Oregon Wasted Food Study: Institutional and Commercial Sector Case Studies

Case 3: Tracking overproduction and leftovers 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 sought to understand the major types and causes of wasted food in an institutional dining operation. It also tests the effectiveness of **tracking production and leftover food as a tool for reducing food loss.** Initially, this case study was set to test a comprehensive waste awareness campaign, like that tested in case study 4. However, the business was not able to conduct the campaign because of understaffing and changes to management. Researchers worked with the business to create an alternative practice that more narrowly addressed the most prominent cause of wasted edible food uncovered through the waste assessment and interviews - overproduction. While additional practices were discussed to quantify and reduce overproduction through reductions in planned production, the use of smaller batch sizes, and improved repurposing practices, the business decided to focus first on production tracking because it was do-able with their limited staff capacity.

The recommendation was to implement a system of production tracking to support more accurate production planning and use of periodic automatic replenishing (PAR) systems and the prevention of overproduction. **Each day, staff recorded product names, prepared quantities, and leftover amounts**. This data was then used by the manager to adjust ordering and production.

Business context

This case study is of a college dining hall in the Portland area. It serves between 1,500-5,000 meals per day, including breakfast, lunch and dinner. It is managed by a food service company with a national presence. This dining hall operates as an all-you-care to eat buffet with independent stations serving a range of food options.

We found that 54.7% of food wasted back-of-house and 96.32% front-of-house was edible. A follow-up assessment of back-of-house food waste showed that 48.39% was edible food. For nearly 30% of dishes served some level of overproduction occurred, meaning a portion of what was produced went unserved. Food was overproduced, on average, at a rate of 10.16% of the total food produced.

Methods

The study was conducted over a six-month period from August 2017 through January 2018. It included employee interviews, a waste assessment, a wasted food tracking practice, and a cost/benefit and environmental impact analysis. 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

Six employees were interviewed for this study. These included the waste programs manager, the executive chef, a manager, the front-of-house supervisor, a breakfast lead chef and a dishwasher. Initial interviews were all conducted on the same day in August 2017. The manager was also interviewed after the practice was implemented in March 2018.

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 assessment

Researchers sorted 33.3%, by weight, of the business' back-of-house food scrap waste generated during a 24-hour period of regular business in September 2017. A follow-up assessment was conducted in April 2018, with approximately 77% of a day's back-of-house food waste sorted. Results reported are prorated to represent 100% of the business' daily, back-of-house food waste. Full description of waste assessment methods are provided in the Appendix.

Recommended practice

The recommendation was to implement a system of **production tracking to support more accurate production planning and the prevention of overproduction**. Each day staff recorded the date, station, product names, prepared quantities and unit types, as well as leftover amounts and unit types. Buffet waste was not recorded, only unserved prepared food. The practice was deployed consistently on weekdays from January 18 to February 28, with additional recording done on March 8, 12, and 13. Data was not recorded at all stations, but consistently collected at four stations: the allergy conscious buffet station, the grill, a separate grab-and-go location with limited buffet offerings, and an entree station.

Staff indicated limited capacity to enter paper tracking sheets into a computer program, so researchers recorded data on a bi-weekly basis and sent the compiled data back to managers for use. Managers were also unable to provide researchers with meal attendance data, though the reason was unclear.

Results

Waste assessment

Initial assessment

Total daily back-of-house foods, edible and inedible combined, weighed 633 pounds. The back-of-house audit found **inedible parts** of food were the largest category of waste, with the second highest category of wasted food being **edible prepared foods**, defined as foods that of mixed categories such that they can't be separated, e.g. burritos, pizza, or lasagna. 239.8 pounds of mixed, prepared foods comprised primarily of over-prepared salads, beans, rice, pastas and other salad or hot food buffet components and ingredients. For a full accounting of assessment results, see Table A2 in the Appendix.

Follow-up assessment

Total daily back-of-house wasted food weighed 665 pounds, with **inedibles** comprising more than half the total at 51.61%. Other major categories included **cooked meat** weighing 87.39 pounds (27.24% of edible wasted food), of which 56 pounds was cooked pork. The **prepared food** category weighed 144.91 pounds or 45% of edible wasted food.

Some substantial changes from the pre-practice assessment to the post-practice assessment were found. The total amount of food waste differed by only 12.88 pounds, or an increase of only 1.97%. The most significant differences could be seen in the edible meat and fish category which rose 580%, from 12.85 pounds to 87.39 pounds, primarily due to a single large overproduced batch of pulled pork. The baked goods category rose as well, from 3.09 pounds to 10.48 pounds (or 238.9%). Finally, the edible cooked and prepared category saw a significant decrease of 94.85 pounds (or 39.56%).

Interviews

Sources of food loss

Both front- and back-of-house staff indicated that the major sources of wasted food were: 1) **plate waste**, 2) buffet waste, specifically **food left on the buffet line that was discarded at closing**, and 3) **over-production**, though some of this food was able to be repurposed.

Causes and barriers

Interviewees shared five key causes of waste and barriers to its prevention. These include (1) expectations for bountiful presentation, (2) customer self-serving, (3) labor shortages and high turnover, (4) variable customer demand and (5) poor production planning.

Expectations that buffet serving dishes be full at all times, set by the cafeteria's parent company, was noted as a key cause of waste. Staff said that this practice exacerbates buffet waste because it does not allow them to partially stock or run out of product towards the end of meal times. This means full to partial buffet serving dishes of each menu offering are being discarded at the end of each meal. As discussed below, this expectation is challenged by some staff at this particular location. The extent of this non-compliance with company policy is unknown.

The **buffet's self-serving format** leads to higher amounts of plate waste than other models. This was especially a problem at peak hours when students would line up and wait 5 to 10 minutes to get their food. This, staff said, encouraged students to take larger than necessary portions to avoid going back through the line. Occasionally the cafeteria staffed servers at high-value items, but its ability to do so was limited because of staffing shortages.

Labor shortages and high turnover were especially problematic, causing higher waste and limiting capacity to prevent waste. Labor shortages meant limited ability for buffet servers, less staff time dedicated to planning, and staff filling roles they were not trained for or familiar with. High turnover contributed to a loss of institutional knowledge, and fewer skilled and trained staff who were familiar with the business' operations and unique clientele, which was especially a problem in this type of dynamic food service environment. While labor shortages and turnover are problems industry-wide, school cafeterias, including this one, have particular challenges. First, they are only open 9 months of the year, meaning most staff are laid off in the summer months. This not only makes hiring more difficult, but makes hiring towards the end of the school year nearly impossible. Second, university cafeterias often incorporate student workers into their staff, who may only work one or two years, which leads to high turnover and fewer well-trained staff. Management indicated that chronic understaffing was not due to lack of available funds, but rather, due to the difficulty of filling positions and retaining existing staff.

Cafeterias also struggle because of **variable demand**, both in terms of customer numbers and consumer taste preferences. Staff said that meal attendance may fluctuate as much as 200 meals from day to day. Furthermore, a long-time dishwasher said that she observes variation in student taste preferences from year to year. For example, some years, there are more requests for spicy food while other years students throw away food if it is too spicy.

Finally, food loss is caused by **limited production planning and record keeping**. Staff indicated that, generally, station leads used production numbers from the day before to plan for the day's production amounts. In addition, the previous week's meal counts were posted on a bulletin board for use by staff. Little guidance was given to the staff we talked to in terms of what to expect for meal count (i.e. if there was a special event that might alter meal counts, or if daily/weekly trends were present). The impacts of poor production planning included both under-preparation, followed by frantic over-preparation to keep menu items on the buffet, and overproduction outright. At the institutional level, PARs were set by the executive chef, for example, 120 pounds of meat protein per meal. But these PARs were not adapted by day of the week or week of the school year. Furthermore, no records of production were kept, so station leads had no way of observing trends in under- or over-production over time.

Existing prevention strategies

Staff currently deploy a range of measures to prevent the wasting of food. These include strategies to encourage the re-purposing of food, occasional staffed servers at buffet stations, and a flexible interpretations of company policies related to buffet serving practices.

The company has **flexible recipes** and expectations that staff adapt recipes to use edible and properly stored over-prepared food, e.g., extra, not-yet-served chicken breasts. The soup program also runs almost entirely by using re-purposed food. Staff also follow best practices to ensure the ability for re-purposing - for example, they **keep proteins separate from sauces when able**.

When they are able, managers try to **staff servers at busy or high-value stations** to serve appropriate and consistent portions, which helps reduce plate waste and enables better production planning. This practice

occurs only when staff capacity is available, which is not often. Finally, staff at this particular location reduce wasted food by **partially filling buffet trays towards the end of meal times**. Though company policy is to keep the trays full and "bountiful" for the entire service time, staff at this location adapt these rules to reduce waste.

Potential prevention strategies

Staff discussed three opportunities for wasted food reduction. First, they talked about the value of **student waste awareness campaigns** or visual displays (which the cafeteria had done in the past) and its perceived effectiveness at temporarily reducing plate waste. Second, staff thought they could do a better job **planning menus and offerings** to make the food more desirable and to better match student tastes. They said the kitchen staff could be more receptive to these changes. Finally, staff mentioned that the walk-in **refrigerator could be re-organized to promote the use of re-purposed or open food items** (i.e. by placing them at the front of the walk-in or on a highly-visible shelf).

Recommended practice

Production quantities and leftovers were recorded for at least one station for 34 days between January 18, 2018 and March 13, 2018. Leftovers, here, meant only unserved food. Items placed on the buffet that remained at the end of a meal service were not recorded. Quantities were mostly recorded on weekdays, though the business was in operation during the weekends. The tracking results demonstrated significant overproduction was occurring, with overproduction recorded in 71 out of 241 records (a record being one menu item prepared on a given day), or 29.5% of the time. Overproduction ranged from 0% to 100% of the product prepared, with an average overproduction of 10.16%.

Analysis of results suggest no statistically significant reduction in overproduction over time or between days of the week. Additional details can be found in the Appendix. However, qualitative data suggests that with modification, this tool could reduce food loss, and that it affected ordering to reduce waste.

Post-practice interview

Interviews with management post-practice suggested the tracking practice was helpful, but burdensome. A manager said they used the data to justify a change of offerings, deciding to discontinue serving barbecued meats at one of their stations because they were was routinely thrown away. The manager also said they used the data as a tool to reinforce target PARs, helping **cooks avoid fear of running out by showing them patterns of leftovers**.

While the practice was understood to be useful, staff also said it was labor intensive. This was in part because the production tracking was not shared across employees, but rather, completed by a single manager on top of her normal workload. They **cited inadequate staff capacity and under-training as critical barriers** to having more staff take on tracking responsibilities. This model, staff noted, is not sustainable long term given existing constraints.

Analysis and Conclusion

Key causes and barriers to full food utilization

Buffet-style serving

While not explored in depth in this case study, front-of-house waste (plate waste) was a significant portion of the wasted food generated at this business. Employees indicated that this waste is reduced when servers are present on the buffet line, students are made more aware of their waste through waste awareness events and when waiting lines remain short. Alternatively, moving away from the all-you-care to eat model could alleviate some of this unnecessary plate waste.

Weak production planning

The waste sort, recommendation data and interviews suggest overproduction is a significant cause of wasted food. This appears to occur both because of variable consumer demand and inflexible PARs. Furthermore, over-preparing because of frantic preparation of food as a product gets close to running out also causes overproduction waste. While some of this product is re-purposed, the waste sort and interviews suggest much of it still goes to waste.

Expectation of abundance

Employees also cited that the company's expectation of abundance was a key driver of wasted food. While they had recently reduced the sizes of serving dishes, they still composted significant amounts of food at the end of each meal since many dishes were kept full or close-to-full. This phenomenon was documented in the waste sort, as well.

Labor shortage

A cross-cutting issue that both causes wasted food and prevents reduction is the chronic and acute labor shortages this business experiences. This leads to a higher prevalence of under-trained staff because the business had to rely on temporary employees, less familiarity with and inconsistent application of policies and a limited ability to apply wasted food prevention techniques, including serving. Chronic understaffing appeared to be caused by difficulty filling positions, primarily due to the 9-month term of employment, as well as difficulty retaining current employees, many of whom were students.

Analysis of recommendation

While it is unclear whether or not tracking overproduction decreased wasted food over time (the results were not statistically significant), staff indicated that the tracking process was a helpful tool. Post-practice interviews suggested the data gathered from the tracking practice informed decisions to change offerings and was used to encourage staff to stick to PARs and avoid frantic preparation. The **inconsistency of tracking, though, generally made it challenging for staff to utilize data to make menu-item specific PAR modifications**.

Future production and leftovers tracking could be improved in a few key ways. First, **staff time needs to be budgeted for tracking, data entry and analysis and periodic review**. Deployment of this particular practice relied on a single staff person for tracking, and researchers for data entry and analysis. Second, future tracking efforts may benefit from a **more targeted system of tracking**. For example, using limited staff

capacity to record **only protein production and leftovers** could maximize an institution's cost-savings and carbon-emissions reductions and avoid burn-out. Finally, tracking will be most successful if it is accompanied by an institutionalized and **iterative process for feedback**. The data collected needs to be routinely operationalized and used by management and cooks alike to adjust PARs or highlight key opportunities for re-utilization. Examples could include a review of production data during end-of-shift or weekly check-ins with station leads. **Worker empowerment**, including operations staff in making menu and ordering decisions, and **using data to make more resource efficient business decisions** seem to be key ingredients for success.

This case study raises questions about systems of tracking and their relative effectiveness. The practice deployed here was low-tech and had low upfront barriers to implementation. However, as noted, high labor demands during deployment hindered its uptake and accuracy. While more advanced kitchen and business management systems, often integrated into point-of-sale systems, benefit from easier use and built-in analytics, these have higher upfront and often continuous financial costs. **Businesses should decide what system works best for their needs, a more targeted low-tech approach or a more versatile and robust tracking system**.

Limitations

This case study took place in a particular environment, an all-you-care-to-eat buffet style cafeteria on a college campus. Unique labor issues related to the academic calendar may not apply at year-round businesses. That said, many issues that arose may be more broadly applicable to other cafeterias and or businesses with buffet style serving.

The recommendation tested also had limitations when put into practice. For example, only one employee took charge of recording PARs and overproduction, which contributed to inconsistent tracking of stations. This inconsistency inhibited researchers and staff from conducting a more targeted and quantifiable reduction of PARs.

Conclusion and additional opportunities

This study suggests that production and leftover tracking has the potential to be a foundation for meaningful wasted food prevention work. However, it also suggests that the **practice's impact is limited if (1) it is not done constantly or correctly, (2) is not integrated into regular systems of feedback and (3) if staff capacity is limited**. Production tracking could be deployed alongside a robust analysis of sales data to understand daily, weekly and quarterly patterns in customer demand. Together, **overproduction data and sales data could better inform dynamic PAR setting that accounts for variable demand**.

Production tracking could be more effective and less burdensome if deployed in a periodic but targeted fashion. For example, tracking protein production and leftovers one month every quarter to use to adjust PARs and menu offerings may be an easier lift for many food service institutions and might lead to more constant data collection and a more intentional use of data. Production and leftover tracking may not be an appropriate priority in situations with labor shortages and inadequate staff training. In some cases, tracking may distract from critical operations or necessary staff training to encourage proper preparation and serving techniques, which themselves may be important food utilization practices.

This study also demonstrates the limitations of using point-in-time or day-over-day analysis to understand patterns in a context with high day-to-day variability. This was present in two ways. First, a point-in-time waste assessment has limited ability to track progress over time. Rather, the strength is in its objectivity,

assessing the level and composition of wasted food at any given time. Second, it appeared that the day-to-day and week-over-week production planning used by the business also failed to adequately capture sales trends and led to high levels of overproduction.

The business discussed here could also benefit from a suite of other practices that would support the prevention of wasted food, lower demands on labor and increase cost savings. First, the business should **prioritize hiring and retaining servers**, especially from the student population. Servers, especially for high-value items, were thought to be critical in reducing plate waste and stabilizing some variability in product demand, according to business employees. The cost savings from the reduction of wasted food (especially proteins) could potentially cover the wages of these positions. Another option could be to use **smaller serving utensils** to promote more appropriate sized portioning by students themselves. Finally, **reductions in plate sizes** support smaller portions - one study found that it led patrons to take smaller portions at self-serve buffets and eat less food, leading to less food being wasted[1].

Another way to reduce buffet waste is to **change company policies around abundance** and allow buffet serving dishes to run out towards the end of meals. This could be supplemented by an expanded cook-to-order menu to ensure customers still have food options.

Production waste could also be avoided by **improving processes for repurposing**. Staff indicated that while the soup program was highly successful at using repurposed product, other stations were less likely to plan around these ingredients. Stronger policies around repurposing, more adaptive menu designs, and walk-in refrigerator reconfiguration could support more widespread implementation.

Finally, the business could benefit from a more **in-depth and routine analysis of sales data** in order to better forecast hourly, daily and weekly customer trends. This data could better inform more dynamic PARs rather than relying on day-over-day or week-over-week comparisons to inform PARs.

[1] Wansink, B., & Van Ittersum, K. (2013). Portion size me: Plate-size induced consumption norms and win-win solutions for reducing food intake and waste. *Journal of Experimental Psychology: Applied*, *19*(4), 320.

Appendix

Waste assessment method in detail

Initial sort process

- Sort conducted on-site in September 2017.
- Wasted food for the study was collected from three 65-gallon food scrap collection roll carts, two identified as back-of-house and one as front-of-house.
- 100% of the contents were weighed.
- 34.93 % of the total contents were sorted.
- Description of food waste sorted:
    - Sources of waste: back-of-house prep
    - Types of waste: vegetable and fruit peels, cores and stems, whole fruits and vegetables, cooked meat, cooked grains, bakery items, prepared and processed foods.
    - Characteristics: carrot, romaine, tomato, lemon, pineapple, watermelon and yellow onion peels and tops/ends, corn cobs, avocado pits and skins, apple and pear cores, buffet salads (beans, grains and diced vegetables), coffee grounds, green salad buffet items (cooked and diced vegetables, diced chicken, croutons, tomatoes, cheeses, etc) cooked broccoli, whole cooked potatoes, scrambled eggs, soy sausages, pizza, breads and rolls, etc.
- Process for sort conducted on-site of business:
    - Four CES staff sorted three 65-gallon roll carts. Each cart was emptied by slowly tipping over, dragging backwards allowing the contents to spread out preserving the general stratification by which foods and other items were placed in the cart.
    - A visually estimated sample of approximately 33.3% was scooped away from the pile vertically, done for each of the three roll carts assessed, capturing a 24-hour representative sample. Two of the three roll carts contained back-of-house waste only. The third roll cart was intermixed with both back-of-house and front-of-house waste indicated by layers that were separated and assessed. Weighing the sample after sorting confirmed it was almost 35% of the total daily waste.
        - Back-of-house waste was identified as vegetable trimmings, prep waste and large volumes of homogenous prepared foods.
        - Front-of-house was identified by layers that included paper napkins and cups, banana peels and small portions or heterogeneous mixes of prepared foods.
        - Prepared foods and single category items were difficult to separate such as beans, pasta or vegetables, as it was unclear whether food items came from the salad bar or from overproduction of other prepared and mixed foods. Accordingly, crossover waste, or waste that potentially belonged in differing categories was present but in minimal amounts.
- Two folding tables were set up adjacent to one another lengthwise with two large low-rimmed black bins on tables and two CES staff per black bin. Roll cart contents were carefully dumped into black bins to facilitate sorting. Numerous yellow bins were placed around the perimeter of the sorting area and labeled with each specific food category for collecting all food items separately.
- Once all foods were sorted and categorized, photos are taken of each yellow bin.
    - All yellow bins are weighed with amounts recorded
    - Tare weights of yellow bins are captured for actual weight of contents

- If present within the food scrap stream, landfill and recycling are also separated into yellow bins during sorting process, weighed and photographed.

Post Intervention Sort

- Sort conducted on-site in April 2018
- Wasted food for this case study was collected from two of twenty full 65-gallon food scrap collection roll carts assessed based on five days accumulation to represent a 24-hour period.
- Roll carts were visually assessed to determine if they contained front-of-house or back-of-house waste, as these were generated in different parts of the kitchen and remained separate. Of the 20 roll carts 13 were from the back of house and 7 were from front-of-house. This suggests that 2.6 back-of-house roll carts of food waste was generated for each of the five days.
- The amount sorted (2 roll carts) was prorated to meet the 2.6 roll carts worth of back-of-house food waste generated per business day. In effect, the sample weights were multiplied by a factor of 1.3 as to represent a full business day's worth of back-of-house waste.
- Back-of-house waste was exclusively represented in this particular assessment
- Description of waste sorted
    - Sources of waste: back-of-house prep
    - Types of waste: vegetable scraps and trim, whole fruits and vegetables, cooked meat, cooked grains, prepared and processed foods.
    - Characteristics: Pineapple tops, trim and cores, watermelon rinds, onion peels, whole steamed cabbage leaves, peppers, oranges, cooked and shredded pork, sliced ham, white rice, cubed and cooked tofu, flour tortillas, and pork breakfast sausages.
- Process for sort:
    - Four CES staff sorted 100% of two full back-of-house 65-gallon roll carts.
    - The process required tipping and emptying the roll carts onto tarps in order to make the contents accessible.
    - Foods were sorted and scooped from the tarp directly into several yellow bins and weighed accordingly.
    - Once all foods were sorted and categorized, photos are taken of each yellow bin.
        - All yellow bins are weighed with amounts recorded.
        - Tare weights of yellow bins are captured for actual weight of contents.
        - If present within the food scrap stream, landfill and recycling are also separated into yellow bins during sorting process, weighed and photographed.

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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Table A2: Pre- and post-tracking, back-of-house waste by category				
	Assessment 1 (lb)	Assessment 2 (lb)	Difference (lb)	Difference (%)
Inedible	286.77	343.46	56.69	19.77%
Meat & Fish	12.85	87.39	74.53	579.82%
Dairy	1.75	0.26	-1.49	-85.11%
Vegetables & Fruits	52.25	24.74	-27.51	-52.65%
Baked Goods	3.09	10.48	7.39	238.89%
Dry Foods (Grains, Pasta, Cereals)	<.01	53.14	53.14	N/A
Snacks, Condiments, Sauces	<.01	1.09	1.09	N/A
Liquids, Oils, Grease	36.62	<.01	-36.62	-100.00%
Cooked, Prepared, Leftovers	239.77	144.91	-94.85	-39.56%
Unidentifiable	<.01	<.01	<.01	<.01%
Edible wasted food (lb)	**346.32**	**322.01**	**-24.31**	**-7.02%**
Edible wasted food (% of total food)	**54.70%**	**48.39%**		**-6.31%**
Total food waste	633.09	665.47		

Statistical analysis

A one-way analysis of variance test was conducted to compare overproduction amounts by day of the week. No significant relationship between overproduction and day of the week was found ($F=0.52$, $p=0.721$).

A regression analysis was performed to test the relationship between overproduction and time. Using all 241 records, no significant relationship was found to exist ($R2 = 0.00004$; p-value = 0.914), suggesting overproduction did not change over time.

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 3 of the institutional and commercial sector assessment of the Oregon Wasted Food Study using the FLW Standard.

[2] See, http://flwprotocol.org

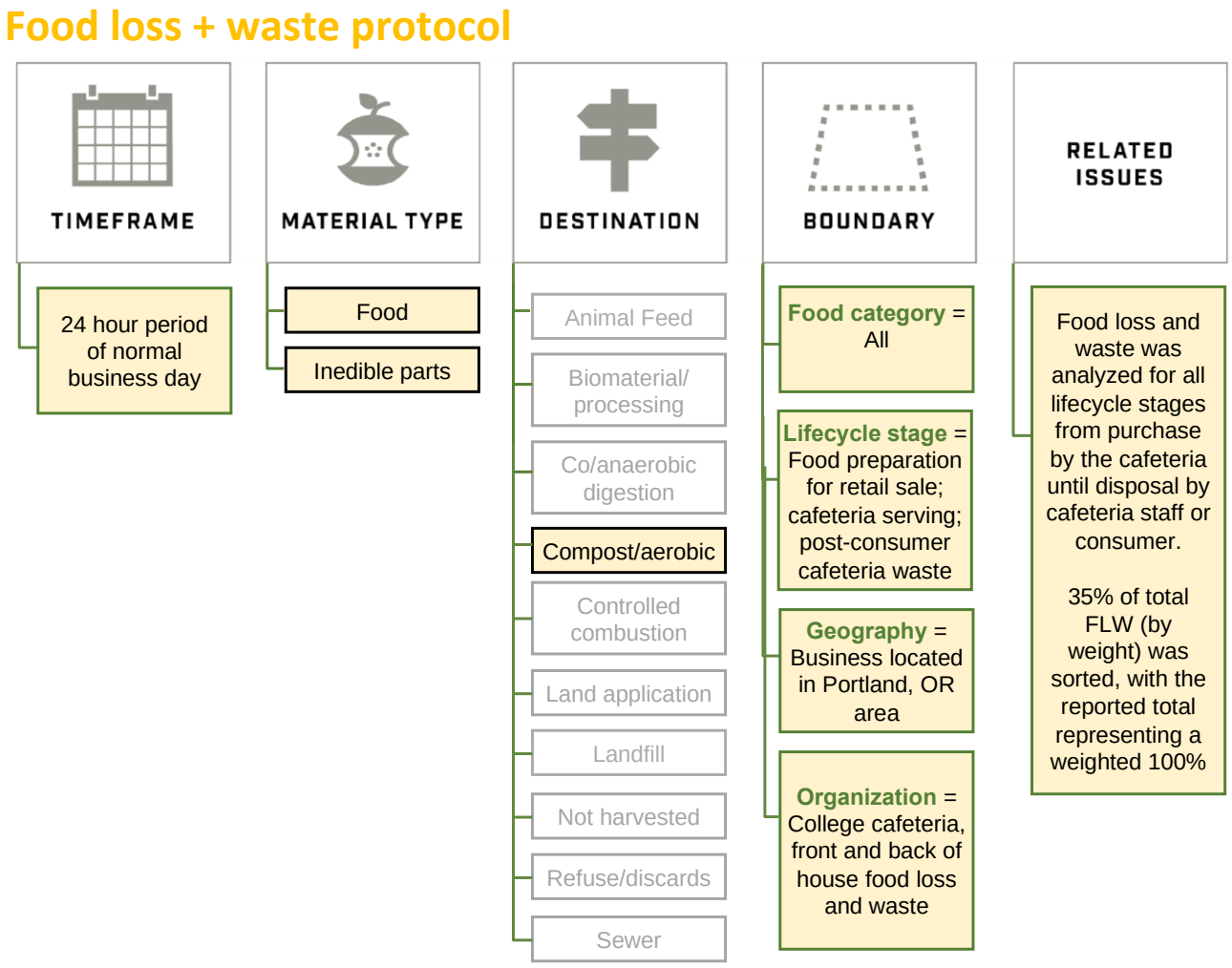

Figure A1: Scope of Case Study 3 as relates to the Food Loss and Waste Reporting Standard