

INFLUENCERS OF SURPLUS FOOD DONATION AT INSTITUTIONS OF HIGHER
EDUCATION

BY

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THESIS

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ABSTRACT

In recent years significant policy attention has been given to reducing food waste, including the practice of donating surplus food. The most recent of these policies was the 2018 Farm Bill which dedicated new funding and public positions to research and reduce the quantity of food waste. Policies come in response to a climate of both waste and hunger in the U.S. In this study, we examine the factors that influence surplus food donation at institutions of higher education (IHE). IHE hold an interesting position in the economy, as they receive both direct and indirect benefits from public services or “doing good”. Like any food service provider (e.g. a restaurant), donating may reduce direct costs through reducing waste disposal, or generate direct funding through tax breaks or grants. But, distinct from other food service providers, IHE may also receive indirect benefits as food donation attracts students, faculty, and staff which in-turn affect institutional goals including revenue generation. These indirect benefits may make them more likely to donate surplus food. Research on food waste in IHE has primarily focused on plate waste. While this is a significant source of waste, it does not address pre-consumer waste or its management. Thus, this study contributes to the literature by considering pre-consumer waste, and in particular, how it may be diverted via food donation at IHE. Institutions from the National Association of College and University Food Services (NACUFS) were surveyed on a series of characteristics including goals, liability and sustainability and waste management practices, including food donation. Results of the study show that not paying to dispose of waste, liability concern and being located in a town as compared to a city are correlated with a decrease in an institution’s likelihood to donate. Being aware of a nonprofit organization that accepts excess food donations increases the likelihood of donation. The findings support the need for attention to liability concerns as purported by others in the literature.

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Chapter 1: Introduction

According to Buzby and colleagues (2014), food loss is defined as edible food which is not consumed for a variety of reasons, including spoilage, cooking loss, and plate waste. The term *food waste* is a subcategory of *food loss* which accounts specifically for edible items that go unconsumed at the retail and consumer level. In the U.S., food loss is estimated to be between 38.4 and 86 million tons per year (Further with Food 2018). The disparity in the estimations is explained by variant definitions of food waste. The Environmental Protection Agency (EPA) defines it as food going to landfills leading to a smaller estimation, whereas the U.S. Department of Agriculture (USDA) defines it as postharvest food not consumed for any reason, leading to a larger estimation (Bellemare et al. 2017). However, even the smallest estimation, 38.4 million tons found by the EPA, represents a significant amount of loss. In line with UN Sustainable Development Goal 12.3, the USDA and EPA set the Food Waste Reduction Goal, which aims to reduce total food waste in the U.S. by 50% by 2030 (USDA 2015).

To help reach the Food Waste Reduction Goal, the EPA initiated the U.S Food Recovery Challenge, a pledge to improve sustainable food management practices, including but not limited to the use and reuse of food. For the purpose of this paper, food recovery is defined as the use or management of food which prevents, diverts, or reduces waste of food that would have otherwise been disposed of in landfills. Surplus food donation, or the donation of surplus food to a nonprofit that feeds people, is one method of food recovery. Over 150 colleges and universities have joined the Food Recovery Challenge to date (EPA, Food Recovery Challenge 2018). However, interest in food recovery extends beyond this one challenge. Institutions of higher education (IHE), including 2- and 4-year universities and colleges, have joined in the food recovery movement through multiple avenues. These institutions include Harvard's partnership with Food for Free (Harvard Campus Services 2018), Colorado State's partnership with Larimer County Food Bank (Colorado State University 2018), and the 230 IHE with student-run chapters of the Food Recovery Network (Food Recovery Network 2017).

For most, food loss is an abstract concept. Its significance comes from the resource loss that it represents (Giudice, et al. 2016) — a forfeiture in essential resources including land,

water, energy, and meals. Meal loss is a particularly interesting lost resource, as 11.8% of households in the U.S. are food insecure (Coleman-Jensen et al. 2018). Furthermore, around 1,249 calories per person are lost each day (Buzby, Wells, and Hyman 2014). Although all of these calories cannot be recovered to feed people, it has been estimated that reducing barriers to surplus food donation would generate an extra 1.8 billion meals (ReFED 2016). The EPA supports the concern of lost meals through their Food Recovery Hierarchy (see figure 1), which ranks the options for food waste reduction. They prioritize feeding hungry people as second only to source reduction. It follows that the donation of surplus food is an important solution to examine, yet little research has touched on it.

Of the calories per person lost each day, 460 of them come from the retail level (Buzby, Wells, and Hyman 2014). IHE represent a unique segment within the retail sector. Like other food service businesses, dining services within IHE must account for the costs of waste disposal, potential government rebates and funding for preventing waste, and the cost of any action which reduces waste. However, the majority of IHE are nonprofits with a mixture of objectives, including providing high quality education, promoting research, enhancing general community welfare, and attracting donors (Stafford 2011; Garvin 1980; Winston 1999). Meeting these objectives comes in many forms, and donation of surplus food may achieve these objectives either directly, as one of the IHE's contributions to the public or by reducing costs within the dining facility, or indirectly, through improving reputation to attract students, faculty or donors to the institution (Stafford 2011).

One study estimates that the University of Missouri wastes approximately 13.4 tons of food a month (Costello, Birisci, and McGarvey 2015). Surplus food donation can be thought of as a portion of food waste. Following this assumption, when the amount of waste increases the amount available for donation increases and the amount of donated may also increase. Similarly, when the amount of waste is reduced the amount available for donation decreases and therefore the amount donated may decrease. The University of Missouri presents a relatively large amount of waste which may relate to the amount they are able to donate. This is an example of a large institution, so the magnitude of waste and potential donations cannot be extrapolated to all IHE. Still, this estimate suggests a large amount of food waste may be generated at the IHE level, even though it only represents a small part of the issue. Research on food donation from IHE is

therefore significant both because of the potential for recovery, and because of IHE's unique value for nontangible goods and services.

The issue of food recovery and surplus food donation has clear policy relevance. The 1996 Bill Emerson Good Samaritan Act states that

A person or gleaner shall not be subject to civil or criminal liability arising from the nature, age, packaging, or condition of apparently wholesome food... that the person or gleaner donates in good faith to a nonprofit organization for ultimate distribution to a needy individual (42 U.S.C. 1791).

This act limited the liability an organization could face when donating surplus food. The Good Samaritan Act was introduced to clarify state laws surrounding surplus food donation, but it isn't clear if the act preempts state laws, as the act includes a statement that it should not supersede state or local health regulations (Munger 2018). Furthermore, while the Good Samaritan Act defines "person," "apparently wholesome food," "donates," and "nonprofit organization," it fails to define "good faith." The phrase "good faith" introduces ambiguity to the act, particularly as it has never been tested in court (Munger 2018). These confusions may inhibit donation from IHE. Expanding on the language in the Good Samaritan Act, the 2018 Farm Bill added protection to those donating directly to people in need, rather than "to a nonprofit organization" alone. While the new language doesn't clarify the previous concerns, it may open up new routes to donation making the donation of surplus food more accessible. The Farm Bill also included significant funding that could be used for food recovery broadly (donations included) and created a staff position within the USDA which would, among other food waste reduction practices, recommend how to increase surplus food donation practices (Center for Health Law and Policy Innovation 2018).

The following research explores what facilitates and inhibits surplus food donation on the campuses of IHE. This research is important to inform policy makers, administrators, and others interested in implementing or utilizing donation as a food recovery option. This research will help verify the barriers to surplus food donation ReFED (2016) has identified. It also expands on important research in the general field of institutional sustainability done by Stafford (2011), Chen, Arendt, and Gregoire (2010) and Chen, Gregoire, Arendt, and Shelley (2011).

Chapter 2: Review of Existing Literature

2.1 Literature on food waste and recovery

The majority of the literature on food waste has focused on measuring the problem (Ellison, Muth and Golan 2019). There is a dearth of research examining food waste and recovery efforts, particularly at the pre-consumer levels. In a recent systematic review, Filimonau and Coteau (2019) found that food waste and its management in the hospitality sector, specifically, remains understudied. At IHE, research tends to focus on reducing plate waste (Engstrom and Carlsson-Kanyama 2004; Whitehair et al. 2013; Costello, Birisci and Mcgarvey 2015; Pinto et al. 2018; Ellison et al. 2019). While plate waste is certainly a concern, it provides no potential for donation.

In “A Roadmap to Reduce U.S. Food Waste by 20 Percent,” ReFED (2016) studied the cost effectiveness of 27 solutions to food waste, with more than a quarter of the solutions focusing on food donation. They found that the most cost-effective solutions are related to prevention and donation (see figure 2). Lee and colleagues (2017) produced a study focusing on on-farm gleaning. Using a stochastic optimization model, they found that volunteer eagerness led to smaller recovery amounts because eager volunteers would arrive more frequently earlier in the gleaning season but burn out before the end of the season. However, the study focused only on gleaning, and was also narrow in scope, only examining one food bank in New York. The literature is still missing key information on the donation of surplus food and why such a practice may be adopted.

Literature specific to institutional practices does give some insights into the barriers for adoption of food waste prevention practices. Goonan and colleagues (2013) found that pre-consumer food was wasted at hospitals in New Zealand due to food service personnel’s perception of the waste, with most not caring about waste itself, but instead how waste affected profits. It follows economic and business sense that maximizing profits are the objective of a profit driven institution. Filimonau and Gherbin (2017) show that all major UK grocery chains recognize food waste as a concern, but only some of them donate the surplus due to liability and other concerns. Engstrom and Carlsson-Kanyama’s (2004) research discusses food waste at

Swedish food service institutions, including schools and restaurants. While they discuss common ways to prevent waste, they focus on plate waste within the institutions and do not provide a comprehensive discussion of waste reduction methods. The following research seeks to further explore the role of the food service provider, rather than the student, in waste prevention and food recovery, through surplus food donation.

2.2 Literature on sustainability in IHE

Due to the limitations in data on food waste and donation as a recovery method, I rely on general research on sustainability in IHE to inform much of my research approach. Three studies in particular stand out. In the first, Chen, Arendt, and Gregoire (2010) use a survey given to members of the National Association of College and University Food Services (NACUFS) to determine which demographic characteristics are associated with a sustainability ranking. Their main findings are that private institutions, those in the Northeast, and those that provide sustainability educational materials to students had a higher sustainability score. They also found that institution size did not affect sustainability score, that administrators had more influence within contract companies than in self-operated food services, and that students had more influence over sustainability in the west than the south. In another study, Chen, Gregoire, Arendt, and Shelley (2011) use the Theory of Planned Behavior to examine the effect of attitude, subjective norm (or pressure from others), perceived control, knowledge, personal norm (or individual values), and past experiences on dining director intention to adopt sustainable practices at IHE. Their study showed that subjective norm had the greatest influence on intention to adopt sustainability practices, followed by attitude and personal norm. The importance of personal norm in the adoption of food waste reduction practices is supported by an ethnographic study which finds that habits and attitudes of food service workers impacts waste generation (Goonan, Miroso, and Spence, 2013).

Finally, Stafford (2011) examines the factors that influence the adoption of sustainable practices by IHE. In this study, a conceptual model of an IHE's value function is presented, which is constrained by its cost function. In the model, the outputs that generate revenue (directly or indirectly) are teaching, research, and service. Inputs that affect revenue include students, faculty, staff, buildings, and libraries. Stafford (2011) hypothesizes that sustainability

practices affect revenue both as a part of the service output and as a draw for quality students and faculty. An ordered probit analysis is used to examine sustainability practice adoption, with explanatory factors including regulatory pressures; financial constraints; student preferences; and stakeholder influences. Stafford (2011) finds that the number of total students, percent of student body on financial aid, being a public institution, wealth of the IHE, number of full-time faculty, percent of out-of-state students, percent of international students, size of the IHE relative to the size of the local community, and the education level of the local community were all significantly and positively related to adopting sustainability practices.

Each of the above studies considers food waste reduction in their examination of sustainability practices. Chen, Arendt, and Gregoire (2010) is the only one that considers donating surplus food explicitly. To expand on these three studies, the following research explores what influences dining services to adopt food donation as a food recovery practice.

Chapter 3: Methodology

3.1 Conceptual Framework

For an IHE to donate surplus food, the benefits of doing so must be equal to or greater than the costs. Benefits from donating include attracting donors, faculty, staff, and students, which may add revenue either directly or indirectly, as mentioned by Stafford (2011). Direct benefits include cost savings and revenue generation associated with donating. Cost savings may come in the form of less waste and its associated disposal costs. Revenue may be seen through tax breaks (only for for-profit IHE) and available funding, such as government grants, for sustainability practices, food waste reduction and food donation. Indirect benefits from donating surplus food center around positive reputational effects, where an improved reputation may attract donors, faculty or students. Costs of donating primarily include labor and transportation, both of which are relatively straightforward to measure. However, there could also be negative reputational costs for an IHE, for example, if donated food resulted in illness – such costs are far more difficult to quantify. Given the difficulty in providing a full accounting of the costs and benefits associated with food donation, we instead focus on factors that facilitate or inhibit an IHE's decision to donate surplus food.

First, we discuss facilitators of food donation. Among the facilitators, three relate directly to the willingness and ability to adopt sustainability practices. Food donation is more likely at IHE that have specific sustainability goals and/or food waste reduction goals. These goals represent a commitment to sustainability and food recovery which may improve institution reputation. While there are many practices that could accomplish sustainability and food waste reduction goals, donating surplus food is a way to simultaneously accomplish both. The wealth of an institution may influence the adoption of such practices and goals, where a wealthier institution has more disposable income for donation and other sustainability practices. This follows Stafford's (2011) finding that sustainability is a luxury good at IHE. Being a private institution may reduce restrictions on the institution allowing them to more easily adopt sustainability and waste reduction practices, surplus food donation included. Surplus food donation can be considered one sustainability practice, so that factors facilitating sustainability adoption may also facilitate surplus food donation.

Dining management structure may also influence donation. In general, dining facilities can be self-operated by the university or operated through a contract company (e.g., Aramark, Sodexo). Either management structure could pursue food donation; however, contract companies may develop entire sustainability programs (that include donation) that they implement at all contracting institution partners. Bon Appetit Management Company (2018) is one example of a management company with a comprehensive food waste management plan that includes surplus food donation. A self-operated dining program, on the other hand, will have to develop its own food recovery and donation protocol and network of recipient organizations such as food banks. Awareness of a nonprofit that would accept donations of surplus food is expected to be a necessary facilitator for donation, as an IHE can only donate when there is an identified recipient. An IHE's decision to donate is likely also influenced by the potential liability associated with their donations. Under the Bill Emerson Good Samaritan Act, donors of surplus food are protected from liability related to harm (e.g., illness) their donation may cause (42 U.S.C. 1791). It follows that being aware of the Good Samaritan Act and other laws which shield donors from being held liable may reduce the perceived costs associated with liability, making awareness of liability shield laws a facilitator of donation.

While liability shield awareness is predicted to facilitate food donation, liability concern is expected to inhibit donation. Despite the Good Samaritan Act being over 20 years old, businesses and food service providers still cite liability as one of the biggest barriers to donating (Harvard Law School 2018). As previously discussed, sustainability goals and other such facilitators may encourage donation. However, they are also likely to encourage other sustainability practices such as composting, recycling, and investment in building and food certifications. Other sustainability practices are likely to compete for available time and monetary resources required for implementation. The likelihood of donation is reduced as the number of competing sustainability practices increases. Accessibility of a donation center will also likely influence surplus food donation, where a donation center that is further away or more difficult to get to will increase the cost of donating and consequentially decrease the likelihood of donating. Poor accessibility is then an inhibitor of donation.

We are interested in the donation of *surplus* food where surplus food is a portion of food waste. For this paper it is assumed that waste and food donation have a positive relationship. It

follows that when more waste is created there is more surplus food and more food that could be donated. Similarly, when waste is reduced through other diversion means, such as source reduction, there is less surplus food and thereby less that may be donated. Waste reduction, through donation or another method, can reduce the cost of waste disposal. These costs are dependent on the disposal fee structure. An institution that pays for disposal by weight or by pickup has an incentive to reduce the amount wasted and thereby an incentive to donate surplus food rather than dispose of it. Under a fixed monthly fee or not paying to dispose of waste there are not financial incentives to reduce the amount wasted. Therefore, an institution using one of these fee structures will be less likely to donate. Pay-by-weight and number of pickups may facilitate donation while not paying and fixed monthly fees may inhibit donation. Note that the suggested relationships above extends to all diversion practices that impact the amount of food wasted: source reduction, feeding animals, industrial uses and composting. Only food donation is considered in this paper.

Given the aforementioned relationship between food waste, surplus food and food donation, the size of an institution and the number of facility operation types they have may act as either facilitators or inhibitors. A larger institution conceivably generates more waste, and therefore may have more surplus food available to donate. Consequently, a larger institution may facilitate donation. Larger institutions are also likely to benefit from economies of scale, where their size allows them to be more efficient, thereby wasting less as found in one case study (Papargyropoulou, et al. 2016). In the event that economies of scale exist, institution size would inhibit food donation. Beyond size, institutions also vary in terms of the different facility types (all-you-care-to-eat (AYCTE) dining halls, a la carte dining halls, grocery stores, convenience stores, coffee shops, and catering services) they offer on campus. The total number of types of facilities an institution has may increase waste generated as each facility generates food waste. If the amount of food waste increases with the number of facility types, then the amount of available surplus food to donate may also increase. In this case, the number of facility types acts as a facilitator of donation. In contrast, having a higher number of different facility types may allow the institution to benefit from economies of scope. Different facilities within an institution are likely to share resources. For example, a grocery or convenience store selling goods that will soon expire could transfer said goods to a dining hall where they could be used immediately.

This reduces waste from the grocery or convenience facility, and optimally does not affect waste from the dining hall facility. If economies of scope exist, as in the previous example, the institution would become more efficient and waste less. Here, the number of different facility types would be an inhibitor to food donation.

3.2 Data Collection Strategy

To examine which factors influence food donation at IHE, we conducted an online survey in Spring 2019. Study participants were recruited from the member database of the National Association of College and University Food Services (NACUFS). The 2018 NACUFS membership directory listed member institutions in the U.S., Canada and Mexico. The criteria for inclusion in this study were:

1. Located in the U.S.;
2. Having a university or college dining services operation; and
3. Inclusion of a contact email for at least one personnel within dining services.

A total of 398 IHE were recruited to participate in the study. Recognizing the time constraint of dining directors, as well as the smaller sample size found by Chen et al. (2010, 2011) when using the NACUFS directory, every contact listed in the directory was emailed (2,491 individuals – approximately six people per IHE).

Emailing multiple people at each institution meant that there could be multiple responses from the same institution. Since only one response per institution could be used, responses for institutions that appeared more than once were compared on completeness and response position. Response positions were ranked according to an assumed level of knowledge where the highest ranked respondent was assumed to know the most about overall operations and the lowest ranked respondent the least. In the event that an institution had multiple complete responses, the response from the highest-ranking participant was retained for data analysis. The following ranking system was used:

1. Food Service Director (or other dining director)
2. Associate Director

3. Sustainability Director
4. General Manager
5. Purchasing Manager
6. Executive Chef
7. Dietitian
8. Other

In the event that an institution had multiple responses, but responses were mixed in terms of completeness (some complete, some incomplete), the differences between the responses to individual fields were considered (see figure 3 for a complete breakdown of inclusion decision choices).

3.3 Survey Contents

The web-based questionnaire was developed using Qualtrics. The survey drew from insights from Chen et al. (2010), Chen et al. (2011), and Stafford (2011). Before the survey was distributed, six IHE dining staff were chosen to pre-test the survey. Based on their feedback, minor wording modifications were made. The study was reviewed and approved by the Institutional Review Board prior to data collection. The survey was distributed through a recruitment e-mail inviting dining staff to participate along with a short explanation of the survey. A sample recruitment email is available in Appendix A. One follow-up e-mail was sent out one week after the initial recruitment email to encourage response.

The survey included six sections: the IRB consent question, institutional and respondent specific classifications, institutional goals, waste management and sustainability practices, liability, and institutional characteristics. The IRB consent process detailed what would be asked of participants and ensured their privacy. Respondents were able to opt out of the survey at this point. The institutional and respondent specific classifications allowed the researchers to distinguish duplicate responses and characterize the potential operational knowledge level of particular respondents. The goals section asked respondents about their institution's goals

surrounding food waste and sustainability. The questions characterized institutions as having no goals, having broad goals, or having specific goals surrounding food waste and sustainability separately. The section on waste management and sustainability practices asked questions on their management practices including awareness of donation facilities and funding opportunities. Liability questions assessed both awareness of liability shield laws and liability concern using a 3-point likert scale. The institutional characteristics asked questions on institution size and whether or not they were managed by a contract company. A complete copy of the survey can be found in Appendix B.

While data was collected on institution size and accessibility to a donation center, it could not be used in the analysis due to inconsistencies in the way the variables were reported (or not reported). Data from the Integrated Postsecondary Data System (IPEDS) was used to supplement the survey data for these variables and added new variables: tuition revenue; being a private institution as opposed to a public institution; Bureau of Economic Analysis (BEA) Regions. Revenue acts as a proxy for institution wealth, where revenue is received on a per student basis from tuition and fees. Institution size and revenue both were able to appear as continuous variables.

3.4 Data Analysis

Stata was used for all data analysis. Descriptive statistics including means and frequencies were calculated. A maximum likelihood method needed to be used to analyze the probability that an IHE donates. Both a probit and logit model are estimated to support the use of a binary dependent variable. The probability of donating given the explanatory variables was estimated using the following relationship:

$$(1)D_i = \beta_0 + \beta_1 SG + \beta_2 WG + \beta_4 PBW + \beta_5 FMF + \beta_6 FFP + \beta_7 DP + \beta_8 NS + \beta_9 F + \beta_{10} AD + \beta_{11} LA + \beta_{12} LC + \beta_{13} CC + \beta_{14} NF + \beta_{15} R + \beta_{16} IS + \beta_{17} PI + \beta_{18} Sb + \beta_{19} Tw + \beta_{20} Rr + \varepsilon,$$

where D is the probability that institution i donates. The binary variables SG, WG, PBW, FMF, FBP, DP, F, AD, LA, LC, CC, PI, Sb, Tw, and Rr use one and zero to indicate whether (1) or not (0) the institution has specific sustainability goals (SG); has specific food waste reduction goals (WG); uses a pay-by-weight disposal fee structure (PBW); uses a fixed monthly fee disposal fee structure (FMF); pays a fixed fee per pickup of waste disposal (FFP); does not pay for waste disposal (DP); is aware of funding opportunities (F); is aware of a donation center that would accept excess food donations (AD); the respondent believed a liability shield law protected an institution from being held liable (LA); the respondent believed their institution would be held liable for donated food (LC); the institution uses a contract company (CC); is a private institution (PI); is located in a suburban area (Sb); is located in a town (Tw); and is located in a rural area (Rr). City, suburb, town and rural were used to examine the extent of urbanization, where the extent of urbanization was used as proxy for distance to a donation center, and a more urbanized area is assumed to represent closer proximity to a donation center.¹ City was excluded from the analysis so that each of the other variables could be compared to the case where an institution is located in a city. While LA, LC, SG and WG were asked with three ranked answers they were considered binary for the analysis. A one indicated specific goals for SG and WG and a “very true” belief for LA and LC. NS and NF are continuous variables where the number of sustainability practices (NS) and the number of types of facilities (NF) are aggregated. Revenue (R) and institution size (IS)² are continuous variables where revenue from tuition and fees³ is used as a proxy for wealth and student body size is used as a proxy for institution size.

3.5 Hypotheses

¹ The following definitions were taken from IPEDS and used in this analysis. A city is any territory inside an urbanized area and inside a principal city. A suburb is any territory outside a principal city and inside an urbanized area. A town is a territory inside an urban cluster that is some distance from an urbanized area. A rural area is a census-defined rural territory some distance from an urbanized area or urban cluster.

² Analysis was performed using revenue squared and institution size squared (both individually and together). Squared terms did not change the significance of either variable.

³ Tuition revenue is the price of attendance for individual students, including tuition and fees, as reported by IPEDS. IPEDS reported this cost of attendance based on the 2017-2018 published price of attendance for full time, first-time in-district undergraduates for the full academic year.

Keeping in mind the conceptual framework, the existing literature, and economic reasoning, a directional effect has been hypothesized for each explanatory variable in equation 1. SG, WG, PBW, FFP, F, AD, LA, CC, R and PI were predicted to facilitate surplus food donation, where each of the aforementioned variables increased the likelihood that an institution donates. FMF, DP, NS, LC, Sb, Tw and Rr were predicted to inhibit surplus food donation, where each of the inhibitors decreased the likelihood that an institution donates. As mentioned in the conceptual framework, IS and NF may either facilitate or inhibit donation, depending on the existence of economies of scale and scope, respectively. See table 1 for complete detail on variable name, description and hypothesized effect.

Chapter 4: Results

4.1 Summary Statistics

In total, 2,491 people from 398 institutions were recruited from the NACUFS directory. Of the 2,491 people in the NACUFS directory, 293 responded to the survey. After those who did not fit the sample population ($n = 20$), incomplete responses ($n = 71$), duplicate institutions ($n = 31$) and those who opted out of the survey ($n = 13$) were dropped, the final sample represented 158 institutions,⁴ giving an effective institutional response rate of 39.6%. This is greater than the 26.4% College and University Food Service Administrator (dining director) response rate found by Chen and colleagues (2010) when using the NACUFS directory.

Table 2 presents the breakdown of response position for all 158 responders (where each responder represents one institution). Directors were the largest respondent group (33.5%). Feedback during the pre-testing phase indicated that associate directors, sustainability directors, and general managers would be equally equipped to answer survey questions. Over 40% of respondents belonged to one of these three categories. The rest of the sample (25.4%) belonged to the dining positions of dietitian, executive chef, or some other self-identified position.

Figure 4 presents the percent of the population belonging to each Bureau of Economic Analysis region. It compares the sample population to the actual population according to IPEDS. While the Mideast and Rocky Mountain regions were proportionally represented in the sample population, the New England, Great Lakes, Plains and Far West regions were over represented and the South East and South West regions were under represented.⁵

Table 3 presents descriptive statistics on the explanatory variables shown as a percentage or mean for the whole population, those who donate, and those who do not donate. The following discussion first examines the whole population and is followed by a discussion of descriptive statistics for those who donate. Over 85% of the sample reported donating surplus

⁴ Responses that did not list institution name were determined using the following IP address locator: <https://www.iplocation.net> Not all institutions could be found this way, and only IP addresses that were listed under a college or university name were included in the sample. Seventeen of the included studies were determined using the IP address locator.

⁵ Regions were not included in regression models as they did not improve model fit.

food. Such limited variation may cause problems with analysis, but a more varied data set would potentially provide further support findings presented in this paper.

It is notable that only one institution did not have any sustainability practices and that the average institution in the sample had at least five different sustainability practices. The majority of institutions participated in recycling, composting, promoting the use of reusables, donating surplus food, sustainable food sourcing, LEED or other green building certifications and the use of energy efficient appliances (see figure 5). Recycling, use of reusables and sustainable sourcing stood out among the practices for the high percentage (90% or more) of institutions that had adopted them. The population can be characterized as generally sustainable, where sustainable refers to the number of practices they have adopted. Despite nearly all institutions having sustainability practices, less than half (45.3%) had specific sustainability goals. Similar to the discrepancy seen in sustainability goals and practices only 40.4% of institutions had specific food waste reduction goals. The mean institution size was just above 20,000 students. The largest institution in the sample had approximately 64,000 students and the smallest 1,500 students. This can be compared to the average IHE in the U.S. which has an average institution size of 3,999 students (NCES 2017). The sample seems to disproportionately represent large institutions in the U.S. It should be kept in mind, though, that data from NCES includes all institutions of higher education, without indicating if they have any dining services. It follows that while the sample over-represents large institutions as compared to all IHE, it may better represent institutions that have dining services.

The majority of the sample (93%) were aware of a nonprofit organization that would accept donations of surplus food, but few (10.1%) were aware of funding opportunities available to support food recovery or donation related goals. Institutions sampled had an average of more than four different facility types. Less than half of institutions reported being aware of a liability shield law (46.5%) and an even smaller number reported being concerned with liability (12.3%).

4.2 Comparing those who donate to those who do not

There was a significant difference for three variables when comparing those who donate to those who do not. Among those who donate, significantly more (97.8%) were aware of a

donation center that would accept surplus food as compared to those who do not (65.2%). While there was no significant difference in liability shield awareness, significantly fewer institutions were concerned with liability among those who donate (9.7%) than those who do not (28.6%).

Institutions who donate reported being aware of a nonprofit that would accept surplus food donation more than those who do not donate. Of the 147 institutions that were aware,⁶ 93.9% were less than 20 minutes from a donation center. Distance from a donation center could be an important factor in awareness, and subsequently, donation. Of those who donate, significantly fewer are located in a town (12.6%) as compared to those who do not donate (56.5%).

Using an outside organization to pick-up donations is predicted to reduce the cost of donating. Furthermore, of those who donate, 76% have their donations picked up by an outside organization at least some of the time. This can be contrasted with how aware those who do not donate are of the potential for another organization to pick up donations. A direct comparison cannot be made as those who do donate were asked if they *use* an organization that picks up their donations and those who do not donate were asked if they were *aware* of an organization that would pick-up. While being *aware* and *use of* a service are different, it can be assumed that all institutions that use the pick-up service are also aware of said service. Of those that do donate, but do not use a pick-up agency it is not clear if they are aware of one or not. It follows that at least the 76% of the population that donates is aware of an organization that would pick-up excess food, as compared to the 43.5% of institutions that do not donate. Increasing awareness of these pick-up agencies may increase donation, particularly among IHE that currently do not donate.

While 135 institutions indicated they donated excess food, only 51 were able to approximate the amount they donated annually. Figure 6 shows over a 30% jump in the percent of institutions donating 500-999 pounds a year to those donating 1,000-4,999 pounds a year. In a discussion on the current landscape of food recovery in the U.S., ReFED (2016) points out that a certain scale is needed to make donation of surplus food viable for an individual food service provider. The jump in the percent of the population that donates over 1,000 pounds may support

⁶ Note that awareness is not equal to donation.

ReFED's observation and indicate that an institution needs a sufficient amount of surplus to make donation worthwhile. These hypotheses cannot be confirmed with the given data set, and future research could explore how food waste and thereby the amount of potentially recoverable surplus food relate to the actual amount donated.

4.3 Association of Explanatory Variables with Donating

Results from both a probit and logit model were found. Coefficients and marginal effects from both models were similar (see table 4). In both models it was found that being aware of a donation center was associated with an increase in the probability of donating ($p < 0.01$) and being located in a town was associated with a decrease in the probability of donating ($p < 0.05$). Since using a probit model is consistent with Stafford's (2011) method the following results are based on the probit analysis.

Table 4 shows all regression results. Not paying for waste disposal is associated with a decrease in the probability of donation ($p < 0.05$), supporting the hypothesized effect that not paying inhibits surplus food donation. This follows economic reasoning that not facing a cost to dispose of waste would decrease pressure to reduce waste and therefore decrease interest in donation. Institutions that do not pay to dispose of waste do not face a penalty for that waste. Without a penalty for disposing of the waste there are fewer incentives to mitigate it. None of the other disposal fee structures were significantly associated with the probability of donation. This may be explained by the amount of waste recovered constituting such a small percent relative to the whole waste stream. Of the institutions that donate, 70% reported donating less than 10,000 pounds annually (see figure 5). When compared to an annual waste stream of more than 160 tons (Costello, Birisci, and McGarvey 2015), 10,000 pounds spread over a year may not significantly impact the fee paid due to a pay by weight or pay per pick-up fee structure. Further analysis on the size of institutions, their waste streams, and the number of pounds donated could verify any conclusions on the effect of disposal fee types and waste on donating.

Concern that one's institution would be held liable for donated food is associated with a decrease in the probability of donating ($p < 0.05$), supporting the hypothesis that liability concern would inhibit surplus food donation. This may be explained by the perceived cost of donating

going up if an institution is held liable. Although liability shield awareness was not significant, liability concern and liability shield awareness are negatively correlated such that when an institution is aware of a liability shield, they are not concerned. These results support those found by ReFED (2016), which cite increased donation liability education as having the potential to recover an extra 95 million meals annually.

Being aware of a donation center that would accept donations of surplus food is associated with an increase in the likelihood that an institution would donate ($p < 0.01$). This supports the hypothesis that awareness of a donation center facilitates food donation. Almost all (93%) of the institutions surveyed were aware of a nonprofit that would accept donations of excess food. It was found that being aware of a donation center is associated with a 77.8% increase in the probability of donating ($p < 0.01$). Although a significant increase, one may have expected the effect to be higher as those who donate would need to know of a location to be able to donate. Those in the sample who donate but are not aware of a nonprofit organization that would accept those donations may be aware of a government agency or for-profit organization that would accept said donations. This cannot be confirmed with the data collected.

As compared to being located in a city, all other locales are associated with a decrease in the probability of donation. Being located in a town is the only locality which is significantly associated with a decrease in the probability of donating (38.4% decrease, $p < 0.05$). If the extent of urbanization is a good proxy for donation center accessibility, then it could be extrapolated that poor access to a donation center is associated with a decrease in the probability of donating. Note that this cannot be confirmed with the collected data.

Having a contract company, institution size, and revenue were not significantly related to the probability of donating. Chen and colleagues (2010) reported that pressure from others and personal norm had the largest effect on the adoption of sustainability practices. At least in the case of surplus food donation, contract companies were not a significant part of this pressure. While personal norm itself was not measured, institutional goals surrounding sustainability could be used as a similar variable. Neither a commitment to sustainability goals nor a commitment to food waste reduction goals were significantly associated with a change in the probability of donating. Stafford (2011) found that institutional size did not impact an institution's decision to join the Presidents Climate Commitment. This study similarly found that neither size of the

undergraduate population (institution size) nor scope of the dining operation (number of facility types) significantly correlated with the likelihood of donating. Stafford (2011) also found that sustainability was a luxury good and therefore more common among wealthier institutions, including institutions with higher tuition and fees and those with higher endowments. This research found that revenue was not related to donation. The difference between the findings here and Stafford's cause one to consider the relationship between sustainability and food donation. While the lack of a relationship may be due to sample size, it may also give further insight into the understanding of donating as compared to other sustainability practices.

4.4 Robustness Check

In the survey respondents were asked in two different instances if they donated. In the first instance (see appendix B, Q7) they were asked "What happens to food when it is purchased by dining services, but not sold for any reason?" If they selected the option "Donated to a nonprofit that can reuse it to feed people" they were included in the data set as an institution that donated excess food. In the second instance (see appendix B, Q9) respondents were asked "What sustainability practices does dining services follow?" If they selected "Donating excess food" they were included in the data set as an institution that donated excess food. Question 9 was originally used as the indicator for the survey. A robustness check using question 7 as the dependent variable found that of the significant variables in first regression, only being aware of a donation center was still significant. Liability concern and being located in a town, although not significant, did show the same directional effect.

The check found that the disposal fee variable indicating that an institution did not pay to dispose of waste was no longer negative or significant (see table 5). It also found that disposal fee- Pay by Weight was significantly associated with a decrease in the probability of donating ($p < 0.05$). This suggests that paying by weight doesn't encourage waste mitigation through surplus food donation, contrary to the hypothesized effect. Further study of the relationship between waste and donation will help clarify this. Questions 7 and 9 were originally written to mean the same sort of donating. Upon further examination the key difference is that in Q7 it is specified that the donation was meant "to feed people" while in question 9 it was not. It could be

that those indicating they donate excess food under question 9 ($n=137$) but not in question 7 ($n=132$) donate surplus food to farms or for animal feed.

4.5 Limitations to Data and Analysis

While the response rate for this study is commendable for online surveys, the sample itself may not be representative of the actual population of IHE within food services. Unfortunately, there is little publicly available data to conclude how well our sample matches the IHE population. The sample may also suffer from self-selection bias. The recruitment email included the word sustainability. This may have caused institutions that care more about sustainability to select into the sample, and those who care less about sustainability to opt out of the sample.

The second relevant limitation comes with the data. Due to the way the survey was organized and questions were asked, many facilitators and inhibitors to donation had to be excluded. Possible explanatory variables include the distance to a donation center, whether or not the IHE is aware of an organization that would pick-up or otherwise take on transportation costs, use of a waste management software, the amount of surplus food available for donation and other variables yet to be identified. The data also constrained the way explanatory variables could be considered. A larger sample may have allowed for more variation and better captured the population.

Chapter 5: Conclusion

Donation of surplus food is important to study as it may help relieve some of the problems associated with both hunger and food waste. Not only have many IHE shown interest in food donation through the Food Recovery Challenge and other such programs, they also may be more likely to donate due to the indirect benefits they receive from donating. This research found that a majority of IHE are already donating. While the purpose of the research was to identify what facilitates and inhibits surplus food donation, this finding should cause one to question the importance of determining how to increase the number of institutions donating. It was also found that awareness of a nonprofit that accepts excess food donations is associated with an increase in the probability of donating. This finding could suggest that policy to increase awareness would increase the number of institutions that donate. However, keeping in mind the percent of the population that already donates, decreasing marginal returns would suggest that increasing awareness may not be as effective as the study results suggest in capturing the last seven percent of the population. Rather than examining awareness, future research may want to focus on access to donation facilities.

It was found that liability concern inhibits donations. The findings on liability concern support findings by ReFED (2016) and Munger (2018). While Munger (2018) suggests liability concern stems from confusion in the wording of the law, ReFED (2016) suggests that liability concern is a product of a lack of liability shield awareness and a concern with the reputational effects of harm caused. Both ReFED (2016) and Munger (2018) cite concern that the act has not been tested in court. It is clear that there is some amount of uncertainty surrounding liability. Future research should explore these distinct concerns before policy suggestions can be made. A distinction between liability concern and reputational effects should be made, as policy to address each will differ. While Munger has suggested confusion within the language of the law, a choice experiment comparing different language choices could both verify her hypothesis and determine language which would make the law clearer. The 2018 Farm Bill may have reduced barriers to donation for IHE, as they would now be able to donate directly to students or others in need. This presents an opportunity to explore liability shield awareness as well as barriers associated with donating directly to those in need using a before and after experiment.

This research assumed a positive relationship between waste and food donation. It also presented the caveat that donation would be influenced by the cost associated with said waste. It was found that not paying to dispose of waste, and therefore not having a cost associated with waste, inhibits donating. This may suggest that the relationship between waste and donation is not strictly positive. The study also asked institutions if they could quantify how much they donate annually. Comments in the “other” option for the question on sustainability practices mentioned donating food at the end of a semester, when students move out of the dorms. Future research could explore how frequently institutions donate. Characterizing this frequency would give further insight to the costs associated with donating, as donating 5,000 pounds twice a year would have a much different effect on operating and transportation costs than donating 25 pounds every week. It was found that only a small percent of institutions knew how much they were donating. Future research could explore why so many institutions do not track their donations. More information on how much is donated by industry would help in an analysis on the relationship between donation and waste.

This study attempted to measure time to a donation center, software use and use of an agency that pickup donations as proxies for donation costs. While time to a donation center could not be measured, population density was used a proxy. It was found that being located in a town as compared to a city (that is being located in a less dense area) was associated with a decrease in the probability of donation. Of the respondents who did know the proximity to a donation center, the majority are within 20 minutes of the donation center and use an outside organization to pick-up the donations. Both practices would reduce the cost to donating. As these variables were not able to be used in the model, further research should be done on the relationship between access to donation facilities, including transportation costs, and donating.

Although difficult, the literature would benefit from specific cost measurements for transportation and liability. Said measurements could improve understanding of the inhibitors of donation. Further studies on the potential for food waste diversion from institutions could be insightful, specifically keeping in mind an optimal donation amount, where recovering every possible portion of wasted food is likely not optimal. A rigorous cost/ benefit analysis could compare donation to other diversion tactics, such as source reduction through the use of a food waste tracking software. While this research added the existing literature, there is still much to explore. Future research should focus on liability and a rigorous cost/ benefit analysis.

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Figures

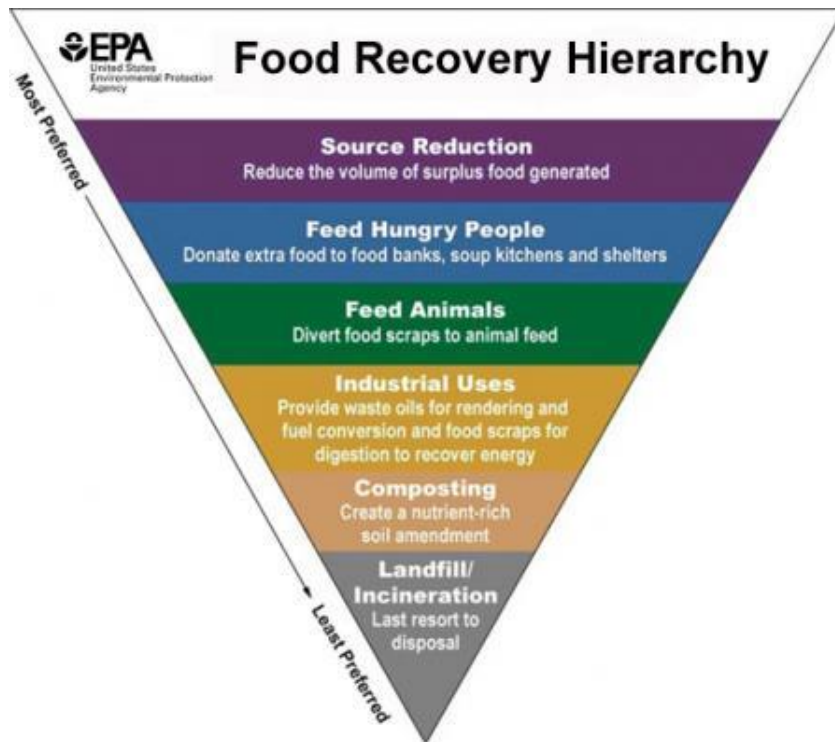


Figure 1. Food Recovery Hierarchy

(Source: EPA, 2018)

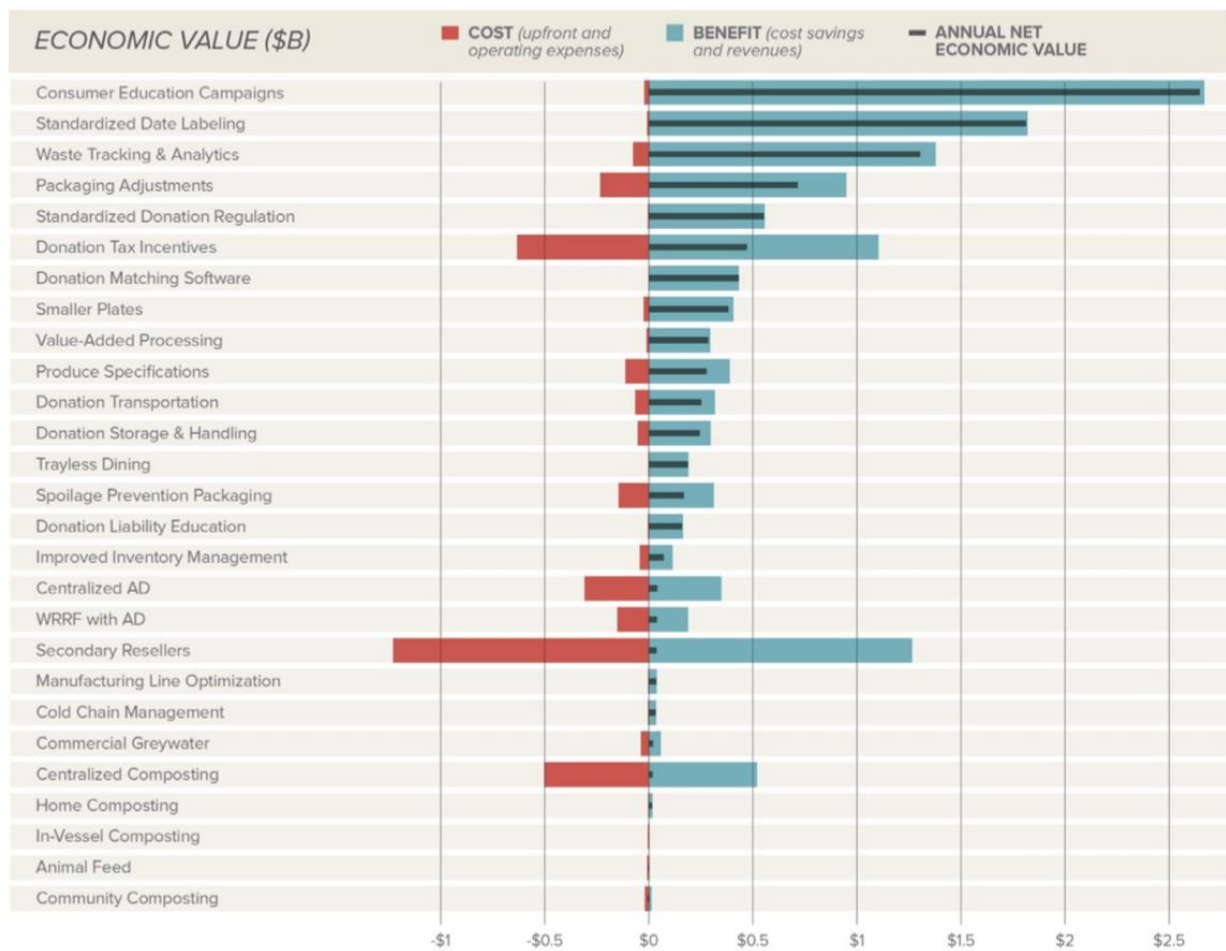


Figure 2. Food Waste Reduction Methods: Cost Benefit Analysis

(Source: ReFED, 2016)

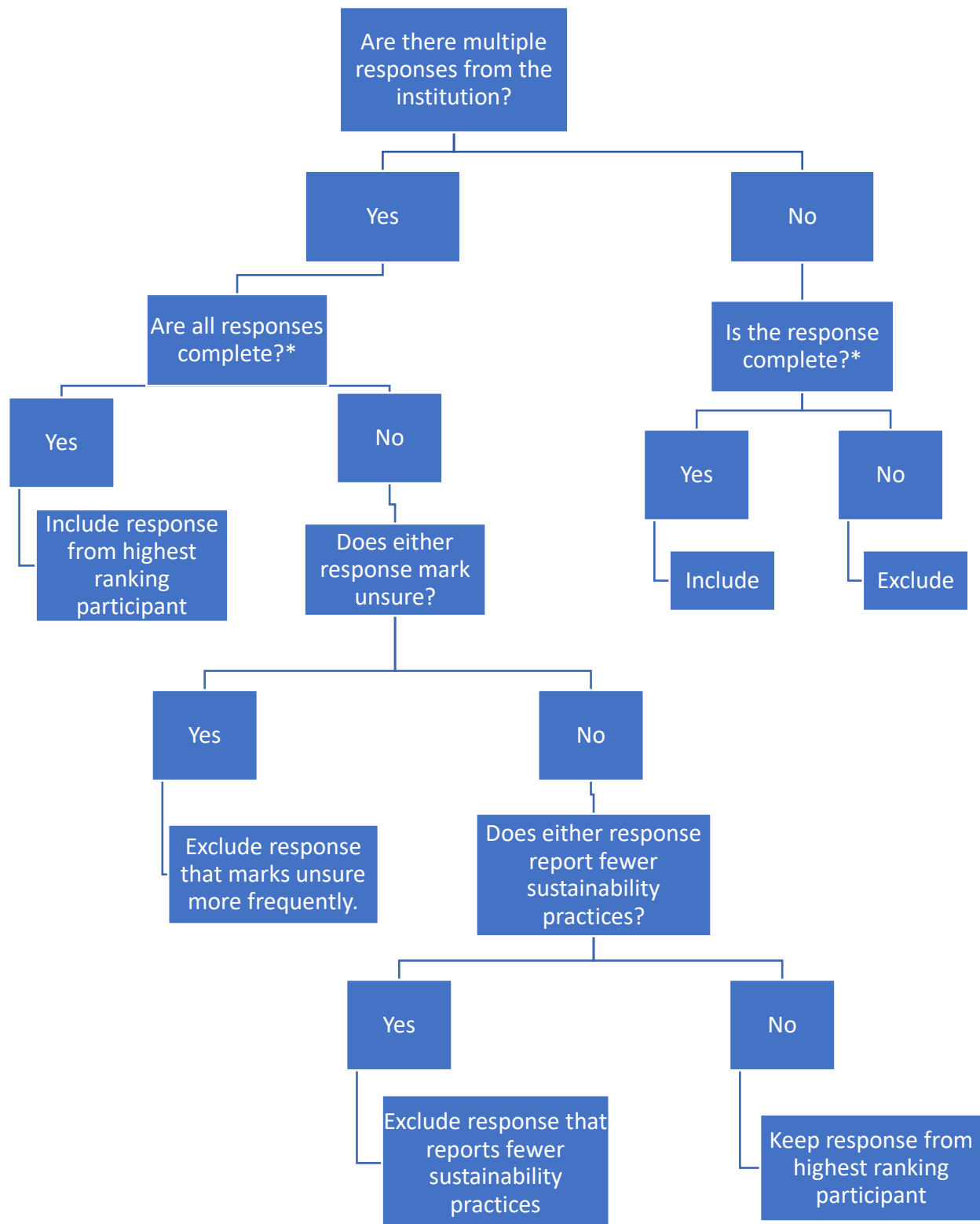


Figure 3. Inclusion Decision Tree

*Complete is defined as missing responses to 3 or fewer responses

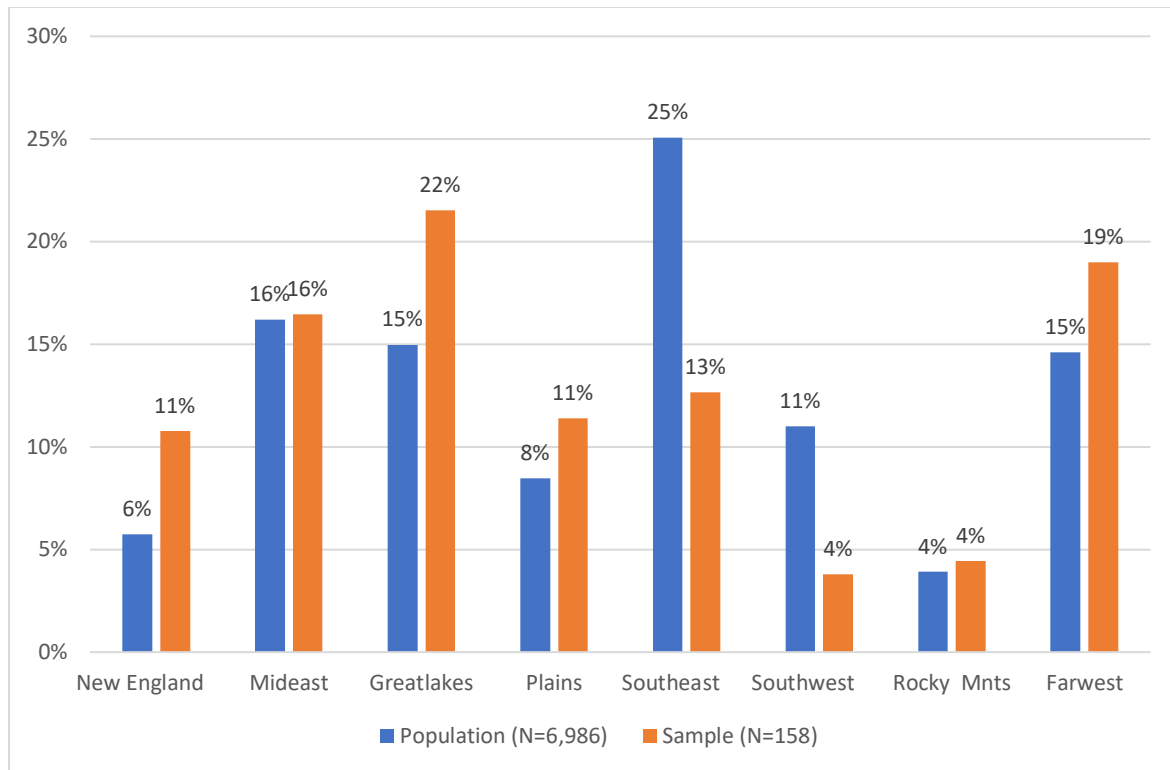


Figure 4. Bureau of Economic Analysis Regions

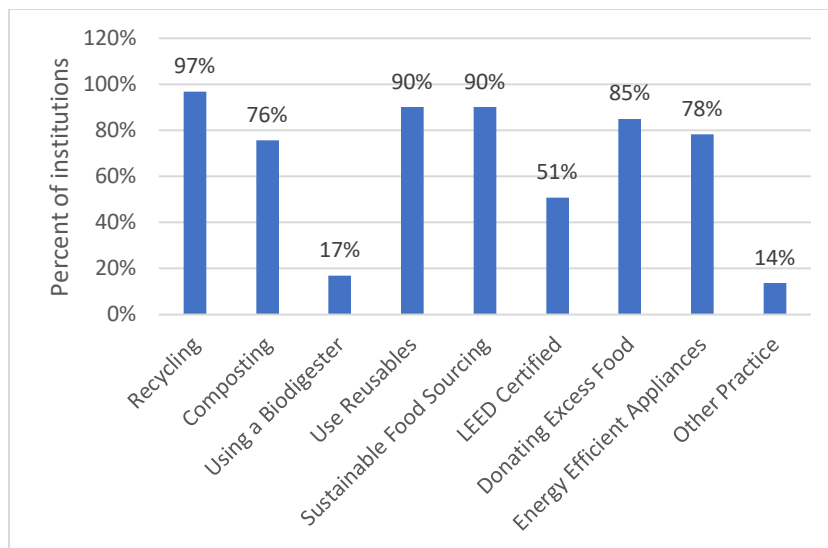


Figure 5. Sustainability practices by percent of institutions participating in said practice (N=158)

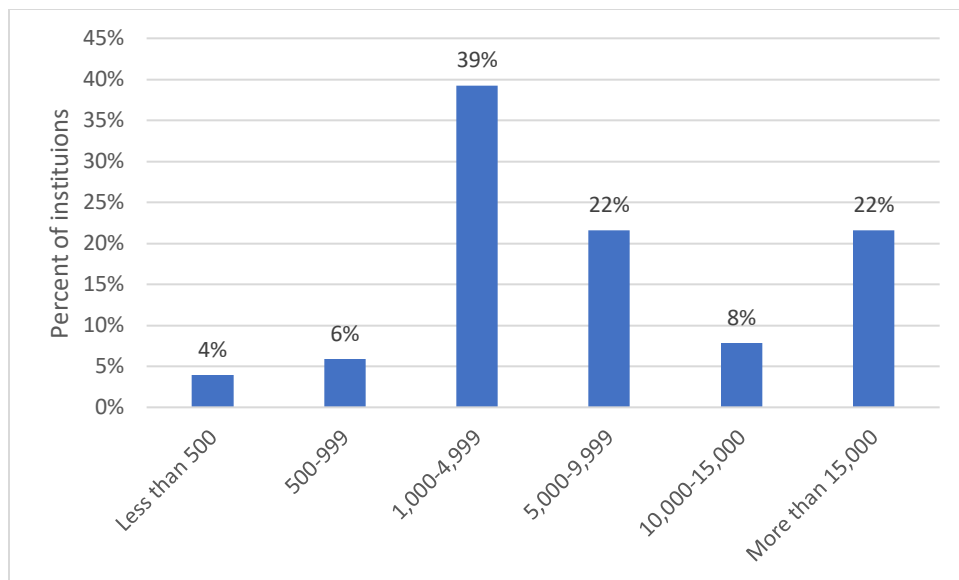


Figure 6. Pounds of Food Donated (*N*=51 institutions that tracked donations)

Tables

Table 1.

Explanatory Variables with Variable Description and Hypothesized Effect

<i>Variable</i>	<i>Code</i>	<i>Description</i>	<i>Hypothesized Effect</i>
Specific Sustainability Goals	SG	Indicator variable where a one indicates the institution has specific sustainability goals and a zero indicates they do not, i.e. they have no goals or broad goals	Positive
Specific Food Waste Reduction Goals	WG	Indicator variable where a one indicates the institution has specific food waste reduction goals and a zero indicates they do not, i.e. they have no goals or broad goals	Positive
Disposal Fee- Pay by Weight	PBW	Indicator variable where a one indicates that the institution uses a pay by weight disposal fee and a zero indicates they do not	Positive
Disposal Fee- Fixed Monthly Fee	FMF	Indicator variable where a one indicates that the institution pays a fixed monthly fee for disposal and a zero indicates they do not	Negative

Table 1 Continued

<i>Variable</i>	<i>Code</i>	<i>Description</i>	<i>Hypothesized Effect</i>
Disposal Fee- Fixed Fee by Pickup	FFP	Indicator variable where a one indicates that the institution pays a fixed fee per waste pick-up and a zero indicates they do not	Positive
Disposal Fee- Don't Pay	DP	Indicator variable where a one indicates that the institution does not pay to dispose of waste and a zero indicates that they do	Negative
Number of Sustainability Practices	NS	Continuous variable that aggregates all sustainability practices an institution reported, excluding donating	Negative
Funding Awareness	F	Indicator variable where a one indicates that the institution is aware of funding opportunities (including grants and tax breaks) and a zero indicates they are not aware	Positive
Aware of Donation Center	AD	Indicator variable where a one indicates that the institution is aware of a nonprofit that accepts donations of excess food and a zero indicates they are not aware	Positive

Table 1 Continued

<i>Variable</i>	<i>Code</i>	<i>Description</i>	<i>Hypothesized Effect</i>
Liability Shield Awareness	LA	Indicator variable where one indicates a belief that liability shield laws that would protect the institution from being held liable when donating and a zero indicates a disbelief or uncertainty	Positive
Liability Concern	LC	Indicator variable where one indicates a belief that the institution would be held liable if they donated and a zero indicates a disbelief or uncertainty	Negative
Contract Company	CC	Indicator variable, where a one indicates that the institution uses a contract company and a zero indicates they do not use a contract company	Positive
Number of Facility Types	NF	Continuous variable representing the number of different facility types, where a 1 means that the institution has any 1 facility type, a 2 means that the institution has any 2 facility types and so on	Unclear

Table 1 Continued

<i>Variable</i>	<i>Code</i>	<i>Description</i>	<i>Hypothesized effect</i>
Revenue	R	Continuous variable representing the institutions published tuition and fees. Taken from the National Center for Education Statistics (NCES) Integrated Post-Secondary Data System (IPEDS) 2017-2018 access database. Variable: TUFEYR3- Tuition and Fees (2017-2018)	Positive
Institution Size	IS	Continuous variable representing the number of students attending an institution. Taken from the NCES IPEDS 2017-2018 access database. Variable: UNDUP- Student Body Size (2016-2017)	Unclear
Private Institution	PI	Indicator variable where a one indicates if the institution is private and a zero indicates that it is public. Taken from the NCES IPEDS 2017-2018 access database. Variable: CONTROL	Positive
Suburb	Sb	Indicator variable where a one indicates the institution is located in a suburb and a zero indicates it is not. Taken from the NCES IPEDS 2017-2018 access database. Variable: LOCALE	Negative
Town	Tw	Indicator variable where a one indicates the institution is located in a town and a zero indicates it is not. Taken from the NCES IPEDS 2017-2018 access database. Variable: LOCALE	Negative

Table 1 Continued

<i>Variable</i>	<i>Code</i>	<i>Description</i>	<i>Hypothesized effect</i>
Rural	Rr	Indicator variable where a one indicates the institution is located in a rural area and a zero indicates it is not. Taken from the NCES IPEDS 2017-2018 access database. Variable: LOCALE	Negative

Note: variables derived from researcher distributed survey unless otherwise stated

Table 2.

Response Position – Descriptive Statistics (N=158)

<i>Variable</i>	<i>N</i>	<i>Percent of sample</i>
Dining Director	53	33.5
Assistant/ Associate Director	19	12.0
Sustainability Director	18	11.3
General Manager	28	17.7
Purchasing Manager	6	3.8
Executive Chef	9	5.7
Dietitian	5	3.2
Other	20	12.7

Table 3.

Descriptive Statistics- given as proportion or mean

<i>Variable</i>	<i>Whole Sample</i>	<i>Donate</i>	<i>Do not Donate</i>
<i>Dependent Variable</i>			
Donates	85.4%	100%	0%
<i>Institutional Goals</i>			
Specific Sustainability Goals	45.6%	46.7%	39.1%
Food waste reduction goals	39.9%	40.7%	34.8%
<i>Waste management and sustainability practices</i>			
Disposal Fee- Pay by Weight	40.5%	41.5%	34.8%
Disposal Fee- Fixed Monthly Fee	31.0%	29.6%	39.1%
Disposal Fee- Fixed Fee by Pick-up	22.2%	23.0%	17.4%
Disposal Fee- Don't Pay	9.5%	8.9%	13.0%
Number of Sustainability Practices	5.2	5.3	4.7
Aware of Funding	10.1%	10.4%	8.7%
Aware of Donation Center	93.0%	97.8%	65.2%**
<i>Liability</i>			
Liability Shield Awareness	46.5%	47.0%	42.9%
Liability Concern	12.3%	9.7%	28.6%*
<i>Institutional characteristics</i>			
Contract Company	25.3%	24.4%	30.4%
Number of facility types	4.5	4.5	4.6
Wealth	22,241.1	22,943.9	18,116.1
Institution Size	20,161.3	21,199.9	14,064.9
Private Institution	35.4%	36.3%	30.4%
Suburb	26.6%	27.4%	21.7%
Town	19.0%	12.6%	56.5%**
Rural	1.9%	1.5%	4.3%
Number of Observations	158	135	23

Table 3 Continued

Notes: Means for all indicator variables listed as a proportion, continuous variables listed as numeric mean. * and ** denote significant differences at the 5% and 1% levels, respectively, between IHE who do and do not donate surplus food.

Table 4.

Probit And Logit Regression Estimates for Likelihood of Donating

<i>Variable</i>	<i>Logit</i>		<i>Probit</i>	
	<i>Coefficient</i>	<i>Marginal Effect</i>	<i>Coefficient</i>	<i>Marginal Effect</i>
Specific	-0.421	-0.018	-0.260	-0.025
Sustainability	(0.795)	(0.034)	(0.440)	(0.045)
Goals				
Specific Food	0.732	0.028	0.337	0.030
Waste	(0.815)	(0.031)	(0.434)	(0.038)
Reduction				
Goals				
Disposal Fee-	-0.476	-0.020	-0.195	-0.019
Pay-by weight	(0.920)	(0.041)	(0.460)	(0.046)
Disposal Fee-	-1.354	-0.073	-0.677	-0.081
Fixed Monthly	(0.932)	(0.064)	(0.469)	(0.069)
Fee				
Disposal Fee-	-0.021	-0.001	-0.013	-0.001
Fixed Fee by	(0.894)	(0.037)	(0.470)	(0.045)
Pickup				
Disposal Fee-	-2.411	-0.247	-1.271*	-0.258
Don't Pay	(1.279)	(0.222)	(0.649)	(0.194)
Number of	-0.086	-0.003	-0.050	0.005
Sustainability	(0.264)	(0.011)	(0.144)	(0.014)
Practices				
Funding	-0.291	-0.013	-0.165	-0.018
Awareness	(1.257)	(0.063)	(0.676)	(0.080)
Aware of	5.097**	0.805**	2.757**	0.778**
Donation	(1.367)	(0.157)	(0.675)	(0.160)
Center				
Liability Shield	-1.179	-0.052	-0.664	-0.068
Awareness	(0.888)	(0.043)	(0.444)	(0.049)

Table 4 Continued

<i>Variable</i>	<i>Logit</i>		<i>Probit</i>	
	<i>Coefficient</i>	<i>Marginal Effect</i>	<i>Coefficient</i>	<i>Marginal Effect</i>
Liability	-2.078*	-0.182	-1.180*	-0.223
Concern	(0.897)	(0.125)	(0.492)	(0.132)
Number of	0.052	0.002	-0.040	0.004
Facility	(0.469)	(0.019)	(0.252)	(0.024)
Types				
Revenue	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Institution	-0.000	-0.000	-0.000	-0.000
Size	(0.000)	(0.000)	(0.000)	(0.000)
Private	-1.973	-0.114	-0.836	-0.100
	(2.166)	(0.180)	(1.141)	(0.173)
Suburb	-1.854	-0.121	-0.951	-0.135
	(1.076)	(0.096)	(0.523)	(0.093)
Town	-3.464**	-0.408*	-1.776**	-0.384*
	(1.085)	(0.179)	(0.546)	(0.154)
Rural	-0.690	-0.038	-0.286	-0.034
	(2.050)	(0.147)	(1.161)	(0.168)
Intercept	1.336		0.505	
	(2.923)		(1.494)	
AIC	106.941		107.097	
BIC	167.810		167.966	
Number of	155	155	155	155
Observations				

Note: Values in parenthesis are standard errors; 11 of the variables are indicator variables and their marginal effects have been calculated accordingly using discrete change from 0 to 1

*Significant at the .05 level

**Significant at the .01 level

Table 5.Robustness Test Using Alternate Donation Indicator (*N*=155)

<i>Variable</i>	<i>Probit Model</i> <i>(Std Error)</i>
Specific Sustainability goals	0.078 (0.352)
Specific Food waste reduction goals	-0.056 (0.348)
Disposal Fee-Pay-by weight	0.840* (0.383)
Disposal Fee- Fixed monthly fee	-0.300 (0.359)
Disposal Fee- Fixed fee by pickup	-0.063 (0.349)
Disposal Fee- Don't pay	0.434 (0.606)
Number of sustainability practices	-0.159 (0.116)
Funding Awareness	-0.190 (0.546)
Aware of donation center	2.145** (0.587)
Liability shield law awareness	-0.267 (0.315)
Liability concern	-0.594 (0.408)
Contract company	-0.535 (0.316)
Number of facility types	-0.024 (0.211)

Table 5 Continued

<i>Variable</i>	<i>Probit Model</i> <i>(Std Error)</i>
Revenue	-0.000 (0.000)
Institution Size	0.000 (0.000)
Private	0.613 (1.032)
Suburb	-0.335 (0.387)
Town	-0.701 (0.409)
Rural	-1.092 (1.163)
Intercept	0.280 (1.212)

*Significant at the .05 level

**Significant at the .01 level

Appendix A. Recruitment Email

Subject: Food Service Practices in Sustainability and Waste Management Study

Brenna Ellison<noreply@qemailserver.com>

Sun 3/3/2019 10:52 AM

To: Respondent

Dear *respondents name*,

We are researchers at the University of Illinois, and would like to learn more about sustainability and waste management practices in food service operations at colleges and universities across the U.S. We have developed a brief survey to learn more about food service operations at your institution and we need your help! If you choose to participate, be assured that none of your identifying information, or that of your institution will be shared. Survey results will be presented in summary format only and will primarily be used to fulfill graduation requirements for a master's thesis.

More information can be found by following the link below. **We ask that you please complete the survey by Wednesday, April 10th.**

[Take the Survey](#)

Thank you for your help in completing this important research project! If you have questions about the study, please contact Dr. Brenna Ellison at brennae@illinois.edu.

Best,

Dr. Brenna Ellison and Samantha Forrest
Department of Agricultural and Consumer Economics
University of Illinois at Urbana-Champaign
Institutional Review Board #19602

Follow the link to opt out of future emails:

[\\$!://OptOutLink?d=Click here to unsubscribe}](#)

Institution Food Service Practices in Sustainability and Waste Management

Start of Block: Consent Statement

Q1 Please read the consent statement carefully before you decide to participate in this study.

You are being asked to participate in a voluntary research study. The purpose of this study is to examine institutional food service practices in sustainability and waste management. Participating in this study will involve answering a series of questions on your institution's practices. The survey will take no more than 10 minutes to complete. There are no risks to participants beyond those that occur in daily life. As a participant you will not receive any direct financial benefits, but by participating you will be helping contribute to the understanding of institution's practices which could be used to help better understand surrounding sustainability and waste management. If you do not wish to participate in this study simply select "I do not wish to participate in this survey" at the end of this consent statement. You will be taken to the end of the survey at which point you can exit the survey window. Principal Investigator Name and Title: Dr. Brenna Ellison Department and Institution: Agricultural and Consumer Economics, University of Illinois at Urbana Champaign Contact

Information: brennae@illinois.edu

217-300-0238 **What procedures are**

involved? What you will be asked: You will be asked about your campus food services practices surrounding waste management and sustainability, where sustainability practices are defined as any practice the food service provider has to reduce impact on the environment. You will also be asked specific questions surrounding food waste and the management of excess food.

Time required: If you agree to participate you will complete one online survey lasting no more than 10 minutes. **Will my study-related information be kept confidential?** Faculty, staff, students, and others with permission or authority to see your study information will maintain its confidentiality to the extent permitted and required by laws and university policies. The names or personal identifiers of participants will not be published or presented. **Will I be reimbursed for any expenses or paid for my participation in this research?** You will not be offered payment for being in this study. **Can I withdraw or be removed from the study?** If you decide to participate, you are free to withdraw your consent and discontinue participation at any time. Your participation in this research is voluntary. Your decision whether or not to participate, or to withdraw after beginning participation, will not affect your current or future dealings with the University of Illinois at Urbana-Champaign. **Will data collected from me be used for any other research?** Your de-identified information could be used for future research without additional informed consent.

Whom to contact with questions: If you have questions about this project, you may contact Dr. Brenna Ellison, brennae@illinois.edu, 217-300-0238.

If you have any questions about your rights as a participant in this study or any concerns or complaints, contact University of Illinois Institutional Review Board at 217-333-2670 or via email at irb@illinois.edu.

Please print a copy of this consent form for your records, if you so desire.

Q2 Your decision to participate, decline, or withdraw from participation will have no effect on your current status or future relations with the University of Illinois.

☐ I have read the procedure described about and am 18 years or older. I voluntarily agree to participate in this survey. (1)

☐ I do not wish to participate in this survey. (2)

Skip To: End of Survey If Q2 = I do not wish to participate in this survey.

End of Block: Consent Statement

Start of Block: Demographics

Q3 What Institution do you represent?



Q4 Which of the following best describes your position within Food Services?

- ☐ Food Service's Director (1)
- ☐ Sustainability Director (2)
- ☐ General Manager (3)
- ☐ Purchasing Manager (4)
- ☐ Executive Chef (5)
- ☐ Other, please specify. (6) _____

End of Block: Demographics

Start of Block: Goals

We would like to start by asking you about sustainability goals at your institution.



Q5 Which of the following best represents your institution's goals surrounding sustainability?

- ☐ We have specific goals surrounding sustainability. (1)
- ☐ We have broad or general goals surrounding sustainability. (3)
- ☐ We do not have sustainability goals. (4)



Q6 Which of the following best represents your institutions goals surrounding food waste reduction?

- ☐ We have specific goals surrounding food waste reduction. (1)
- ☐ We have broad or general goals surrounding food waste reduction. (3)
- ☐ We do not have any food waste reduction goals. (0)

End of Block: Goals

Start of Block: Waste Management and Sustainability Practices

Next, we would like to ask you about waste management and sustainability practices at your institution.



Q7 What happens to food when it is purchased by dining services, but not sold for any reason? Select all that apply.

- ☐ Thrown away (1)
 - ☐ Compost (2)
 - ☐ Biodigested (3)
 - ☐ Donated to a nonprofit that can reuse it to feed people (4)
 - ☐ Other, please specify (5)
-



Q8 What type of waste disposal fee does dining services pay for trash services? (Select all that apply.)

- ☐ Pay by weight or volume (1)
- ☐ Fixed monthly fee. (2)
- ☐ Fixed fee per pick-up. (3)
- ☐ We don't pay to dispose of waste. (4)
- ☐ I'm unsure (5)



Q9 What sustainability practices does dining services follow? Select all that apply.

- ☐ Recycling (1)
 - ☐ Composting (2)
 - ☐ Using a biodigester (3)
 - ☐ Promoting use of reusable items (bags, cups, water bottles etc) (4)
 - ☐ Sourcing sustainable food (local, organic, fair trade etc) (5)
 - ☐ LEED or other green building certifications (6)
 - ☐ Donating excess food (7)
 - ☐ Using energy efficient appliances (8)
 - ☐ Other, please specify (9)
-



Q10 Do you know of any funding opportunities that your institution can receive by reducing food waste or donating excess food (including grants and tax breaks if applicable)?

- ☐ Yes (1)
- ☐ No (0)
- ☐ Unsure (2)
-

Q11 Are you aware of a nonprofit organization that would accept donations of excess food?

- ☐ Yes (1)
- ☐ No (2)

Display This Question:

If Q11 = Yes



Q12 How far away is the closest food bank or other organization that accepts fresh food donations?

- ☐ Less than 10 minutes (1)
- ☐ 10-20 minutes (2)
- ☐ More than 20 minutes (3)

Display This Question:

If Q9 = Donating excess food



Q13 Do you know how many pounds of excess food dining services donates annually?

- ☐ Yes (1)
- ☐ No (0)

Display This Question:

If Q13 = Yes

Q14 How many pounds of excess food are donated annually?

- ☐ Less than 500 (1)
- ☐ 500 - 999 (2)
- ☐ 1,000 - 4,999 (3)
- ☐ 5,000 - 9,999 (4)
- ☐ 10,000 - 15,000 (5)
- ☐ More than 15,000 (6)

Display This Question:

If Q9 = Donating excess food



Q15 How are donations moved from the dining hall to the donation center?

- ☐ We deliver them. (0)
- ☐ An outside organization picks them up. (1)
- ☐ I'm unsure. (2)
-

Display This Question:

If Q9 = Donating excess food

And Q20 = An outside organization picks them up.

Q16 What organization(s) pick(s) up your donations?

Display This Question:

If Q9 != Donating excess food



Q17 Are you aware of any organization that would **pick up** fresh food from the dining hall if dining services wanted to donate excess food?

☐ Yes (1)

☐ No (0)

Display This Question:

If Q17 = Yes

Q18 Which organization(s) would be willing to pick up food from the dining hall if dining services wanted to donate excess food?

End of Block: Waste Management and Sustainability Practices

Start of Block: Liability



Q19 To what extent do you believe each of the following are true?

	Not True (1)	Somewhat True (2)	Very True (3)
There are laws that protect dining services from liability when donating. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My institution would be held liable for food donated. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: Liability

Start of Block: Conclusion

Last, we would like to ask you a few general questions about your institution and dining service operations.

Q21 How many undergraduate students attend your institution (excluding online only students)?

- ☐ Less than 5,000 (1)
- ☐ 5,000-14,999 (2)
- ☐ 15,000-30,000 (3)
- ☐ More than 30,000 (4)

Q22 How many people have dining or meal plans for the 2018-2019 academic year?

X→

Q23 Is dining services managed through or by a contract company?

- ☐ No (0)
- ☐ Unsure (5)
- ☐ Yes, Sodexo (1)
- ☐ Yes, Aramark (2)
- ☐ Yes, Bon Appetite (3)
- ☐ Yes, other (please state) (4) _____

Display This Question:

If Q15 = Yes, Sodexo

And Q15 = Yes, Aramark

And Q15 = Yes, Bon Appetite

And Q15 = Yes, other (please state)

And Q15 = Yes, other (please state)

Q24 Does the contract company you work with have food waste reduction goals?

- ☐ Yes (1)
- ☐ No (2)
- ☐ Unsure (4)



Q25 What food management software(s) are used by dining services? Select all that apply.

- ☐ Foodpro (1)
 - ☐ Cbord (2)
 - ☐ Lean path (3)
 - ☐ Eatec (4)
 - ☐ Other, please specify (5)
-

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Q26 How many locations are there for each of the following food service options at your institution? (Only include those managed by dining services.)

	0 (1)	1 (2)	2 (3)	3 (4)	4 (5)	5 or more (6)
Convenience Stores (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Grocery Stores (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Coffee Shops or Carts (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Catering (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
All you care to eat service dining halls (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pay per item dining halls (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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Q32 Is there anything you wished you'd been able to add to any of the above questions? (If yes, please state.)

End of Block: Conclusion
