that is every month, we do inventory, right? So does that get factored in as well? What?

D = Because that's still, if it's all usable product and then you can have a huge inventory and it's fine, right? As long as it's all gonna be used, it's not money that you're gonna lose, right? So yeah. So, I don't know if that really helps but or if I manage, if I'm understanding exactly the question, I am, I think, I think I have thought of a scenario that can probably better explain the question.

D = So let's say, for instance, Open kitchen orders a hundred kilograms of chicken. Yeah, or a week and then midway through the week. Open kitchen. Realizes oh, we still have, let's say it. We've used up 30 kilometers. We have 70 kilograms in October. So instead of letting it spoil, we just use it for a sharp special.

T = Yeah. And then does that 70 kilograms of chicken that wasn't exactly used or just wasn't being sold that much kind of influenced the decision or influenced the amount of chicken that is to be ordered next time. So yeah, of course hundreds like 80. Just like and that's what I mean about, we have the data, right?

D = I create sales reports off of OC that tell me all my sales for the week and every day, also, what the sales were and that influences how we use that data when we're ordering. So it's definitely a lot of data available to a chef. It's just a matter of using it, right?

D = Yeah. But it's all, it's all most places. It's all there. If they have a place where somebody rings in an order, a computer that rings in an order then they have all that data. Unless they're writing it down on a piece of paper and handing it to the kitchen but otherwise all that data exists and most apps are taught and trained in how to use that for ordering.

T = Yeah, that's all the questions. Well, thank you so much. I mean, it was very informative. I think I feel like, you know, it's hard for us coming into this project having no experience really working in the kitchen.

Wednesday, March 16

T = Team
J = Representative at Food Services

T = So with that we can start off with the first question. And the first question we have here has been implemented so far to prevent food waste at place value and specifically pre-consumer food waste.

J = Okay. I mean that's a very broad flesh. Let's start off with product management. So what we use is our first line of defense for food waste is utilization of the product that we receive.

J = So, on many items, say it's going to the sector of produce. Any items that we're receiving for produce, will identify what wastage would be. Say when you're cutting a shower, the 10% of the shower, that is too close to your fingers for the night. **You will identify that portion of the product that we order and develop the secondary.**

J = For instance, when we cut shallots, at that little piece too close to the finger then gets roasted off and put into a roasted, shallot mayo where the shape of the shallow doesn't matter.If we are talking about product like salmon, which is a very expensive product and we take our sustainability, very seriously, with UBC, being an ocean wise campus.

J = The **trim pieces that come off of the salmon skin, all get that packed and safe to be used into other items**. The most unusable bits of trimming, it used to be things like making salmon powders or you know salmon congee across. This is where it gets cooked down. If there is a usage for the skin, we'll scale the skin and make salmon crackers out of it to be crunched on dishes.

J = The first line defense to out of this answer is **utilizing the product that comes in the back door, in the entirety of that product**. In the tip to the tail beyond that.There's many other steps where wastage shows up over prepping can be the next one to go.We have a lot of clients.

J = You know, that's like gathering funds, **5,000 transactions, a day**. So we need to be ready every day for 6,000 transactions. To ensure the students have the abundant access to food that they deserve so we often have excess prep at the end of the day. So our second line of defense is making sure that a product is prepped and that everything gets transported into a laser dates menu.

J = So that we utilize that product or the more dangerous area that is the product is prepped and heated and put out there needs to be a utilization for that product. **If a student is picking food from an area where students can touch it, say like a solid bar or a sidebar, you cannot use that product.**

J = You can't come back into our space because we would consider that contaminated so that would be its other category of compost. Your food has been heated up and put into a station where it's served but it's been held above a critical control point. We take it back into the kitchen and we safely cool that product down and we if we can't use it.

J = The next day, we donated it and we've got programs like sprouts, which is a UBC person. We have products that are donations like foods, which is a Vancouver, you let them know what the product is. That way, it's not getting wasted and compostable.As of course, like the final one and then, so we've gone through utilizing the product.

It's going through over prepping. And then the third one is is is a kind of like a more of a conceptual process which is writing our menus proper. There's items on the menu where you will realize, the students aren't actually consuming everything that we're serving them.Say you make a, he was 14 inch pizza, you're serving off of the station.

J = **It's very quick that we'll see, especially and say, the dish areas that there's food coming back on plates, students, aren't consuming everything that we're serving them, which is an opportunity for the chefs, to take a step back and look at our menus and see if we really need to be serving as much as we're serving, and to be checking to see if maybe a community.**

J = So, they can order one and that is the second one too. So, really, **look at the menus as a bigger picture to see if we're serving them**. Everything they need, but nothing more and it's kind of a little niche spot right from the middle of that. So those are, those are three good layers.

First one utilizes these food items. Second one **over prepping**. The **third one is writing the menu's process** and as part of all these different strategies are these strategies directly taught and shared to the entire kitchen staff team. So, for instance, when I, when you mentioned donating, some of the excess food is given to sprouts or food runners are that eyes as they're already a system place for everyone to know.

J = Okay, that we have X amount of carrots left over left. Just send them over to sprouts and if so, how frequently is that them?

T = Is that like once a week or once a twice a week?

J = Yeah. Okay. I'll start, I'll sort of answer that question top. That question is, is the whole stack trim?

The leaders are the chefs.So myself and fellow chefs, act as supporting roles which are usually in the classification of first cooks. **They are fully trained and all three of those are just about**. And the first cooks, will specifically be the ones who make the decision, whether the food is going to be cool that you can use the next day or cooled or donated or just straight composted.

J = So that's where the decision making happens for that. Secondly, they have a process given to them by myself, which is you asked about sprouts, Sprouts comes on Thursdays, so on Wednesdays, me and the first books meet and we discuss, what would be going to sprouts? **The second layer of that is because of the larger picture of course, but I want to be gaining value from that proved not just giving it away.**

J = Yeah, there's a lot, there's a lot of value to sharing. Don't get me wrong with you, you know, it's, it's a really key portionable. But my initial goal is to be receiving money for a product that we've put prep, work time and equity.

T = And what our next question would be is what types of food ingredients do you know are often thrown out during the preparation.

J = Such as rice and grains or more needs or vegetables.

Are you asking about in the most volume or in the most value, or in the most frequent with ideally all three, but we

can start with we can start with the frequency because I do know. Yeah.Part of the issues that the amount of three can place food waste.

J = **Oftentimes you have to compensate with ordering those items** especially if they are considered more valuable and necessary (for the menu). Okay. I mean something like to give you an example of how we got around it. The potatoes we used were peeled often and there was a whole lot of waste that came from that and that's a potato peel.

J = That **honestly doesn't have a whole lot of use on menus or even a whole lot of use for donating so that would end up in the compost**. So we switched our menu, offerings to be represented by **potatoes that have peels that are very edible**. So we went to things like a Yukon gold or red nugget, potato or a butter potato farm where we cook it with the skin on it to avoid having to compost the excess on it.

J = But so things that are very frequently composted because you get our carrots and very large volumes. And if we are prepping carrots, I would say, we prefer 75 kilograms a day. There's a lot of peels. And if they yield on that is 3% yields. That means 7% of those carrots.

J = (Weight of food waste) is going into the compost. That's the tip, the tail and the peel going into compost. So that would be something that's very very frequent.You wanted to see all three of those things that are of the most value and wastage that comes from. I think salmon was one that we talked about earlier.

J = Yeah, we've gotten it, **we've gotten in front of the value of salmon, because any weight of salmon that we're throwing out is extremely expensive**. Also, as a big cost financially to us, but also the big cost of the ocean. I think it's really important, we identify the the sustainability aspect of it as well as the value.

We've done really well with them. **I find we have a voice stage on chicken items that we cook.There's a lot of chicken things that we will do to chicken**. They **get cooked ahead of time for services**. **Heat it up in large packages. Say we will hundred kilograms of chicken thighs for an item of one of our stations and because it's because it's very volatile and the protein once it's competed up above 85 degrees** and health, the more than 40 minutes, we can no longer use it for through having the next day.

J = So we waste those out. Now, the ace in the hole of wasting matter of what we do is we make it if it's super the next day, where it then gets heated up to above 90 degrees, to keep food safe. Now, we don't serve all that soup, we have to throw it out but we still consider that wasted.

You're so right that chicken down is wasted. So that's the highest values.So we've done frequency value qualified, third, one by weights.

T = So, okay and I just want to quickly revisit some of the answers.You mentioned how you're dealing with different ways. Because you mentioned some of the products that are often not used such as the potato and carrot peels make their way to the compost.

T = And where would be the most common place that the compost generated from food services? **Will it be used for whether the used for UBC farmer, would probably be sold to other other retailers** or, or is it perhaps used in-house, or announced in the sense that if, like the compost could be used for other residents needed, such as such as the not the forms?

J = Okay. That's an excellent question.That's actually a question that I don't know if I can we answer? Because once the, once the compost bins, that we have are taken away. They're taken to a UBC facility where it's essentially cooked and broken down and composted in a five stage systems.

J = **And I'm not sure where they can go, but I can tell you that, it can't go to UBC farm. And I work very closely** with UBC farm and they come with the really high achievement of being a hybrid organic farm. **And because the food is coming out of my kitchen, we cannot 100% every day, save it everything that went into the compost was organic**, so therefore, they can't take our compost.

J = So I know it doesn't go there, although that would be very cool. That would be a really cool cycle. If it was, yeah, I'd be very dynamic to be with that cycle is, but **unfortunately we cannot do that**.

T = Okay, okay? Yeah, yeah, because that's where my mind was thinking as well.

J = Like, it would be really nice to have something. **I've kept a system that can really just sustain myself and really designed to own a place from the. If we had insects on the farm**, we have them be used by the farm (by) feeding them to animals and reducing food wasted from this space and then the pig actually put into their compost and then we can be doing that in a cycle system.

But I don't, I don't know enough about you to use. Composting processing plant to really answer where it goes, after that. Yeah, yeah. You'll be cool to know, though.So as you get through your as you get through here, if you find anything out about that, make sure you contact myself and (other Food Services representative) back at his time actually.

T = It's funny mentioned that because I was looking a little bit into make making assist making a system like that and found insects to be a pretty interesting case scenario where insects can help break down the course compost ingredients, and kind of feed into this feeling, through the system up and use of using that compost to grow produce, but also eat into some extent.

T = And it wasn't one of the initial questions we have in mind, but I just figured I have to ask at this point. What are some ideas presented?And there's like, any more out of the box ideas that feature a spider-up export to reduce free consumer freebase like I did mention insects.

J = And the reason I brought that up is because from what I found and sex can be, can have a high level of violability. Basically, we can procure the ingredient, and cook it into different dishes, with almost no leftover of the ingredients being thrown out. So you're so that's when we have eliminating pre-consumer food waste and there was a I think was the University of a while back in 2050 and and I know it's like quite out of the box for me to ask that's our questions about that.

J = Are there? Are there any ideas that have been further explored export outside of the current great work? Even though it's two layers of the answer? So in 2012 I wrote paper and Cuba based on urban agriculture and one of the key ingredients in their composting facilities. In Cuba. Of course you go.

J = To imagine the Cuba has tricking by embargoes for, you know, 20 plus years prior to us reading this paper. So they become almost primarily dependent on internally sourcing everything. So in 2012, we were there we were busy there, composting facilities, they were importing, thousands of thousands of pounds of worms from another location and then putting them into concrete bins with their compost and the dirt that was coming out

of it was like just the same incredibly rich soil and they were dumping two ways both.

J = Like they would say what kind of music through this process but I've never seen accomplish system work so well, so fast. And it used zero emissions. There was, there was no, there was nothing. **I think that there was a diesel, one of the facilities that we've visited about 12 times had one diesel generator pumping water, and that was it, and it was seven and a half acres of just bins with compost.**

J = And they just had mesh over top of them to kind of keep the heat and the gasses again.So what you're speaking about?I'm very familiar with and I can tell you that that's not something that I don't think the UVC is quite.As I don't know what the word I'm looking for is we're not on that cutting edge or on that kind of low tech cutting edge.

J = I believe that our facility users heat and enzymes to break things down as opposed to something that's cool. Is worms for, you know, other bugs. So I'm very familiar with that. However, I can tell you that we don't, **we're not at that level of some of the challenges that you can see in food services.**

J = And specifically, largest issue residence (housing) have is just being able to put out enough food every day to put the students and to be able to give the value perception.Through that food those goals, take major president over the secondary, use of the foods, and it's only within the past five, or six years.

J = That you receive is really taken up. Really forward thinking approach to their wastage, which is, I mean exactly what brings us here today. So it's very new for UBC to be processing three ways indications in the grand scheme of things.

JJ = We're not quite at that stage yet.I see, I see.And and then European, it might take some time before you receive is comfortable and for like that stage to explore more.Well, it will take a lot from me and **my teams to be able to if we can check all the boxes sustainably source food for our kitchens, to be able to provide it to the students at an affordable and sustainable rate.**

J = And then also be ahead of our menu planning our sourcing. **Because supply chain issues have become a real** front and center problem for us and we can check those three boxes off in. The next one, is to just look at what we're doing with our waste, you know, really, really heavily.

T = And I think that if we can get those first three done, which are the universities kind of major directives, then there will be more attention given to compost in the bank. Not sure. Yeah. So building off that you mentioned that part of the supply chain for those three reasons has been rather difficult and yes we want to and we wanted to ask just I'm sure part of the reason for that is because of the covered pandemic.

T = So what other or how has coded impacted other aspects of of the food procurement? I guess. Just food waste generated. And general is, we got some idea because we talked with (key Food Services staff) during from Open kitchen.He knows that there wasn't a real significant change, but I was wondering if that's also the case with any.

J = I **don't think that COVID caused much more food waste for us.**The only time that I remember three ways spikes, **being directed related to covid would be when we started doing isolation meals for three about a year ago**.When students first started coming, **we wanted to be sure that we were providing ample self isolation meals for students**.

J = So we've prepped enough of them for our entire student bodies. Of course, not all of them came, all of them

signed up for it and not all of those who signed up for picked it up.**So, we ended up with a lot of leftovers from that, which we donated to the downtown inside grow program, aimed at mental health, then versus simply down**, like, substance abuse.

J = That's the only time that I remember being directly related to building other than that are operations.Have been one of the cliche sayings is **pivoting**. **Shifting going through COVID and just as any like, as if it was any other day in the kitchen**, doing the same practices that we regularly would to do not to watch it.

J = And until the part of the practices. And I, I, I'm just, I just remembered part of the ways that students often but are how frequency lead services are the ingredients and be able to make sure that there is enough food prepared for the same body to have access to.

J = **So I always, I was curious, I pop, I'll have food services, been able to forecast their ingredient demands**, based on the various information that's collected on on side such as how such it's not frequently. The **foods are sold how frequently their each menu item is ordered that uses on the same ingredients a couple out.**

J = Yeah.I mean, well, what you're speaking to there is kind of that third layer that was talked about, we're writing our menus with considerations for product usage.So you touch on something in there. That's kind of it said, you know, **we use the same product**. Yeah.So if I'm buying carrots, I have many layers of items where we're getting a whole carrot against the field.

We're sealing it, we're tipping. It retailing. We have those usable portion of the middle. So the biggest things I want are, you know, big rounds of it. Those are going to be, say, vegetable pot time. So those big rounds go to that.**And then the smaller pieces, some of them are getting shredded up broad but into a bar like a salad that has (sliced) carrots.**

J = And then at the tips of it, the little small pieces below that are getting put into sauces, they need to have carrot in them because they're gonna get cooked down in pureed if I'm using a carrot in a recipe. I want to make sure that every portion of every little piece of that code is going to use.

J = So I have to create other recipes that also we're trying to group all the recipes together that are going to use it and create like a little bit of a flow chart. And definitely if you find products, like we sell, we sell some beef here, plus any, I mean, beef is a product that uses an incredible amount of water to raise it.

Has a really big hard to put prints on the planet is where incredibly careful of what we do with all of the byproduct of that.So it's if there's trim that comes off of the cuts and make sure that we make a sauce out of, there's leftovers that come from whatever item that we're doing and make sure that those left over pieces get put into a, to a sauce and just soup into something, secondarily to make sure, but some items you order like say seeing if we're ordering a whole tenderloin there's a little parts of it that are smaller than than your implication.

J = So I create menu items based on the wastage.If I know I'm gonna have a little pieces of zuc left over, I make sure that I have another recipe that that goes into instead of just wasting it up.Yeah, and that that makes sense then.And kind of just like remembering remembering what you said about, how sometimes.

J = Yeah, if things are sold, they'll especially during the early onset. It dependent like the meals would be donated and I, and I wonder how how much of that fact is being incorporated to forecasting, ingredient demands because I do remember you from my interview there, in this app. Sometimes the lots of ingredients are made into chef's

specials.

T = So like what you said with the leftover, chicken meat, feel good, often cook at the soup.And I wonder if if there's some sort of factor does considered when ordering ingredients getting so, for instance, if if chicken needs often often finds its way into soups and it would be considered more food waste and sold as specials. Does that mean that your operations would order the last chicken for the next week or so?

J = I'm just kind of experimenting with the menus and that's right. Yeah. We often collect data to see where the sales are that one right in front of me, I should show you. This is a report that I rent weekly all the 25 and 10. So the items up on the top of it, my species glory that items in the top or things that are problems and items in the bottom are things that are really really successful. And the intention of that is to identify where you know where our successes and our challenges are.

J = If an item say like, you're giving me an example chicken falls into the problem which is the 25s it falls into a problem category. **What I do is I take a look at the following week, say next Monday, and I see how I can take that chicken item either off the menu, or into an area, where it's going to sell better.**

J = If you better utilize or waste less ultimately, we will regain the value of the chicken if it's not selling that putting it into soups but the goal is to to the, you know, to the most profit and the most successful utilization of the okay, okay?And, and kind of building off that, how after Houghton would food services?

Like the different dining halls.**Sous chefs just meet up and let's drop and draft out different menu items**.

T = Like because I'm curious, like, with what the amount of information that can be gathered in like a single day.It.You know, it does open up a lot of room to explore different recipes and different recipes that perhaps the peculiar food waste when it's being prepared.

J = No, it's a profession.**We meet once a month, as it's to discuss menus. But we meet various other times during the week for a million of different reasons.**But I mean where there's three of us in the, in the leadership roles as chefs and residents, and I solved (with fellow Food Services key staff).

And so we share very often our successes in our challenges with each other you know on a on a less official route, you know, we're on like a whatsapp chat, maybe like 10 12 times a day discussing other menus on an official one.We need once a month at a boardroom, and we go through the, but it's safe to say that we are constantly inspecting, our menus, constantly inspecting, our processes, and constantly inspecting, our relation of our menus, to our staff, and how well we can execute because you can you can create also to things in the big dream on paper.

J = But being able to actually execute it, sustainably, affordably, and consistently is an incredible challenge. I can tell you.**Yeah, I can definitely imagine that and we yeah we have a we have a few more questions here and and part and part of the reasons. I've as you've talked about cycling certain types of ingredients such as beef, what the coming down to the different costs associated with the ingredient.**

J = Like like you said, t**he amount of water that may be needed to procure, about a kilogram of beef**.And one of our main deliverables that we were trying to achieve with our project is to create a cost method analysis, regarding the different types of feel ingredients and propose, some of the recommendations through those findings.

T = So, what what, what's, what's even additional information? Would you like to see in a cause benefit analysis, like with it?Whether to adjust include some of the sunken environmental costs are, are there some other costs that you would be really interested in finding out as well.I think I think from the lifecycle side, yeah, carbon footprint would be really important to know.

Now that comes with another layer to it for both of you, with Kenny's, it may be tricky for you to **find out how far that food has traveled**. Transportation wise. I can tell you that we touched a little bit.The three of us here on supply chain issue, as things have gone quite a wire over the past years.

I mean, **things like the flooding in BC and the pandemic have just completely thrown any of our processes first for transportation methods, out the window.**So an item that maybe in prior years, in four years ago, would only take two stops to get to us, you know, by rail by truck and then it's here.

May now be looking more like four or five stops because we're sourcing them from a different nation or a different company that has more stops along the way.**So there's less ways for me to know. You know how many middlemen** were in college.Carbon has been used to do that at the end of the day you know, things like creating menus and things like pineapple and banana.

And avocados are difficult to really know the damage that was caused, as I said, I've seen these items from far away places with, you know, wastage and yield issues in there's things like, avocado. **They're very difficult to source.Me like sustainably because they they get, right? And then they have a very small window.**

So a lot of these companies that are bringing them across are working with **processes like CO2 sprays where they where they package them up, unripe and then they ripen them in transition.You know, if it takes an avocado four days to make it here for Mexico then it in that 40 window** it's only got me and then she got to a supplier and then it needs to get through that supply of processing facility and it needs to get into a truck and it needs to get to us and it needs to get to me.

J = So, there's some really difficult steps there. For meeting, know how to get metrics on.I would like to know where the carbon footprint is or what the responsibility of companies that we use, what the responsibility they have is to their target of our physicists and transportation portion.Yeah and may ask which food companies have food services been working a lot in terms of ordering and getting the different types of ingredients used.

Like you can start with thank you for the big company that all of you use is **Gordon Food Services** which is the big kind of conglomerate company and then there's smaller subsidiaries. It's Cisco that we use called **fresh point brush points**, where we buy a lot of other stuff.

J = So if you were to look, if you were to look at those two alone, you'd be taking probably 70% of our orders and the consideration, which is huge. Yeah. And I can, **I can tell you when I order from the farm that it literally has to come one kilometer in the back** of a big blue bag and from the farm to here, **it's a very excellent carbon cocoon**.

Yeah, we're committed to about a hundred and fifty thousand dollars year. Sorry, **$150,000 a term of purchases from UBC Farm**.

T = In terms of scale, but like how much with that account for the amount of ingredients food services order like or at least with place value like five percent?

J = Yes. So that 150 is between the free units which is Open Kitchen, total. Okay. Yeah. So you know, it's just called 50, 50 grand, a term from me. I spend on fresh point a day on a weekday five days a week. At least two thousand dollars. **So I spend approximately 12,000 dollars on produce a week.**

J = Open Kitchen spends approximately $20,000 a week on produce.So $50,000 a location of actually not that. Okay, yeah, gotcha. That's a lot. So, thanks Ben.Yeah, and

T = And what is that?I think that's all or there's one more question rather than being curious and just revisiting the whole supply chain issues that have been recently impacting easy groups, print services.

Did you notice inflation, in terms of the ingredients pricing, it's during the pandemic or moving for moving from the pan and limit?

J = **Like today be I don't know if inflation is the term to use, but we've noticed pricing increases in food on like an exponential gradient for the past four years even prior to pandemic**, you know, things like produce. **We're starting to notice it when it's in the cost of say in the cost of climate change on California, really started coming in four years ago to the source of water in the state of California, a lot of the fruits and vegetables that we were buying from California.**

J = Went up, you know and like the 15-20% tile because they couldn't have water to grow vegetables.We've seen it.Just go up again, as financially through the pandemic because things like international travel have become difficult. No sourcing things have become less fluid through all their stats because of dependent.

J = So they become more expensive. But those are, those are not to say that they're caused directly by the pandemic. And now this isn't something that I can speak on academically, but the cost of food is going to be going up, just to the the inflation of the human race.

J = I mean, **there's so much more consumption, there's so much more globalization**. At the end of the day, they're just the foods are just becoming less abundant because we are there's more of us and there's less resources to go around.The cost is the cost is really stupid.Spiking just this just this past week, we came up against, we had a really sustainable source for salmon for the three years.

J = That was quite a big win for us. **And some ocean wise vendor of salmon that we really liked, and we could work with, really**. Well, there was a source of all your around using buying frozen salmon and then they were off season. T**hey could stop it for us. And just last week they basically said we can't, we can't sustain this volume anymore on the, on the wild school.**

J = So we're gonna have to stop selling it.We're currently trying to figure out culture.Not it up.It's that that's interesting to know and just something, not really kind of opens the door further in terms of what we can try to do what we can try to explore the analysis.

J = And I guess and but disappeared on top of that.Yeah to.Well, if you guys have any further questions, you can feel free to email me touch back on any of the points that you have to look over. Your notes, know to save down their taken away. You guys have, you know, invested clarify and I'll talk really fast.

J = So if you guys have any further questions, don't hesitate to reach out, I'm happy to help.This is and this what

you guys are doing is directly in my wheelhouse of what I want, our food services to looking at more than, and with more considerations.So, the questions, it's for all purpose.

Appendix 3: Sample of Food Waste Report Provided by Open Kitchen

From: Saturday, January 1, 2022
To: Monday, January 31, 2022

Item Descrip	Quantity Wasted	Current Unit Cost	Average Unit	Total
ALF|Flatbread|Sweet Potato	1.000 ea	$1.9310	$1.7293	$1.7293
ARTICHOKE 1/4 SALAD CUT T	0.600 Kg	$4.5013	$4.5013	$2.7008
ASSORTED DANISH	9.000 ea	$2.4500	$2.4167	$21.7500
BATCH|Guacamole	1.200 Kg	$14.2354	$13.2157	$15.8588
BATCH|WestCoast Chowder	3.000 L	$3.3524	$3.3238	$9.9714
BEEF MEATBALLS	750.000 g	$0.0093	$0.0093	$6.9750
BENTO SPICY SHRIMP MANG	3.000 ea	$4.4700	$3.8300	$11.4900
BEV|Happy Planet|Mango Pass	1.000 ea	$1.6267	$1.6267	$1.6267
BLUEBERRIES CULT IQF	0.800 Kg	$8.2600	$8.2600	$6.6080
BOILED|Hard Boiled Eggs FT	15.000 ea	$0.3057	$0.3057	$4.5855
BREAKFAST WRAP HAM & CH	6.000 ea	$3.9400	$3.9400	$23.6400
BREAKFAST WRAP MEDITER	11.000 ea	$3.9400	$3.9400	$43.3400
BROTH|Cioppino	3.500 Kg	$4.8629	$4.8629	$17.0202