

Oregon Wasted Food Study: Institutional and Commercial Sector Case Studies

**Case 4: Tracking and staff awareness campaign to prevent waste in a college
dining hall**



This report was prepared for
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Introduction

This is a report on the methods and results of one of 15 food service business case studies, as part of the institutional and commercial (IC) sector portion of the Oregon Wasted Food Study. This study is funded by the Oregon Department of Environmental Quality and conducted by Community Environmental Services (CES) at Portland State University.

The research objectives for the IC portion of this study are to:

- Understand components of wasted food in IC sector
- Highlight causes of commercial wasted food and key opportunities for waste prevention
- Test wasted food reduction best practices and quantify their effectiveness
- Promote wasted food reduction best practices for application at commercial food service institutions

Focus of study

This study explored the major types and causes of wasted food in an a-la-carte, cafeteria setting, and tested the effectiveness of waste tracking and a waste awareness campaign for staff that promoted strategies for wasted food prevention.

Business context

This case study is of a college dining hall in the Portland, Oregon metropolitan area. It serves between 2,000-2,500 meals per day, including breakfast, lunch and dinner. It is managed by a food service company with a national presence. This particular dining hall operates a-la-carte with students purchasing individual dishes, and independent stations serving a range of food options.

Methods

Study design

The study was conducted over a four-month period from August 2017 through November 2018. It included employee interviews, a waste assessment, a wasted food tracking practice and a suite of waste prevention training interventions. The intent of these analyses was to (1) identify types of wasted food and key causes of waste, (2) develop and implement a best practice for wasted food reduction, and (3) analyze the effectiveness of the practice.

Interviews

A total of nine employees were interviewed for this study, including: two taco station cooks, a grill cook, a saucier, two pizza chefs, a sous chef, a front-of-house cafe lead, and the executive chef.

Employees voluntarily participated in one-on-one interviews, on site but in a private location. Interviews were recorded and took between 15 and 25 minutes each. The interviews were semi-structured: standard interview questions were asked of each employee with additional questions asked that either responded to employee answers or pertained to their specific role.

Waste assessments

Researchers sorted approximately 50% of the business' back-of-house food scrap waste and 100% of its front-of-house food waste generated during a 24-hour period of regular business in October 2017. A follow-up assessment was conducted in December 2017 with 50% of a day's food-related waste sorted, and included both front-of-house and back-of-house food waste that was not separated by the business as it had been for the initial assessment. For a full description of waste assessment methods, see the Appendix.

Recommended practice

Surplus food tracking and staff education

The business created a comprehensive wasted food prevention campaign called the "Waste Awareness Campaign," which it had previously deployed at other locations. The campaign ran for four weeks in October and November 2017. The campaign had two main components: waste tracking and education. Results of the waste assessment and interviews were shared with the business prior to implementation. Researchers suggested doing more to address problems of overproduction in addition to discussing it during weekly trainings, but the curriculum was not changed.

Tracking occurred throughout the day, with employees placing food scraps into one of **three buckets: green for fully utilized product** (i.e., eggshells, vegetables used for soup stock, etc), **yellow for partially utilized product** (vegetable, fruit or meat trim) that could potentially be reduced or re-utilized, and **red for overproduction or spoilage**. Employees marked how many containers (or partial containers) they filled at their station on a paper recording sheet, which was later entered into a spreadsheet by kitchen managers, converted to pounds and reported to the business sustainability coordinator and researchers.

Education was another critical component of the practice. The campaign leveraged existing **10-minute daily all-staff meetings** to remind staff about waste prevention goals and tracking requirements. Furthermore, twice a week these 10 minute meetings were dedicated solely to prevention education using pre-planned lesson plans spanning topics from measurement practices, production controls, portioning guidelines, re-utilization and customer engagement around wasted food.

Limitations

Waste assessment data (from researchers) could not be used to directly verify the waste tracking data (from employees), because of different scopes and time-frames. The researcher-collected waste assessment data included both front-of-house and back-of-house waste, while the employee-conducted waste tracking was limited to back-of-house. Furthermore, the post-practice assessment was conducted a few days after the practice (and associated tracking) had concluded. Furthermore, the waste assessments were conducted using visually estimated samples because the volume of the waste was beyond the capacity of researchers to assess. This method, while commonly used, does introduce some uncertainty into the results of the assessments.

Results

Waste assessments

Initial assessment

Back-of-house wasted food totaled 667.32 pounds. The largest areas of edible wasted food were **dry foods** (107.52 pounds or 16.11% of total food; 22.41% of edible food) and **prepared foods** (126.88 pounds or 19.01% of total food; 26.44% of edible food). **Inedible parts** of foods weighed 271.94 pounds (40.75% of total food). The dry foods were largely comprised of cooked pasta and rice. Prepared foods contained stir-fry ingredients such as beef, tofu, broccoli, and peppers, and hot and cold food buffet items resulting from overproduction. Inedible parts were mainly fruit and vegetable peels, cores and trim, soup stock remains, eggshells and coffee grounds. Front-of-house waste totaled 146.23 pounds of which 98.12% was edible, with a majority of that (124.58 pounds) being prepared food. See Table A1 in the Appendix for a full account of pre-practice waste sort results.

Follow-up assessment

During the post-practice waste sort, the total amount of edible and inedible foods weighed 577.94 pounds. Front-of-house and back-of-house had been combined within the facility making the items less distinguishable and harder to identify for sorting. The **prepared food** category, weighing 336.7 pounds (58.26% of total food scraps; 66.62% of edible food), was the largest category of wasted food, likely in part due to the combination of front- and back-of-house foods. The next largest categories of waste were **vegetables and fruits** weighing 101.54 pounds (or 17.57% of total food scraps; 20.09% of edible food), largely comprised of melons, squash, cucumbers, broccoli and beets, and inedible food weighing 72.5 pounds (or 12.54% of total food scraps).

The business' waste portfolio changed significantly between the pre-practice and post-practice waste assessments. **Overall, food scrap waste decreased 28.96%**, from 813.55 pounds to 577.94 pounds. Three categories saw approximately a $\frac{3}{4}$ reduction in weight: inedible waste (73.61%), dry foods (75.48%), and baked goods (75.91%). However, edible cooked/prepared food *increased* 33.90%, or 85.24 pounds. Researchers interpret this data with caution as the post-practice sort was an average of waste generated over five days, including slower, weekend days. While generally multi-day averages are more representative, comparing data from a single weekday (the pre-practice sort) to an average from two weekend days and three weekdays (the post-practice sort) may not be an accurate comparison.

Interviews

Sources of waste

Staff shared three main sources of wasted food - **overproduction, over-portioning and buffet-style serving**. The executive chef said that, while he and kitchen managers have regular conversations with station leads about PARs¹ and proper preparation amounts, staff sometimes cooked more than necessary in anticipation of running out. Numerous staff mentioned that over-portioning was also a problem, and that staff wanted to make sure customers got their money's worth. Finally, staff considered the salad bar and

¹ PARs, or periodic automatic renewals, are set production amounts that are generally set by management and followed by preparation staff. Some businesses have standard PARs across days or menu items, while others adjust their PARs according to anticipated customer demand.

other buffet styled stations a primary cause of waste as each product had to be dumped at the end of each meal time.

Causes and barriers

A primary cause of wasted food, as discussed earlier was **over-production** in response to concerns of running out. This was particularly a problem because of the irregular flow of customers, with peaks not only around meal times but after class periods. Staff said they would generally prepare enough for a rush but if it was larger than anticipated they would quickly fire (cook) more, sometimes firing more than necessary.

This speaks to the second major cause of wasted food: **variable customer demand**. Staff indicated that not only does meal attendance vary significantly hour-by-hour, but also it varies day to day. Furthermore, staff said, the first few weeks of every academic year were the most difficult, as students were figuring out what their schedules, meal time preferences and taste preferences were.

The beginning of each academic year was also particularly challenging because of **high employee turnover and inexperienced staff**. The executive chef said that they hire at least 20% new staff at the beginning of each academic year, which, compounded by a hectic and volatile consumer environment, made it difficult for all staff to be fully trained in the business' policies, procedures and waste prevention practices. Furthermore, new staff were less likely to have intuition around meal-time rushes or student taste preferences that more experienced staff indicated helped them manage production amounts more effectively.

A lack of staffing and a shift towards other priorities during hectic times of the academic year also meant the **business did not always utilize their standard waste tracking system**. The chef said that they utilize waste tracking depending on season, staffing and managerial expectations. A lack of waste tracking, specifically overproduction tracking, may inhibit the business's ability to match PARs, or production planning, with customer demand.

Existing prevention strategies

The business already deployed a suite of waste prevention best practices. First of all, management set an **expectation that each station should run out of food** towards the end of meal time. Unlike many food service institutions, employees said, management would rather have too little food at the end of a meal than too much. Station leads appreciated this sentiment, because they knew that as long as they produced their target production amount (their PAR) they would not be criticized for running out.

Staff said that managers were able to set expectations well because of **daily all-staff meetings** where they discussed expected customer attendance, any irregular events that might influence attendance, and strategies for PARs planning depending on the full suite of menu items. For example, the grill station chef said that managers will tell him to lower his PARs if something very popular was on the menu at another station. Station leads also benefited from **daily end-of-shift check-ins** with managers where they discussed production amounts and PARs. **Collaboration and communication across stations can be rewarding for employees, while allowing businesses to achieve stronger bottom line benefits.**

The business also used a few strategies to **encourage the re-utilization of overproduced or soon-to-expire food and trim product**. First, a few of the station cooks indicated, management set strong expectations to re-utilize food. Second, the business set up a dedicated refrigerator space in the walk in for potentially re-utilized ingredients and over-production. Third, standard practice, when possible, is to keep proteins separate from sauces before serving so they could be re-utilized. Finally, every Friday was, according

to staff, “leftover day” - where all proteins saved from earlier in the week were used as the base of menu items.

Finally, this business has a unique waste prevention practice that, while difficult to replicate elsewhere, is important to note. This particular cafeteria has a long-standing **student-run leftover-sharing program**. This particular program operates quite simply: students who have food leftover on their plate after eating leave their plate at a large table by the dish return for other students to eat. The program is well utilized and students can be seen standing at the table eating from various plates throughout meal times. Staff clear the table of all plates and leftovers once every hour or so to decrease the likelihood of spreading illness. A social rule, displayed as part of “Commandments” prominently posted on the wall behind the table, is also in place to discourage students who are or who have recently been ill to participate. In regards to full food utilization, staff believed this program significantly reduced uneaten edible plate waste. Furthermore, some staff indicated that they used the leftovers table as an impromptu survey of menu item desirability. If they saw a lot of an item uneaten at the table they knew students did not care for it.

Potential prevention strategies

Staff shared a few prevention strategies they thought would help promote waste prevention. First, one staff thought that while flexible menu items allowed for better re-utilization practices and supported a more creative process for chefs they thought that **more stable menu offerings** could help the business predict demand more accurately. They noted that new or different menu items were the hardest to predict and often either sold out or went mostly untouched by students.

A few staff indicated that **production logs** would be helpful for station leads to better plan for production amounts, day-to-day variability and menu item popularity. They said they might also help management set PARs to better reflect consumer demand.

Finally, one staff member suggested that **managers could solicit more staff input** during group meetings or one-on-ones. They said that **staff collaboration could help the team better plan** for rushes and irregular events, giving the opportunity for long-time staff to share their knowledge and intuition with junior staff.

First and second waste assessment results

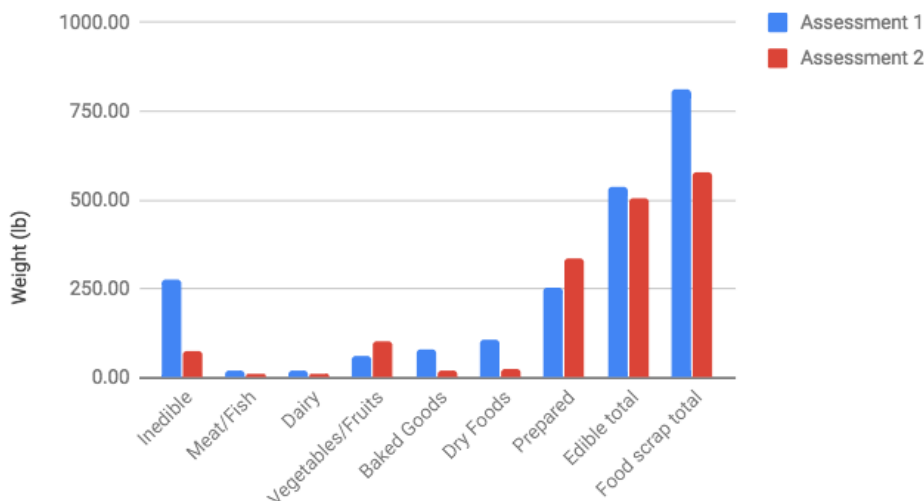


Figure 1. Waste assessment results for back and front-of-house combined, for both the first and second assessment, represented by category.

Recommended practice

All four weeks of the Waste Awareness Campaign were successfully deployed, from October 30th until November 27. Staff measured and recorded food scraps (using the red-yellow-green methodology previously discussed) for the entirety of the campaign, except for the Thursday of week four because the kitchen was closed for Thanksgiving. Because of the closure, and because attendance (and production) was significantly lower during the days preceding and after Thanksgiving, week four data was not used to analyze the effectiveness of the practice.

Analysis of the results suggest that neither trim waste nor inedible waste were reduced over the length of the campaign. However, **results indicate that overproduction and spoilage waste decreased over time.** This suggests the campaign helped to reduce over-production, however the point-in-time waste sort results do not reflect this.

Analysis and Conclusion

Key causes and barriers to full food utilization

The waste assessment and waste tracking records support many of the waste sources and causes staff discussed during interviews. Primarily, **overproduction** and buffet waste appeared to be a significant problem, even as the Waste Awareness Campaign came to an end. While it is likely this was caused in part by overly generous PAR setting, it was likely exacerbated by **variable consumer demand** and unpredictable rushes, causing prepared food to go uneaten or staff to frantically prepare extra to meet perceived demand only to have attendance drop. Finally, **chronic staffing issues**, like high turnover rates, reliance on student employees, and summer layoffs, likely leads to some undertrained or inexperienced staff and limits the business' perceived or real capacity for waste prevention work.

Analysis of recommended practice

Waste tracking results suggest that the Waste Awareness Campaign was moderately effective at reducing overproduction waste, which reduced recorded wasted food overall. However, this relationship was only moderately strong, suggesting that **waste awareness, tracking and employee engagement can only be a part of a broader waste prevention strategy.** Results from the researcher-conducted waste assessment suggest that a substantial amount of edible wasted food was still generated after the campaign and that waste tracking data may have underreported waste totals.

Together, this data suggests waste tracking and employee engagement may be impactful but can only do so much to prevent the wasting of food. This challenges a common theory of change that awareness and information alone can change behaviors. Also, waste tracking data needs to be integrated into food purchasing and production decision making practices. **Education and tracking tools need to be deployed alongside structural changes.** For example, moving towards cook-to-order operations towards the end of

meal times, cooking smaller batches generally, or setting stronger expectations to run out of food towards the end of meal times combined with PAR reductions.

Finally, this case study demonstrates some difficulties in analyzing the effectiveness of waste prevention practices. Both methods of measurement here, **researcher-led point-in-time waste assessments and employee-led wasted food tracking done over time, have strengths and weaknesses.** The waste assessments can be more objective measures of wasted food production because they observe all wasted food produced whereas waste tracking practices may miss some because of non-compliance by staff. However, not as many data points can be collected to assess change over time. Waste tracking provides more data points, allowing more observations over time, better capturing day-to-day variation. However, its accuracy depends on the full compliance of several people whose primary responsibility is not tracking nor research.

Conclusions and additional opportunities

The results of this study suggest **routine employee engagement around waste prevention, bi-weekly best practice trainings, and routine waste tracking together may act as an effective strategy to promote waste prevention and wasted food prevention.** However, significant edible wasted food was still generated during and after the Waste Awareness Campaign was deployed. This suggests **continued and expanded efforts are necessary** and would likely require tools beyond employee engagement and education, such as looking at the business' purchasing policies, production procedures, menu items, etc.

Furthermore, it is unclear, in this case, whether or not reductions were caused by improved waste prevention practices or lax measurement behaviors. This suggests better mechanisms should be in place to ground truth tracking practices. For example, **tracking data, should be corroborated with other data sources for disposed food, such as total weights of compost collected by waste haulers.**

Future efforts to verify the accuracy of continuous waste tracking practices would benefit from a few different approaches than those used in this case study. First, multiple days of data collection need to be compared. Second, instead of utilizing detailed waste assessments, which require more labor and convenience samples to be feasible, simple weight or volume measurements of all food waste would work. For example, use waste hauler data to compare total food waste hauled to total food waste recorded. If hauler data is not available (like in this case study), waste weights or volumes could be recorded during the intermediate stage between waste generation and tracking (at specific stations, for example) and disposal. Generally, kitchens have a few larger totes to consolidate food waste in the kitchen before disposal to compost or landfill. These could be weighed or their volume estimated to compare to recorded totals. **This practice would require less staff time and allow for a more accurate assessment of tracking accuracy.**

Future waste prevention work could also benefit from a stronger structural approach, such as implementing **policies that encourage staff to let menu items run out, reducing PARs** across the board by reducing the amount planned per person expected, or **changing menus** to support full utilization, **combined with employee engagement and behavior change strategies.** Another long-term strategy, discussed by some staff, is creating and supporting routine opportunities for **staff at all levels to share their insights, difficulties and successes** related to prevention practices, customer demand patterns, and customer taste preferences. Staff also suggested that having a system of **mentorship** so junior staff can learn from senior staff could improve planning for waste prevention.

Appendix

Waste collection and sorting processes

Initial collection and sort

Wasted food for the study was collected from two 4-yard compost dumpsters from a 24-hour period in October 2017. Of the two dumpsters, one was approximately 60% full, the other 15% full, both approximated by visual estimate. The use of visual estimates does introduce some uncertainty and error, which should be considered when weighing the validity of the assessment data.

Four CES staff sorted 100% front-of-house and a 50% sample of back-of-house waste that accumulated during a 24-hour period using 11 categories, defined in Table A1. A stratified sample of one end section of the compost dumpster approximately two feet deep to bottom of dumpster was scooped and collected into yellow bins. Back-of-house waste was more combined and less stratified making for more difficult identification. Most samples captured were separated by visual estimation into the dry category, because of the presence of noodles and rice, the prepared category, because of the presence of stir-fry ingredients, and the inedible category, because of the presence of stock ingredients and prep waste. These visual splits were assessed only when complete separation was not possible because of thorough mixing of wasted food products.

Process for post-intervention sort conducted on-site of business

A similar process used for the initial sort was used in the post-intervention sort. However, waste present in the two 4-yard dumpsters was from a 5-day period and back-of-house and front-of-house waste was combined. Both dumpsters were nearly full. One dumpster was sampled, representing 20% of the dumpster, amounting to 50% of a day's food waste.

Table A1: Waste sort categories and definitions

Categories		Definitions	Examples
1	Inedible	Items not intended for human consumption (small amounts of edible material associated with the inedible material are permitted to be included)	Egg shells, banana peels, pits/seeds, bones
2	Meat & Fish	Uncooked or cooked meat (with mostly edible components) unmixed with other types of food	Chicken drumstick, salmon fillet
3	Dairy	Solid dairy products unmixed with other food types or in original form	Cheese, yogurt
4	Eggs	Egg products unmixed with other food types or in original form	Fried egg, whole eggs, liquid egg whites
5	Fruits & Vegetables	Solid uncooked or cooked vegetables and fruits (with mostly edible components) unmixed with other types of food	Potatoes, spinach, berries, salad with only vegetables
6	Baked Goods	Baked goods and bread-like products unmixed with other food types or in original form, including pastries	Bread, tortillas, pastries
7	Dry Foods	Cooked or uncooked grains, pastas, legumes, nuts, or cereals unmixed with other food types or in original form	Rice, cereal, pasta
8	Snacks, Condiments, Sauces	Includes confections, processed snacks, condiments, and other miscellaneous items	Condiments, candy, granola bars, sauces, jellies
9	Liquids, Oils, Grease	Items that are liquid, including beverages	Sodas, milk, oil, juice
10	Cooked or Prepared Food	Items that have many food types mixed together as part of cooking or preparation	Lasagna, sandwiches, burritos
11	Unidentifiable	Used only if necessary	

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Waste assessment results

The raw results of the waste assessment (the actual weight of waste measured) were prorated according to the percent of total waste visually estimated to have been sorted. Accordingly, the data reported here (see, Table A1) are estimates of 100% of the business' daily food waste generation.

Table A2: Combined front and back-of-house waste assessments, pre- and post-practice

	Pre-practice (lb)	Post-practice (lb)	Difference (lb)	Difference (%)
Inedible	274.69	72.50	-202.19	-73.61%
Meat & Fish	20.28	11.50	-8.78	-43.29%
Dairy	19.07	10.40	-8.67	-45.46%
Vegetables & Fruits	61.28	101.54	40.26	65.70%
Baked Goods	78.44	18.90	-59.54	-75.91%
Dry Foods (Grains, Pasta, Cereals)	107.65	26.40	-81.25	-75.48%
Snacks, Condiments & Sauces	0.68	0.00	-0.68	-100.00%
Liquids, Oils & Grease	<.01	<.01	<.01	<.01%
Cooked, Prepared, Leftovers	251.46	336.70	85.24	33.90%
Unidentifiable	<.01	<.01	<.01	<.01%
Edible wasted food (lb)	538.86	505.44	-33.42	-6.20%
Edible wasted food (% of total food)	66.24%	87.46%		21.22%
Total food scrap waste (lb)	813.55	577.94	-235.61	-28.96%

Statistical analysis of waste tracking data

A linear regression model was used to test the relationship between waste recorded by staff over time. A significant relationship would mean waste increased or decreased over time. Only the waste records for the first three weeks of the four-week campaign were used because the fourth week included Thanksgiving, which significantly impacted attendance and operations. Four regression analyses were conducted, one for each of the measurement groups (red, yellow and green) and one for total waste recorded.

Two of the regression results suggested a statistically significant relationship. First, the total amount of waste was negatively correlated with time, **meaning overall waste decreased over time**. Second, the red measurement group (overproduced and spoiled food) was also negatively correlated with time. Both the yellow (underutilized or potentially repurposed food) and the green (fully utilized or inedible food) categories showed no statistically significant change over time.

While the red measurement group and the total waste recorded were found to be significantly negatively correlated with time, the strengths of their relationships were fairly low. The red measurement group had a $r = 0.328$ ($p = 0.007$) suggesting 32.8% of the variability in waste production could be explained by progress over time. There was no statistically significant relationship for the yellow and green groups. The total waste category had a r value of 0.200 ($p = 0.042$). It is likely that the total waste negative correlation is mostly due to the reduction of the red category over time.

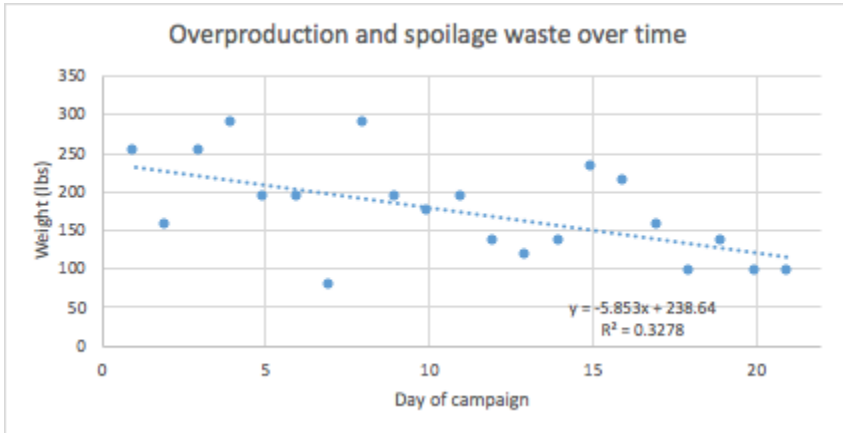


Figure A1: Overproduction and spoilage waste (red measurement group, $p = .007$)

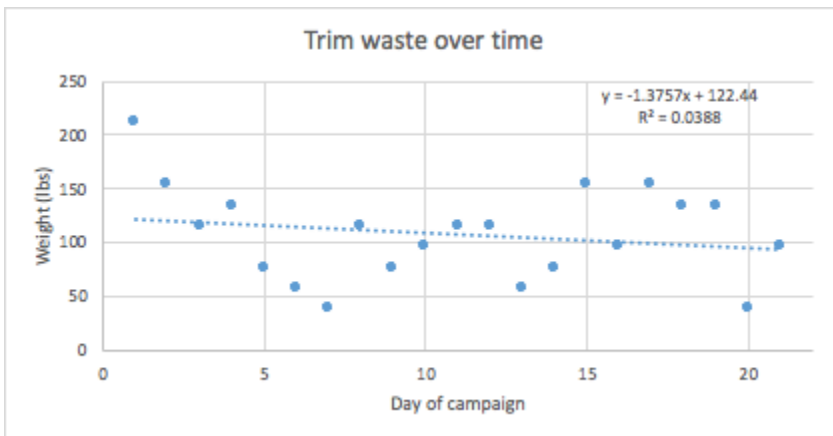


Figure A2: Trim waste (yellow measurement group, not significant)

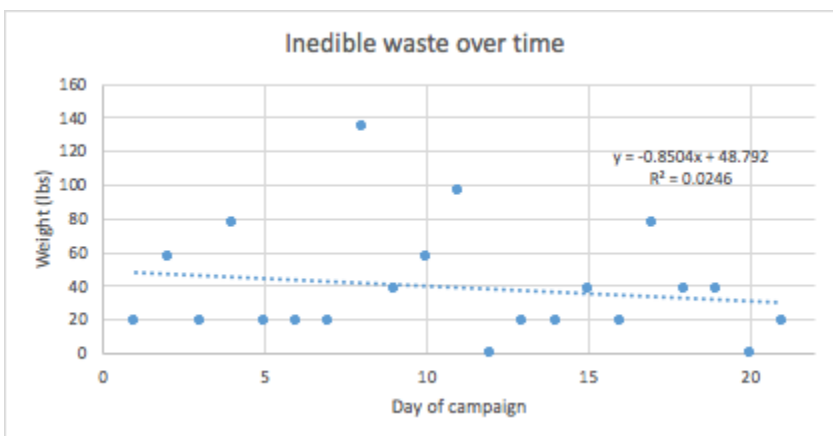


Figure A3: Inedible waste (green measurement group, not significant)

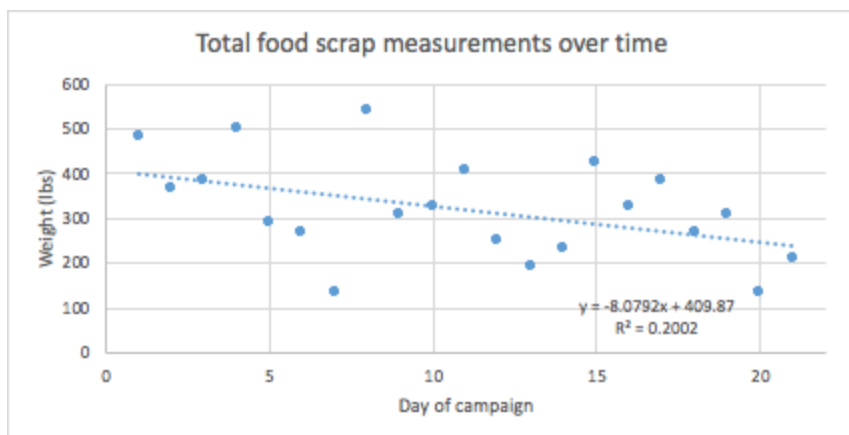


Figure A4: Total food scrap waste (all measurement groups, $p = .04$)

Conformance to Food Loss and Waste Reporting Standard

[The Food Loss & Waste Protocol](#)² is a multi-stakeholder partnership, which has developed the global Food Loss and Waste Accounting and Reporting Standard – also known simply as the FLW Standard. Launched in 2013, the Food Loss & Waste Protocol’s mission is to ensure wide adoption of the FLW Standard so companies, governments, cities and others are better informed about food loss and waste and motivated to curb this inefficiency.”

The graphic below describes the scope of Case Study 4 of the institutional and commercial sector assessment of the Oregon Wasted Food Study using the FLW Standard.

Food loss + waste protocol

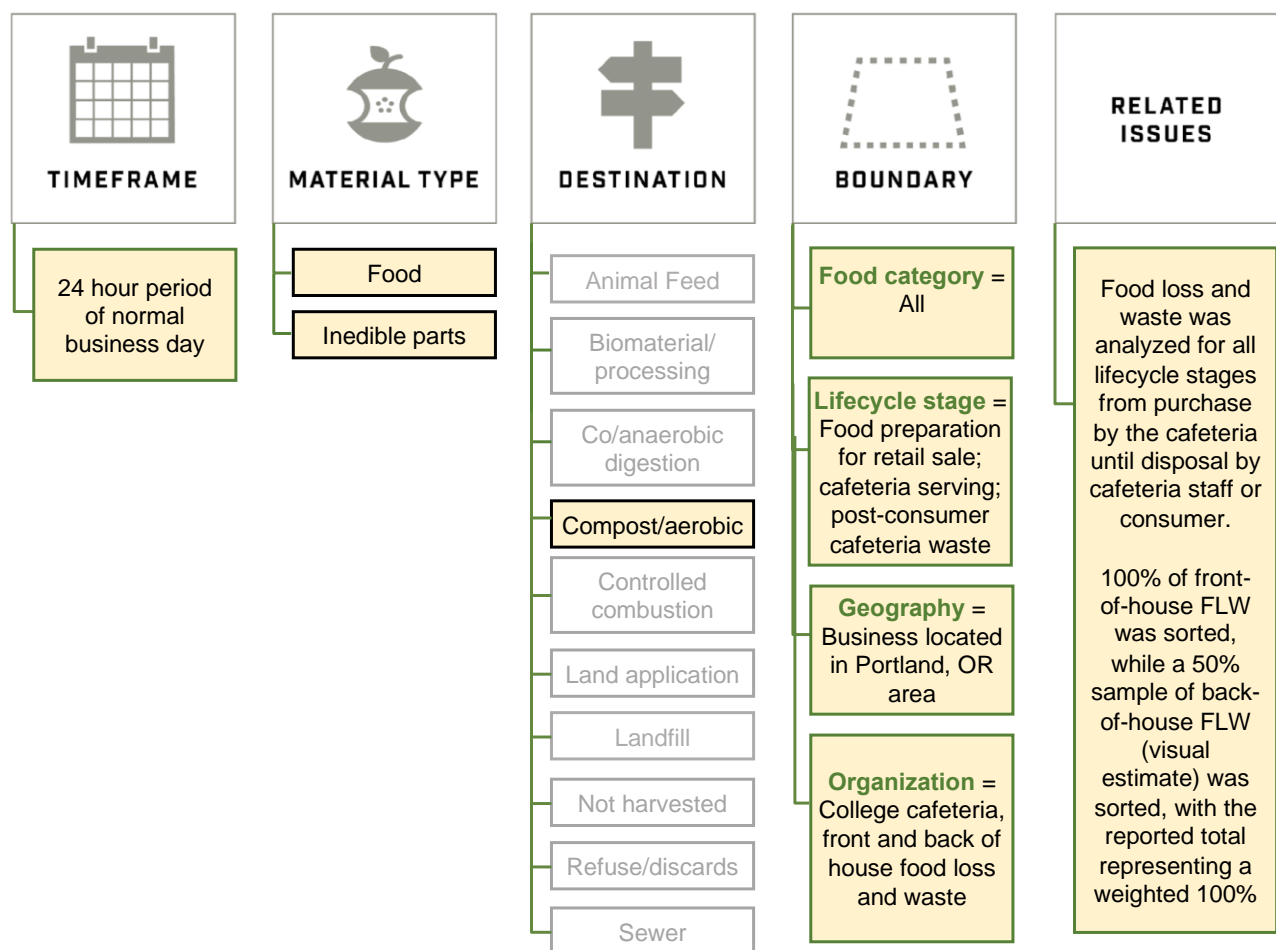


Figure A5: Scope of Case Study 4 as relates to the Food Loss and Waste Reporting Standard

² See, <http://flwprotocol.org>