

# **Food Waste Disposal in Madison Restaurants**

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## **Abstract:**

This paper examines the extent, current practices, and perceptions of food waste in restaurants in Madison, Wisconsin. In our analysis, we use both qualitative and quantitative data derived from a survey shared with restaurant patrons and a questionnaire sent to restaurant owners/managers. Our data collection and analysis focused on the prevalence of restaurants in Madison that compost or donate leftover food as well as customers' opinions of these disposal strategies. We found that restaurant patrons and owners alike have an interest in sustainable dining initiatives, but there is a lack of knowledge when it comes to implementing sustainability measures. This suggests a need for future research to work on creating sustainable practices that benefit restaurant staff and patrons.

## **Keywords:**

Food Waste, Composting, Donating, Waste Disposal, Restaurant Waste, Green Dining, Sustainable Dining, Food Life Cycle

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## **Introduction**

### ***The Food Waste Problem***

Food waste has become an increasingly prevalent concern, as decomposing food in landfills contributes to climate change through the release of methane, and global food losses represent inequalities in access to food. The majority of the food that is wasted on a global scale comes from industrialized countries.<sup>1</sup> The Food and Agriculture Organization of the United Nations states that much of the food waste in medium/high-income countries mainly relates to consumer behaviors in the consumption of food.<sup>2</sup> The food waste created by industrialized, medium/high-income countries highlights inequalities in access to resources, and contributes to harmful environmental changes.

While food systems consist of many working parts including; growing seeds, harvesting finished crops, distributing products from farmers to manufacturers to retailers and so forth, we plan to focus on one of the most important, and forgotten sections: the end of life. Specifically, we will examine the process that occurs once the food leaves the supermarket shelf and ends up in the kitchen. This process most likely differs between individuals, but what about between businesses? Since restaurants earn a profit from having enough food to satisfy their customers, we assume that food waste can be a potential problem. We would like to understand how restaurant owners manage leftover food and food waste. Do they donate, compost, or simply throw leftover food away? Similarly, we wonder what customers' perceptions are regarding these issues. Is it a common practice to take leftovers home in a to-go container? Do patrons prefer that the restaurant they eat at composts food scraps and donates leftovers, or do they not really care?

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<sup>1</sup> FAO. (2011). Global food losses and food waste – Extent, causes and prevention. Rome

<sup>2</sup> FAO, (2011).

### ***Research Question***

Our research seeks to explore the dynamics of food waste by restaurants in downtown Madison, Wisconsin. Specifically, we are looking to: (1) determine the extent of food waste within restaurants; (2) examine the disposal strategies (whether leftover food is donated, composted or simply thrown away); and, (3) understand both owners' and patrons' perceptions of food waste and disposal strategies. The focus of this research is to evaluate how many restaurants in the greater downtown area of Madison, Wisconsin donate food and compost as well as the perceptions of food waste. Therefore, our research will consist of a combination of quantitative and qualitative data. We will quantitatively look at how many, and which, restaurants participate in composting and/or donating foods. After evaluating if restaurants participate in composting or donating we will conduct a survey to see how many of the restaurants that do not participate would be willing to donate and/or compost their leftover food and food scraps. We would also like to qualitatively evaluate restaurant patrons' views on composting and donating, and whether or not this has any influence on restaurant-goers' choices of where to eat.

### ***Site Setting***

The scope of our study is focused on restaurants in greater downtown area of Madison, Wisconsin. Originally, we were just going to focus on restaurants in the immediate downtown of Madison but, because we did not want to limit our responses from owners, we expanded the geographic region to include the greater Madison area, including the neighborhoods surrounding the immediate downtown area. The proportion of food that can be composted is small compared to the total amount of food that is typically wasted or unused in restaurants since compost pick-

up services have constraints on what can or cannot be composted. Additionally, the fees for such services can make it difficult for restaurants to utilize composting companies. We are unsure of restaurant interests or needs in composting as well as the feasibility of using local services. Similarly, donating food from restaurants is a tricky topic given the restrictions placed on donatable food items. Therefore, the likelihood of Madison restaurants donating their leftover food is also unclear.

### ***Key Terms***

#### **1. Food Waste**

Food waste is a highly ambiguous term, and does not have a definition that is agreed upon or used universally.<sup>3</sup> For our research purposes, food waste refers to any byproduct resulting from food preparation, cooking, or consumption. This may include kitchen scraps, like fruit and vegetable peelings, eggshells, bones, coffee grounds, or customer food waste, like plate waste and uneaten leftovers. “Leftover food” includes items that are still safe to eat and could either be donated or taken out of the restaurant by a patron.

#### **2. Food Life Cycle**

The food life cycle relates to every stage that food goes through, starting with production, transportation, distribution, marketing, preparation, consumption, and disposal.<sup>4</sup> We are focusing on the end of the food life cycle, or the disposal of food, which contributes to the issue of food waste when restaurants do not have a sustainable management practice for disposal.

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<sup>3</sup> Thyberg, Krista L., and David J. Tonjes. “Drivers of Food Waste and Their Implications for Sustainable Policy Development.” *Resources, Conservation, and Recycling* 106 (January 2016) p. 112. <https://doi.org/10.1016/j.resconrec.2015.11.016>

<sup>4</sup> Gunders, Dana, and Jonathan Bloom. *Wasted: How America Is Losing Up to 40 Percent of Its Food from Farm to Fork to Landfill*. New York: Natural Resources Defense Council, 2012.

### 3. Composting versus Biodigestion

Composting is an aerobic process in which air is used for the breakdown of organic food matter. There are various ways of composting; the method used typically depends on the amount of organic waste being collected as well as the size of a facility and available resources. A common method used by individual households and small composting businesses is backyard composting. This is when organic materials are manually turned to aerate piles in order for microorganisms to thrive and lead the decomposition process. For large, often commercial facilities that handle a lot of organic waste, if affordable, more machinery and technology is used. This could include a tractor with a pullable turner in the case of industrial windrow composting, as well as in-vessel composting.<sup>5</sup> Regardless, each method utilizes oxygen and creates a solid product that can be used as a soil amendment. Biodigestion, however, is an anaerobic process in which anaerobic bacteria are used to break down organic materials in a closed digester. This process typically results in 1) a biogas that can be captured to generate electricity, 2) a concentrated liquid that can act as fertilizer and 3) a solid product that can be used as a soil amendment.<sup>6</sup>



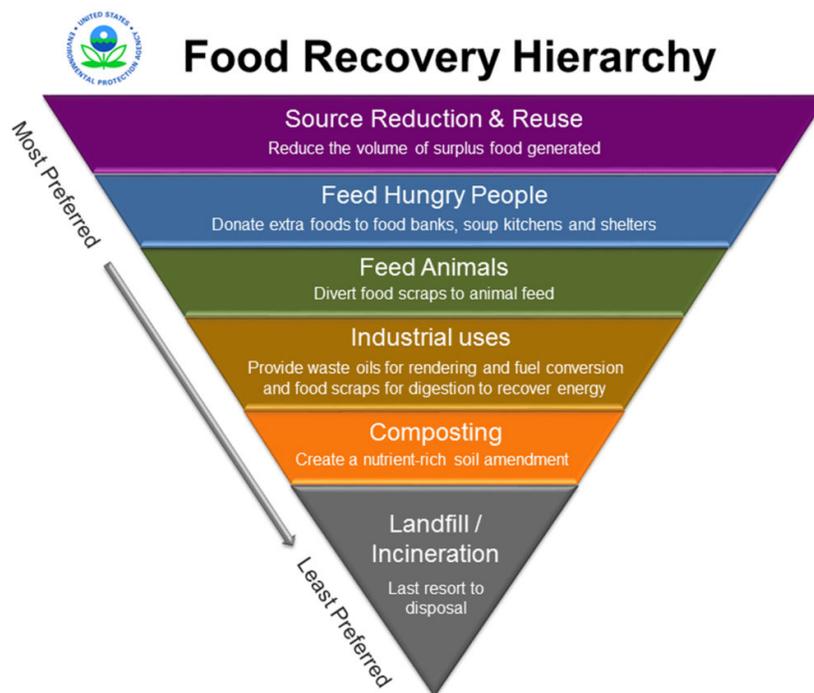
<sup>5</sup> “Types of Composting and Understanding the Process.” EPA. Environmental Protection Agency, August 29, 2016. <https://www.epa.gov/sustainable-management-food/types-composting-and-understanding-process>.

<sup>6</sup> “What Is AD?: ADBA: Anaerobic Digestion & Bioresources Association.” ADBA | Anaerobic Digestion & Bioresources Association. Accessed November 23, 2019. <http://adbioresources.org/about-ad/what-is-ad>.

Images 1 and 2. Photos taken by Claire Stowe at Gunderson Biodigester, Middleton WI. June 20, 2019.

#### 4. Food Recovery Hierarchy

The Environmental Protection Agency (EPA) created a food recovery hierarchy (shown in Figure 1), that “prioritizes actions organizations can take to prevent and divert wasted food.”<sup>7</sup> The actions at the top of the hierarchy are the most favorable, and include reducing the amount of food used, feeding hungry people, and using food to feed animals.<sup>8</sup> The actions at the bottom of the hierarchy are the least favorable, and include industrial uses, composting, and landfill/incineration.<sup>9</sup> This hierarchy is concerned with preventing food waste at early stages, and shows that preventing food waste before it is disposed of has less of an environmental impact than creating sustainable disposal methods.



<sup>7</sup> “Food Recovery Hierarchy.” EPA. Environmental Protection Agency, February 19, 2017. <https://www.epa.gov/sustainable-management-food/food-recovery-hierarchy>.

<sup>8</sup> EPA, (2017).

<sup>9</sup> EPA, (2017).

Figure 1. EPA's Food Recovery Hierarchy.<sup>10</sup>

### ***Current Diversion Options***

Currently, there are only a few options for diverting food waste from the landfill in the Madison area. We are aware of three composting services that do pickups in Madison, those being Curbside Composter, Earth Stew, and Rooted Curbside Composter.<sup>11, 12, 13</sup> These are small businesses that do backyard composting and then sell or give the compost back to their customers or community partners. Households or businesses pay a fee, are given buckets that they can collect their food waste in, and then the service comes in picks it up either weekly or biweekly (see images 3-5). Another diversion strategy used in Madison right now is the Grind 2 Energy program at Whole Foods Market. This is a program through Emerson Electric Company that takes food waste from grocery stores and turns it into renewable energy. The set up for this includes a processing table called the insinkerator<sup>®</sup> that feeds the food into a dry grinder, which reduces the amount of freshwater used, and then sends the slurry into a holding tank (see images 6-8 ).<sup>14</sup> Once the tank is full, a truck comes and empties the slurry and takes it to a biodigester located at the Nine Springs Madison Metropolitan Sewerage District and turned into biofuel.<sup>15</sup> One of the advantages of the biodigestion method is that it can take a full range of foods such as produce, meat, dairy, bread, grains, and even fats and oils.<sup>16</sup> However, this is not available to the

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<sup>10</sup> EPA, (2017).

<sup>11</sup> "Curbside Composter." Curbside Composter, 2019. <https://www.curbsidecomposter.com/>.

<sup>12</sup> "Sustainability Starts With You." Earth Stew Compost Services, LLC, 2019. <https://www.earthstew.com/>.

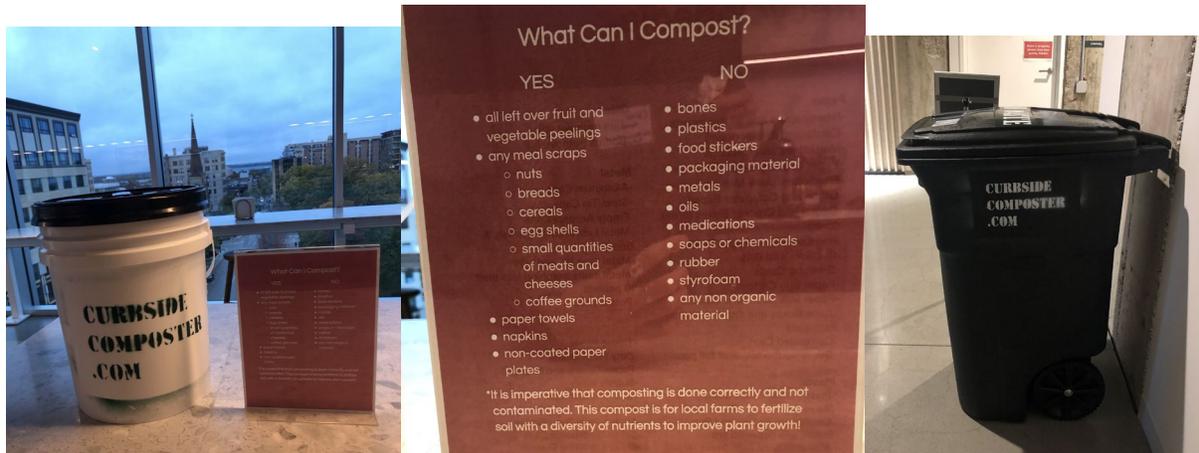
<sup>13</sup> Rooted Curbside Compost - Eliminate Waste | Turn your vegetable scraps into soil, 2019. <https://rootedcurbsidecompost.com/>.

<sup>14</sup> "Food Waste Recycling For Food Retail: Grind2Energy: Emerson US." Food Waste Recycling For Food Retail | Grind2Energy | Emerson US. Emerson Electric Co. Accessed November 24, 2019. <https://www.emerson.com/en-us/commercial-residential/grind2energy-food-waste-solution/grind2energy-solving-food-industry-problems/grind2energy-retail-food-waste>.

<sup>15</sup> Paul Sigmund, personal conversation with Claire Stowe, November 13, 2019.

<sup>16</sup> Emerson US (2019).

public and, while it's currently only used at grocery stores, the system also takes up a lot of space that most restaurants, especially downtown, would not have room for.



Images 3, 4, and 5. Photos taken by Claire Stowe at SustainDane Event “The Ecosystem of Food Waste Solutions,” Madison, WI. October 22, 2019.



Images 6, 7, and 8. Photos taken by Claire Stowe at Whole Foods Market, Madison WI. November 16, 2019.

### ***Potential Diversion Options***

Madison, Wisconsin has tried to implement a city-wide organics collection system similar to the ones described above. Moreover, this disposal strategy differs from the fore mentioned private composting services due to the end destination and acceptable items. During the summer of 2019, the City of Madison’s Streets Division initiated an eight week food scraps

recycling pilot program.<sup>17</sup> Voluntary residents were given food collection bins and information stating what items could be placed in said bins (see images 9 and 10). Collected food scraps were then taken to an anaerobic digestion system in Middleton, Wisconsin.<sup>18</sup> Because the digester is made up of metal pipes, some typically compostable items, such as eggshells, may cause damage to the system and are not acceptable. Despite some worries about contamination, the pilot program was deemed a success and there are further plans to implement a city-wide food scraps recycling program in the near future.<sup>19</sup>

### About the Trial

Identified a single refuse collection route that was not part of the initial attempts at a diversion program

- Solicited volunteers via letters to their home
- Volunteers happened to be predominantly highly educated, motivated, and upper/middle class income levels
- Volunteers received curbside cart & a kitchen caddy

Carts were picked weekly with a rear-loader & a two person crew so we could peek into the carts at the curb & leave behind carts with problems.

Trial ran for 8 weeks. (August 2 to September 20).



### FOOD SCRAPS RECYCLING GUIDE

Place only appropriate food scraps into your wasted food cart.  
When in doubt, place into the trash cart instead.  
Put scraps loose in the cart or in a paper grocery bag.

| YES                            |                                 | NO  |
|--------------------------------|---------------------------------|---|
| <p>Fruits &amp; Vegetables</p> | <p>Dairy Products</p>           | <ul style="list-style-type: none"> <li>• Meat &amp; bones</li> <li>• Egg shells</li> <li>• Seafood shells</li> <li>• Food wrappers &amp; packaging</li> <li>• Yard waste &amp; brush</li> <li>• Pet waste</li> <li>• Diapers</li> </ul> |
| <p>Coffee Grounds</p>          | <p>Baked Goods &amp; Pastas</p> |   |



Questions: [streets@cityofmadison.com](mailto:streets@cityofmadison.com) • (608) 267-2626 • [cityofmadison.com/FoodScraps](http://cityofmadison.com/FoodScraps)

Images 9 and 10. (Left) Screenshot from Sustain Dane Event “The Ecosystem of Food Waste Solutions,” Madison, WI. October 22, 2019.<sup>20</sup> (Right) Photo from City of Madison website.<sup>21</sup>

<sup>17</sup> Rickert, Chris, and Wisconsin State Journal. “Food-Scraps Collection Pilot Program Declared a Success, Madison Turns to next Steps.” madison.com, September 30, 2019. [https://madison.com/wsj/news/local/environment/food-scraps-collection-pilot-program-declared-a-success-madison-turns/article\\_cf75e553-f804-5ec1-bbf2-19764beb25fb.html](https://madison.com/wsj/news/local/environment/food-scraps-collection-pilot-program-declared-a-success-madison-turns/article_cf75e553-f804-5ec1-bbf2-19764beb25fb.html).

<sup>18</sup> “Food Scraps Recycling.” City of Madison Streets & Recycling, 2019.

<https://www.cityofmadison.com/streets/food-scraps/>.

<sup>19</sup> Rickert, (2019).

<sup>20</sup> “The Ecosystem of Food Waste Solutions Understanding Biodigestion, Food Scraps Pilots, Composting & More.” Sustain Dane, October 2019. [https://sustaindane.org/wp-content/uploads/2019/10/OctSBNMainPresentation.pdf?utm\\_source=Sustain%20Dane%20General%20List&utm\\_campaign=2efbf5abb5-EMAIL\\_CAMPAIGN\\_2019\\_10\\_25\\_02\\_27&utm\\_medium=email&utm\\_term=0\\_ad649dde4e-2efbf5abb5-109178665](https://sustaindane.org/wp-content/uploads/2019/10/OctSBNMainPresentation.pdf?utm_source=Sustain%20Dane%20General%20List&utm_campaign=2efbf5abb5-EMAIL_CAMPAIGN_2019_10_25_02_27&utm_medium=email&utm_term=0_ad649dde4e-2efbf5abb5-109178665).

<sup>21</sup> “Food Scraps Recycling.” City of Madison Streets & Recycling, 2019.

<https://www.cityofmadison.com/streets/food-scraps/>.

One strategy restaurants elsewhere have implemented is utilizing mobile programs to prevent food waste. A couple examples of such programs include the applications Too Good To Go and Food for All, which both allow restaurants to sell food that would otherwise be thrown out at the end of the day for a reduced price.<sup>22, 23</sup> Restaurant staff state what surplus items are available; customers check the app for the reduced priced meals, pay through the app, and then pick up the food typically within the last hour before closing time. “Too Good To Go” originated in the United Kingdom and is currently being used by grocery stores and eating establishments throughout Europe.<sup>24</sup> The app has helped reduce food waste headed to the landfill all while giving establishments another chance to earn a profit from the food they have and allowing customers to purchase the leftovers cheaply. “Food for All” has taken the same initiative and brought it to the United States as it has debuted in Boston and New York City.<sup>25</sup> Restaurant owners and patrons alike seem to benefit from these applications, so we want to gauge interest in using this kind of food waste prevention strategy in Madison.

## **Literature Review**

### ***Background***

The literature on food waste, whether in news/media sources, or academic journals, has become more prevalent and popular in recent years, as food waste is proving itself to be more of an issue of public concern.<sup>26</sup> Academic writings on food waste give us different interpretations of food waste and its impact, and allow us to look at food waste over a broad, global scale. Our

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<sup>22</sup> “Fighting Food Waste Together.” Fighting food waste together | Too Good To Go. <https://toogoodtogo.com/en>.

<sup>23</sup> “Food for All.” Food for All. [https://foodforall.com/joinasbusiness?\\_branch\\_match\\_id=537274538773667007](https://foodforall.com/joinasbusiness?_branch_match_id=537274538773667007).

<sup>24</sup> Garfield, Leanna. “This New 'Seamless for Food Waste' Lets You Buy Restaurants' Surplus for around \$3.” Business Insider. Business Insider, August 31, 2016. <https://www.businessinsider.com/food-waste-app-too-good-to-go-3-2016-8>.

<sup>25</sup> “Great food should be tasted, not wasted.” Food for All. <https://foodforall.com/>.

<sup>26</sup> Thyberg and Tonjes, (2016).

research into food waste narrows this scope to focus on food waste produced at a consumer level, which is where the majority of food losses occur during the food life cycle, and the following disposal of this food waste.

Gunders and Bloom (2012) give an oversight into the scale of just how much food is wasted in America.<sup>27</sup> This paper gives a summary of food waste in America, evaluates losses at different parts of the food life cycle and supply chain, and suggests moves towards efficiencies in the food system. The authors state that getting food to our tables “eats up 10 percent of the total U.S. energy budget, uses 50 percent of U.S. land, and swallows 80 percent of freshwater consumed in the United States,” but 40 percent of food in the United States goes uneaten.<sup>28</sup> All of the resources that go into the production and consumption of food are essentially wasted when we throw our food away. The food that is thrown away usually ends up in landfills, where it decomposes and contributes to methane emissions. Gunders and Bloom then suggest ways that businesses, the government, and consumers can help reduce the amount of food waste that is produced, and how to eliminate food waste at every stage in the supply chain.<sup>29</sup> Some of these include; smaller portion sizes, utilize software that identifies waste sources, avoiding buffets with trays, improve training, understand expirations dates, state and local governments can implement food waste prevention campaigns, and municipal composting services.<sup>30</sup>

An article by Thyberg and Tonjes offers multiple definitions of food waste from agencies around the world, a timeline of food waste history, and includes estimates of food loss and waste from different agencies.<sup>31</sup> This article explains that food loss and environmental impacts occur at multiple points throughout the food life cycle, including the production, distribution, marketing,

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<sup>27</sup> Gunders and Bloom, (2012) p. 4.

<sup>28</sup> Gunders and Bloom, (2012).

<sup>29</sup> Gunders and Bloom, (2012) p 5.

<sup>30</sup> Gunders and Bloom, (2012) p 22.

<sup>31</sup> Thyberg and Tonjes, (2016).

and the consumption of food. Food waste is linked to a variety of factors in the developed world, and especially in the United States. The overconsumption and waste of food are in part due to industrialization and the modernization of the food system, which increase the volume of food produced, and consumer behaviors. These behaviors can include placing little value on food, and regarding different foods and food parts as edible, which can in many cases lead to an increase in the amount of food wasted.<sup>32</sup> In discussing this, Thyberg and Tonjes highlight the importance of considering food waste at different points in the food life cycle, and realizing the factors that go into the production of food waste.<sup>33</sup>

Similarly, the article “On the Measurement of Waste” explains that the various definitions of food waste results in different estimates and, therefore, strategies to combat the food waste problem. To limit the ambiguity of such a topic, the authors provide their own definition of food waste that focuses on “food actually wasted rather than on food that is merely removed from the supply chain.”<sup>34</sup> They also recognize that developed countries often see the most food loss after items are distributed to businesses and sold to consumers. The authors emphasize the importance of examining the true value of food lost at the consumer level to provide policy recommendations that adequately mitigate these issues.<sup>35</sup> Moreover, additional research needs to be done regarding food waste at the consumer level to investigate beneficial actions that can be taken.

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<sup>32</sup> Thyberg and Tonjes, (2016).

<sup>33</sup> Thyberg and Tonjes, (2016).

<sup>34</sup> Bellemare, Marc F., Metin Çakir, Hikaru Hanawa Peterson, Lindsey Novak, and Jeta Rudi. “On the Measurement of Food Waste.” *American Journal of Agricultural Economics* 99, no. 5 (October 2017) p. 1149.

<sup>35</sup> Bellemare et al., (2017).

## *Food Waste in Restaurants*

Our research focuses on food waste created at the consumer level, specifically in restaurants in downtown Madison, Wisconsin. Food waste in restaurants is being more frequently recognized, as the culture of eating out instead of dining at home is becoming more commonplace, especially in higher income, developed countries like the United States.<sup>36</sup> There are likely to be shifts in the types and quantities of food wastes produced as more food consumption is done outside of the home.<sup>37</sup> The articles that we found on restaurant food waste provide an assessment of the prevalence of food waste in restaurants. The authors also offer solutions to mitigating restaurant food waste by creating sustainable restaurant environments and strategies for disposing of food waste.

Generally, restaurant waste can be categorized into solids and liquids. Solid waste includes the food, plastics, and papers, whereas liquids include fats, oils, and grease (FOG).<sup>38</sup> In the United States in 2012, it was recorded that 20% of the prepared food ends up as waste, and it is estimated that food makes up 50% of all of the waste produced in restaurants.<sup>39</sup> The book chapter “Restaurant Waste Treatment and Management” discusses the different ways that restaurant waste can be reduced or recycled. These options include donation, giving scraps to animals, composting, and industrial uses, such as the creation of methane through anaerobic digestion, and the creation of synthetic gas from biomass gasification, and the creation of hydrogen from fermentation.<sup>40</sup>

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<sup>36</sup> Thyberg and Tonjes, (2016).

<sup>37</sup> Thyberg and Tonjes, (2016).

<sup>38</sup> Taricska, J. R., J. M. Taricska, Y. -T Hung, and L. K. Wang. 2017. "Restaurant Waste Treatment and Management." In *Handbook of Advanced Industrial and Hazardous Wastes Management*, 695-718. doi:10.1201/9781315117423.

<sup>39</sup> Taricska et al., (2017).

<sup>40</sup> Taricska et al., (2017).

As previously described, food waste is a global issue that occurs at various parts of the food life cycle. One study that we looked at emphasized the important paradox between the massive extent of food being thrown away while so many people in the world starve.<sup>41</sup> Bharucha noticed that restaurants were attributing a large amount of wasted food and there was a lack of research examining this issue; therefore, he decided to evaluate the situation by surveying different owners and managers of restaurants in Mumbai. His research provides some insights to issues of giving away leftover foods as well as maintaining proper refrigeration habits so food loss is mitigated.<sup>42</sup> Additionally, the topic of food portions, especially at buffet-style restaurants, and the prevention of wasted food in this realm was brought up. Bharucha concluded that restaurateurs' actions display the significance of micro management in creating an impact. More specifically, it's essential that people in the restaurant industry are aware of proper food handling as well as disposal. Along with this, however, Bharucha explains that the government is needed to better enforce sustainable practices.<sup>43</sup> This research is highly beneficial in our efforts towards examining downtown Madison restaurants and determining potential solutions to mitigating food wastage.

A study published in *Waste Management* provides a general overview of the different kinds of food waste in the food service industry, the different levels that food waste is produced at, and possible solutions for combatting food waste in the food service industry.<sup>44</sup> The authors discuss how managers in the food service industry have been implementing sustainable food waste disposal as a part of their responsibilities. This connects with the article by Jehangir

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<sup>41</sup> Bharucha, Jehangir. "Tackling the Challenges of Reducing and Managing Food Waste in Mumbai Restaurants." *British Food Journal* 120, no. 3 (2018) p. 640.

<sup>42</sup> Bharucha, (2018), p. 643.

<sup>43</sup> Bharucha, (2018), p. 647.

<sup>44</sup> Martin-Rios, Carlos, Christine Demen-Meier, Stefan Gössling, and Clémence Cornuz. "Food Waste Management Innovations in the Foodservice Industry." *Waste Management* 79 (2018).  
<https://doi.org/10.1016/j.wasman.2018.07.033>

Bharucha as restaurateurs are playing a more active role in the prevention and mitigation of food waste. In this article, the management practices of food waste are classified as either incremental or radical, and the adoption of these practices depends on the type of food waste being produced at a given restaurant.<sup>45</sup> Martin-Rios et al. discuss that the adoption of food waste management strategies in restaurants is based on a favorable cost analysis for restaurant managers, and not usually based on a sustainability goal.<sup>46</sup> The solutions provided in this article are mainly management and prevention-related, which contrasts to our proposed solution of using composting services to intervene at the end of the food life cycle, and reduce the amount of food waste that goes to landfills.

Many researchers employ a method similar to ours, where they question restaurateurs on the amount of food waste produced at their restaurants, and estimate what kinds of waste are most commonly produced. In a study on food waste disposal methods, Principato et al. collected data on 127 different restaurants located in the Tuscany and Lazio regions of Italy to explore why restaurants waste food, and to examine whether most of the food wasted comes from kitchen preparation and cooking, or if it comes from restaurant customers.<sup>47</sup> The methods used by Principato et al. included leaving a questionnaire for restaurateurs and restaurant staff to fill out, which is similar to our method of creating questionnaires for restaurant owners and managers to evaluate how much food waste is produced by restaurants in downtown Madison, Wisconsin. Authors asked restaurant managers to estimate how much food waste is generated, where this food comes from, and if restaurants have taken any actions to reduce food waste.<sup>48</sup> This study found that the amount of customer food waste produced was generally higher than the

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<sup>45</sup> Martin-Rios et al., (2018).

<sup>46</sup> Martin-Rios et al., (2018).

<sup>47</sup> Principato, Luvodica, Carlo Alberto Pratesi, and Luca Secondi. "Towards Zero Waste: An Exploratory Study on Restaurant Managers." *International Journal of Hospitality Management* 74 (August 2018). <https://doi.org/10.1016/j.ijhm.2018.02.022>

<sup>48</sup> Principato et al., (2018).

amount of kitchen food waste, and that factors like the kinds of food served, the hours of restaurant operation, and behaviors and perceptions of food waste influenced how much food was wasted.<sup>49</sup>

Many of the articles on food waste only discuss food waste that occurs at a single point in the food life cycle. Food waste, however, is an issue at multiple points in the life cycle of running a restaurant, including food procurement, preparation, storage, and operational support, as presented in an article focusing on developing sustainability in restaurants.<sup>50</sup> This relates to the Martin-Rios et al. article, as they both focus on food waste throughout its restaurant life cycle, and offer ways to mitigate food loss at these different points of the food life cycle. Our research focuses more specifically on the end of the food life cycle in restaurants, which relates to the consumption and disposal of food. Baldwin et al.'s discussion of the food life cycle, the authors found that food waste in restaurants can be mitigated and prevented by reducing the amount of food sold to diners, and creating better portioning.<sup>51</sup> This leads us to the issue of creating sustainable solutions to combat food waste in restaurants, which is discussed in detail in the following section.

A study done in Finland by Heikkilä et al. analyzed why avoidable food waste was being produced in the food service sector.<sup>52</sup> They used a qualitative approach employing three participatory workshops with three different catering services. This approach was used because the authors wanted to gain the knowledge and viewpoints of people who are involved in this process everyday. They had employees work in focus groups to write on post-it notes to evaluate

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<sup>49</sup> Principato et al., (2018).

<sup>50</sup> Baldwin, Cheryl, Nana Wilberforce, and Amit Kapur. "Restaurant and Food Service Life Cycle Assessment and Development of a Sustainability Standard." *The International Journal of Life Cycle Assessment* 16, no. 1 (January 2011). <https://doi.org/10.1007/s11367-010-0234-x>

<sup>51</sup> Baldwin et al., (2011).

<sup>52</sup> Heikkilä, Lotta, Anu Reinikainen, Juha-Matti Katajajuuri, Kirsi Silvennoinen, and Hanna Hartikainen. "Elements Affecting Food Waste in the Food Service Sector." *Waste Management* 56 (June 30, 2016): 446–53. <https://doi.org/10.1016/j.wasman.2016.06.019>.

what kinds of food waste were being produced, and why food waste was being produced. The authors found that eight main elements for the production and reduction of food waste were society, business concepts, product development and procurement, management, professional skills, diners/consumers, competitors, and communication (modeled in Fig 2).<sup>53</sup> Through this study, the authors found that the best way to manage food waste is through a diversity of approaches, and that the management of food waste should be an integral part of restaurant management systems, as minimizing food waste improves resource efficiency and sustainability in the food service sector.<sup>54</sup>

L. Heikkilä et al. / Waste Management 56 (2016) 446–453

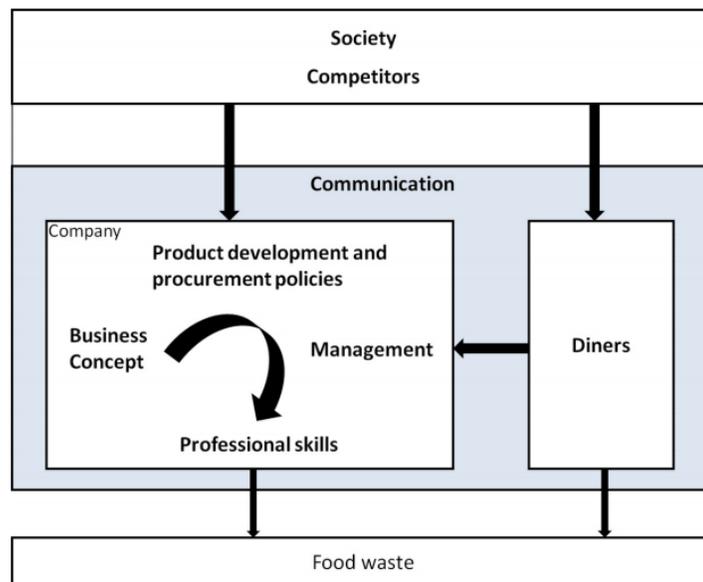


Figure 2. The explanatory model of factors affecting food waste in restaurants.<sup>55</sup>

### ***Solutions to Food Waste***

This section focuses on articles by authors whose main goals are to propose solutions to the issue of food waste. Given the complexities of the food industry around the world, it can be

<sup>53</sup> Heikkilä et al., (2016).

<sup>54</sup> Heikkilä et al., (2016).

<sup>55</sup> Heikkilä et al., (2016).

difficult to decipher proper mitigation strategies for food wastage. However, case studies elaborating on potential solutions can be rather beneficial.

The last step in the food life cycle, disposal, plays a sizeable role in creating environmental impacts. Food is usually thrown away unsustainably, where it is left to decompose in landfills. Decomposing food leads to the release of methane, which contributes to climate change. A 2012 report found that almost all uneaten food in the United States ends up decomposing in landfills, which accounts for 16 percent of the United States' methane emissions.<sup>56</sup> A feasible way for restaurants to sustainably dispose of food is through composting, which decreases environmental impacts of food waste by diverting the amount of food that ends up in landfills. Researchers at Kean University considered the environmental and economic benefits of installing an in-vessel compost system at Kean University in New Jersey.<sup>57</sup> Mu et al. found that economic, environmental, and social benefits were derived from this in-vessel composting system. Compost from the system was used to grow vegetables, which were then utilized in the student cafeteria, saving money on purchasing vegetables from retailers.<sup>58</sup> The compost system was also used as an educational center, and Mu et al. found that the compost system reduced fossil fuel emissions, greenhouse gas emissions, eutrophication, and acidification.<sup>59</sup> At a larger consumer scale, these benefits can be increased, and will help to mitigate the environmental impacts of food waste decomposition in landfills.

One important study we draw from heavily in our research is a report by Sakaguchi et al. examining different disposal practices in restaurants located in Berkeley, California. The authors explain the importance of increased awareness regarding environmental and social issues

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<sup>56</sup> Gunders and Bloom, (2012).

<sup>57</sup> Mu, Dongyan, Naomi Horowitz, Maeve Casey, and Kimmera Jones. "Environmental and Economic Analysis of an in-Vessel Food Waste Composting System at Kean University in the U.S." *Waste Management* 59 (January 2017). <https://doi.org/10.1016/j.wasman.2016.10.026>

<sup>58</sup> Mu et al., (2017).

<sup>59</sup> Mu et al., (2017).

involved with wasted food.<sup>60</sup> Additionally, they find it is essential to educate and share knowledge to create a positive impact. For example, to better mitigate the food waste issue, it's necessary to recognize where restaurants see the most wastage occurring. Similarly, restaurateurs should understand that strategies such as composting and donating leftovers are feasible options to help combat food waste. Since business owners in Berkeley are incentivized to compost—hauling costs are 20 percent less than those for hauling bins to the landfill—it makes sense that a majority (84%) of the restaurants Sakaguchi et al. surveyed compost inedible food waste.<sup>61</sup> However, donating leftover food does not seem to be as frequent a method of reducing food waste as composting. According to Sakaguchi et al., the most common disposal method “was giving edible leftovers to restaurants employees” and “[p]roactively asking restaurant customers to take home leftover food” was a primary method of waste prevention.<sup>62</sup> Most restaurant owners had concerns regarding legal liability and transportation costs perceived with donating excess food, so this was an issue Sakaguchi et al. stated should be looked at in the future. The authors portrayed some of their findings in several infographics like the one in Figure 3. We appreciate these artistic creations and decided to take a similar approach to better display the data we collected and analyzed.

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<sup>60</sup> Sakaguchi, Leo, Nina Pak, and Matthew D. Potts. “Tackling the Issue of Food Waste in Restaurants: Options for Measurement Method, Reduction and Behavioral Change.” *Journal of Cleaner Production* 180 (2018) p. 431

<sup>61</sup> Sakaguchi et al., (2018), p. 435.

<sup>62</sup> Sakaguchi et al., (2018), p. 435



Figure 3. Example of an infographic used to display restaurant owner survey data.<sup>63</sup>

As many case studies have shown, there is great importance in understanding how much food is wasted in restaurants and combating this issue through disposal strategies such as composting or donating leftover food. One case study, which took place in Romania, found that a majority of food establishments surveyed in Alba Iulia city used their leftovers as animal feed.<sup>64</sup> Oroian et al. determined that this was the most frequently used method because this option had the lowest disposal cost. Similar to the findings of other studies, lack of awareness and education regarding the management of food waste in restaurants seems to be a prominent issue in this case. Oroian et al. conclude that educating staff of public eating establishments as well as the consumers is necessary to create change in this scenario.

Another study on restaurant sustainability examined what the potential barriers to a restaurant implementing sustainability practices. The author defined sustainable development as

<sup>63</sup> Sakaguchi et al., (2018), p. 433.

<sup>64</sup> Oroian, Camelia, Antonia Odagiu, Ioan Oroian, Ioan Braşovean, Cristian Iederan, and Bianca Moldovan. "Managing Leftover Food from Public Food Establishments. Case Study: Alba Iulia City." *ProEnvironment Promediu* 11, no. 36 (2018) p. 219

“the means by which a company progresses towards achieving an identified set of sustainability goals and harness competitive advantage.”<sup>65</sup> This study was done by interviewing five restaurants in Tempe, Arizona. The main issues that were identified were energy consumption, water usage, and waste production. Of the five restaurants, two of them self-identified themselves as sustainable restaurants, and three were labeled as traditional restaurants. The results of these interviews showed that the main barriers to sustainability for a sustainable restaurant is lack of specific knowledge and legal concerns. Whereas for traditional restaurants, the barriers identified were thought to be costs, lack of awareness, and space.<sup>66</sup> The author created assessment matrices to identify whether each indicator metric was applicable, if it was present at each restaurant, and the potential barriers to implementing sustainable practices in each indicator area. These are a useful tool because other restaurants can use it to compare their current practices with sustainable practices and see the possible barriers.<sup>67</sup> Figure 4 is an example of part of the matrix. This helped to inform us on how an infographic could be set up that would show ways to create a more sustainable restaurant environment. While this article has some downfalls such as a very small sample size, it does give some general information of what restaurants perceive and know to be barriers in this process.

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<sup>65</sup> Freeman, Emily. “Restaurant Industry Sustainability: Barriers and Solutions to Sustainable Practice Indicators.” Arizona State University, 2011.

[https://repository.asu.edu/attachments/56588/content/Freeman\\_asu\\_0010N\\_10634.pdf](https://repository.asu.edu/attachments/56588/content/Freeman_asu_0010N_10634.pdf).

<sup>66</sup> Freeman, (2011), i.

<sup>67</sup> Freeman, (2011), 2.

| Indicator Area  | Metric  | Presence | Barrier                                     |
|---|---|----------|---|
| Energy  | Electrical or gas equipment (refrigeration, air-conditioning, boilers, fryers, etc.) are certified energy-efficient | Yes      | - Cost                                      |
|   |   | No       |   |
|   |   | N/A      |   |
| Water   | Water-efficient pre-rinse spray valves at 1.6 gpm and aerators are used   | Yes      | - Cost<br>- Health concern                  |
|   |   | No       |   |
|   |   | N/A      |   |
|   | Low-flow toilets are installed in the restrooms   | Yes      |   |
|   |   | No       |   |
|   |   | N/A      |   |
| Waterless urinals are installed in the men's restrooms            | Yes   |          |   |
|   | No  |          |   |
|   | N/A   |          |   |
| Waste   | The approach "reduce, reuse, and recycle" is followed; staff and suppliers are trained accordingly                  | Yes      | - Cost<br>- Spatial<br>- Collection service |
|   |   | No       |   |
|   |   | N/A      |   |
|   | Sorting and collecting systems for waste with separate bins exist   | Yes      |   |
|   |   | No       |   |
|   |   | N/A      |   |
|   | Paper products contain recycled content   | Yes      |   |
|   |   | No       |   |
|   |   | N/A      |   |
|   | No plastic, aluminum, and polystyrene foam is used  | Yes      |   |
|   |   | No       |   |
|   |   | N/A      |   |
| Organic waste is reused or composted                              | Yes   |          |   |
|   | No  |          |   |
|   | N/A   |          |   |
| Grease and oil waste is collected and properly disposed or reused | Yes   |          |   |
|   | No  |          |   |
|   | N/A   |          |   |

Figure 4. Risk Assessment Matrix.<sup>68</sup>

### *Customers' Perceptions on "Green Dining"*

The term "Green Dining" refers to restaurants taking active measures to create a sustainable environment by implementing things such as composting, recycling, and energy efficiency. Today, there is growing evidence that consumers are choosing specific products or avoiding others based on what the customer knows about its environmental impact.<sup>69</sup> It is even being found that consumers not only prefer to purchase environmentally friendly products, but they are also willing to pay more.<sup>70, 71, 72</sup> It has also been studied that the state of one's

<sup>68</sup> Freeman, (2011), 76.

<sup>69</sup> Mohr and Webb 2005; Tilikidou 200

<sup>70</sup> Laroche, M., J. Bergeron, and G. Barbaro-Forleo. 2001. Targeting consumers who are willing to pay more for environmentally friendly products. *Journal of Consumer Marketing* 18 (6): 503-20.

<sup>71</sup> Coddington, W., and P. Florain. 1993. *Environmental marketing: Positive strategies for reaching the green consumer*. New York: McGraw-Hill.

<sup>72</sup> Ottman, J. 1992. Environmentalism will be the trend of the '90s. *Marketing News* 7 (December): 13.

knowledge about a topic or issue significantly influences one's decision regarding that topic.<sup>73</sup>

We seek to evaluate customers' perceptions on food waste and perceptions on restaurants that employ sustainability measures, like composting, and how that affects their likeness to patronize a restaurant.

Another study on restaurant "greening" by Hu et al. specifically looked into how a consumer's knowledge of "greening" affects their intention to patronize restaurants in relation to their demographics such as income, age, education, and gender.<sup>74</sup> They identified the different factors that influence customers willingness to include knowledge of green restaurants, environmental concern, and ecological behaviors.<sup>75</sup> These can be seen in the graphic below (see Figure 5). To study this, the authors distributed original questionnaires at a busy shopping center in Taiwan. The questionnaire was divided into 5 sections to evaluate customers knowledge of greening, environmental concerns, behaviors toward the environment, intentions, and demographics.<sup>76</sup> The authors statistically analyzed the results of the questionnaire, and they found the results to be significant. The findings suggested that customers who knew more about green restaurants did have higher intentions to patronize "green restaurants."<sup>77</sup> They also found that for a restaurant to profit from these "green" actions they not only need to be actively involved but also communicate their actions to the consumers, this could help build customer loyalty.<sup>78</sup>

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<sup>73</sup> Kaplan, S. 1991. Beyond rationality: Clarity-based decision making. In *Environment, cognition and action*, ed. T. Garling and G. Evans, 171-90. New York: Oxford University Press.

<sup>74</sup> Hu, Hsin-Hui, H.G. Parsa, and John Self. "The Dynamics of Green Restaurant Patronage." *Cornell Hospitality Quarterly* 51, no. 3 (August 2010): 344-62. doi:10.1177/1938965510370564.

<sup>75</sup> Hu et al., (2010), p. 350.

<sup>76</sup> Hu et al., (2010), p. 352.

<sup>77</sup> Hu et al., (2010), p. 358.

<sup>78</sup> Hu et al., (2010), p. 357.

**Exhibit 1:**  
A Conceptual Model of Consumers' Willingness to Patronize Green Restaurants

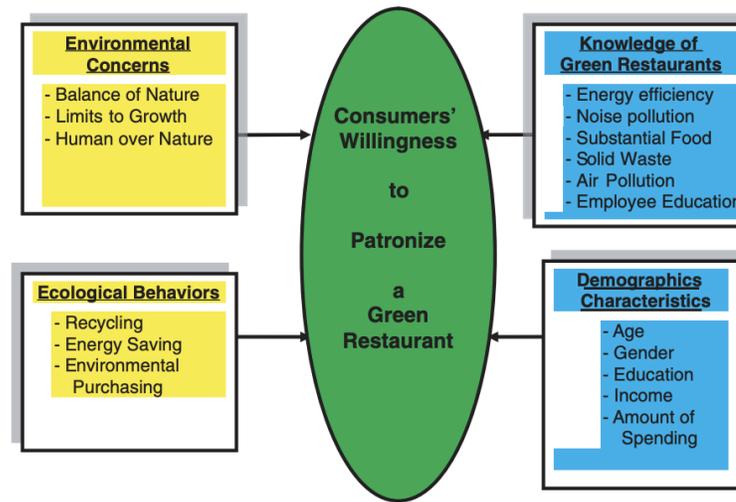


Figure 5. Conceptual Model of Consumers Willingness to Patronize a Green Restaurant.<sup>79</sup>

Consumer behaviors and customer perceptions of “green restaurants” are explored in “Customers’ Perceptions and Expectations of Environmentally Sustainable Restaurant and the Development of Green Index: The case of the Gold Coast, Australia,” by Sarmiento and Hanandeh.<sup>80</sup> The authors of this study created a survey to test their hypotheses about why some people are more likely to partake in “green dining,” and to evaluate who is more likely to be conscious about “green dining.” The authors surveyed people at different sites around Australia’s Gold Coast. Out of the 130 valid responses authors received, they found that the majority of participants were not aware of the environmental impacts of restaurant operations, and the majority of participants were willing to pay more for restaurants that employed sustainability practices.<sup>81</sup> This gives us more insight into customers’ perceptions on restaurant and dining

<sup>79</sup> Hu et al., (2010), p. 346.

<sup>80</sup> Sarmiento, Camilo Vargas, and Ali El Hanandeh. “Customers’ Perceptions and Expectations of Environmentally Sustainable Restaurant and the Development of Green Index: The Case of the Gold Coast, Australia.” *Sustainable Production and Consumption* 15 (July 2018). <https://doi.org/10.1016/j.spc.2018.04.001>

<sup>81</sup> Sarmiento and Hanandeh, (2018).

practices, and helps us evaluate what factors may contribute to a restaurant patron being more concerned over sustainability in restaurants.

A study published in the *Tourism and Hospitality Research Journal* by Schubert et al. examined the “under explored area” of consumer attitude and behavioral intentions towards environmentally sustainable practices in restaurants.<sup>82</sup> They did this because of the issues that restaurants face when implementing “green practices” because of low awareness of effective methods, fear of increasing costs, and lack of knowledge about customers attitudes and intention relating to those two. “Green” practices were outlined in three areas: “green actions” dealing with water, recycling, sanitation, energy, “green foods” local and organic, and “green donations” donating to a green project. The authors also created an original questionnaire consisting of 4 sections using Likert-type scales.<sup>83</sup> These sections included: rating the importance of the three areas of “green” restaurants, exploring the customers beliefs and attitudes towards “green” restaurants including what percentage extra they would pay, demographics and dining frequency, and lastly a section with open ended space for comments regarding their opinions and attitudes. These questionnaires were given out at five restaurants from the Central Ohio Restaurant Association that agreed to participate.<sup>84</sup> Every customer was approached and there was an estimated 90% response rate, equalling 455 customers.<sup>85</sup> Their findings showed that “green restaurants” could be an unfilled market niche, that customers would be willing to pay more, and that they do care.

As shown in previous studies, sustainable or “green” dining options have been popping up in peoples’ restaurant repertoires. While some customers are unaware of the environmental

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<sup>82</sup> Schubert, Franziska, Jay Kandampully, David Solnet, and Anna Kralj. "Exploring Consumer Perceptions of Green Restaurants in the US." *Tourism and Hospitality Research* 10, no. 4 (2010): 286-300. <http://www.jstor.org.ezproxy.library.wisc.edu/stable/23745400>.

<sup>83</sup> Schubert et al., (2010).

<sup>84</sup> Schubert et al., (2010).

<sup>85</sup> Schubert et al., (2010).

impact restaurants have, others are starting to create the bandwagon for this new aspect of eating establishments. However, because it is a fairly recent development in the food industry, much needs to be done to get this niche market going. A first step in this process includes gathering more empirical data. Researchers have noticed there is a gap in quantitative methods regarding food waste behaviors in the food industry and are taking action to change such.<sup>86</sup> Using the theory of planned behavior (TPB), various studies have been done to predict consumptive habits in restaurants while examining customer demographics. For example, people that eat out more often tend to waste more than those who rarely eat at restaurants.<sup>87</sup> Economic and environmental concerns affect consumers' food wastage. Therefore, increasing awareness about the environmental impacts of wasted food has the potential to change behaviors "in a more sustainable direction."<sup>88</sup> This holds true on an individual level as well as for an entire restaurant. According to a study done in 2018, "people turned to restaurants that adopted sustainable practices as they believed that sustainability entailed a usefulness" such as proper food safety precautions, a healthy atmosphere, and an emphasis on waste reduction.<sup>89</sup> Some strong-willed consumers are advocating for businesses to take more holistic approaches when it comes to their operations, which is helping campaigns such as "green" dining gain momentum. Because customers are integral parts to the success of businesses, it is essential for things such as restaurants trying to implement more sustainable practices in their model to occur.<sup>90</sup> Therefore, we are looking into customers' perceptions of relevant business practices and how restaurants, specifically, can improve in the realm of sustainability.

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<sup>86</sup> Lavén, Linnea. "Consumers' food waste behaviour in restaurants." University of Gothenburg School of Business, Economics and Law, (2017) p. 2

<sup>87</sup> Lavén (2017) p. 7

<sup>88</sup> Lavén (2017) p. 23

<sup>89</sup> Tommasetti, Aurelio, Pierpaolo Singer, Orlando Troisi, and Gennaro Maione. "Extended Theory of Planned Behavior (ETPB): Investigating Customers' Perception of Restaurants' Sustainability by Testing a Structural Equation Model." *Sustainability* 10, no. 7 (2018) p. 12

<sup>90</sup> Tommasetti, et. al (2018) p. 16

## **Methods**

We want to quantitatively evaluate how many restaurants in downtown Madison, Wisconsin employ some sort of composting service or donate leftovers, and qualitatively evaluate restaurant patrons' perceptions on food waste. We achieved this by distributing questionnaires to restaurant owners (or managers, public relations coordinators, restaurant association staff, etc. if owners were unavailable), and sending out surveys to restaurant-goers. We created an original questionnaire and survey due to the lack of research about food disposal and food waste at a consumer level. Both the questionnaire and survey were made through Qualtrics and distributed via shareable links. This allowed us to reach a large portion of restaurant owners and patrons to examine how much food is wasted, how restaurants dispose of food, and customers' perceptions about food waste and sustainable disposal strategies.

Our questionnaire (see Appendix B) asks owners and managers to categorize their restaurant into one of five categories: Cafe, Casual/Family Dining, Fine Dining, Fast Food, or Other for restaurants that do not apply to the categories we have provided. The questionnaire then asks for information for an estimate of how much food, by percentage, weight, or volume, is wasted in their restaurants on a daily basis, and what their procedures are for disposing of customer food waste, kitchen food waste, and cooking oils, fats, and grease. We then ask if restaurants composting and, if they do not, we have them rank possible programs that could be implemented by the City of Madison that would make them more likely to employ a composting service. We then ask if these restaurants donate leftover food, and if they do not, what the biggest limitations to donating are. The final question allowed participants interested in further discussing with us to leave their contact information (see Appendix B, Q15). With this information, we sent follow up emails to help us: find out more about the amount of food waste

at each establishment; learn what services are used for fat, grease, and oils; and better understand the owners'/managers' perceptions on waste management (see Appendix C).

The purpose of the survey to restaurant patrons (see Appendix A) is to qualitatively evaluate customers' perceptions on food waste and perceptions on dining at restaurants that compost or donate leftover food items. We start by asking if the survey-takers are students, because Madison has a large population of college students, and we would like to see if a restaurant goer's academic standing changes their perceptions on food waste and composting. We ask customers how often they dine out at restaurants in Madison, Wisconsin, and how often they take their leftover food home. We then ask customers if they know of any restaurants in Madison, Wisconsin that compost food waste, and how much more likely they would be to go to a restaurant that they know composts its food waste. Similarly, we ask how likely patrons would be to go to a restaurant that donates leftover food. To gain an understanding of public opinion on food waste, we ask restaurant-goers how concerned they are about food waste, and if they would use an application/program that allows patrons to receive a meal at a reduced price for food that would otherwise go to waste. To analyze our data, we utilized the Qualtrics Stats iQ function. This allowed us to perform a Chi-Squared Test for independence and analyze the relationships between the responses for some of our questions.

Our project does not fit into many traditional geographical methods as we are not doing archival research, actively seeking out interviews, or observing landscapes. The methods we are using fit more into an ethnographic mode of observation, because we are actively participating in the observation and subsequent evaluation of food waste in restaurants as well as customers' perceptions of food waste. Ian Cook describes ethnographic research as a method where researchers actively participate in a community by "deliberately immersing themselves" into this

community, or by observing, and watching activities unfold without actually taking part.<sup>91</sup> While we are not actively taking part in community activities surrounding sustainability or mitigating food waste, we are observing how restaurateurs manage and dispose of food waste, and evaluating customers' perceptions on food waste and sustainable disposal practices. We are using this method of observation to gain insights into food waste management in downtown Madison, Wisconsin and, therefore, engaging with our community in a traditional ethnographic sense.

In order to conceptualize the data we received from the survey and questionnaire we created two infographics (see Discussion). One summarizes the data gathered from restaurant owners, while the other guides owners to understand patrons' interest in green dining and provides several tips to for restaurants to become more sustainable. We created these on Adobe Illustrator and used statistics from our survey and questionnaire findings.

## **Data Analysis**

### ***Data Collection***

The data collection for our project was carried out during November 2019, and focused on gathering data from restaurant patrons and restaurant owners/managers in Madison, Wisconsin. The restaurant patron survey was limited to people who live in, or have recently lived in Madison, so that we were able to more accurately interpret data from people who dine at Madison restaurants more frequently. The questionnaire sent to restaurant owners and managers was limited to restaurants in or around the Downtown Madison area. We did not want to limit the amount of responses we received for the questionnaire, so we expanded geographical range of

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<sup>91</sup> Flowerdew, Robin, and David M. Martin (eds). "Methods in Human Geography: A Guide for Students Doing Research." Pearson, 2005.

our study to include sending the questionnaire to some restaurants that are located further outside of the immediate downtown area.

The restaurant patrons survey was completely voluntary, and consisted of 10 questions to evaluate patrons' perceptions on food waste, and perceptions on composting and donating in Madison restaurants (see Appendix A). We used a combination of social media and emails to class lists at our university to distribute this survey, as well as personally reaching out to people. To collect data from restaurant owners/managers, we sent the questionnaire (see Appendix B), which was also made on Qualtrics, first to restaurant and business associations around Madison, and then to individual restaurants by emailing the restaurant owners/managers, and filling out contact forms on the restaurants' websites. We emailed seven business and restaurant associations located in Madison, and then proceeded to reach out to restaurants individually to maximize the amount of responses to our questionnaire by emailing 73 restaurants and filling out 21 contact forms on restaurants' websites. Through this method, we individually contacted a total of 94 restaurants around the downtown Madison area.

### ***Results: Restaurant Patrons***

In total, we received 145 responses, which we used to qualitatively evaluate diners' perceptions on food waste and composting in Madison restaurants. It is not feasible for us to calculate the response rate for the patrons because there is no way of knowing how many people the survey reached through social media, list serves, and forwarding. The demographic responses we gathered concluded that 73.4% of respondents said they were college students, and we had an age range of 15 years-old to 66 years-old, with the average age being 25.3 years-old. The majority of respondents listed that they dine at restaurants in Madison between 3 and 15 times every month, with 3, 4, and 15 times being the most common responses. Most of

respondents said that they either always or frequently take their leftover food home when they dine at restaurants. We asked survey-takers if they knew of any restaurants in Madison that compost, and to list the restaurants that they knew of. Most respondents answered no to this question, but 25 respondents provided local restaurants that compost. These answers tended to be similar, and include about 11 of the same restaurants, showing that consumers are only familiar with a few restaurants that compost food waste in Madison.

To evaluate patrons' perceptions about food waste and composting/donating food in Madison restaurants, we asked survey-takers how concerned they are about food waste, and if they would be more likely to dine at restaurants that they know compost or donate leftover food. 125, or 84% of respondents answered that they would be more likely to dine at a restaurant that they know composts their food waste, and 137 (92%) respondents answered that they would be more likely to dine at a restaurant that they know donates their leftover food. Of these responses, 61 (42.9%) respondents said they would definitely be more likely to dine at a restaurant that they know composts their food waste, whereas 100 (70.4%) respondents said they would definitely be more likely to dine at a restaurant that they know donates their leftover food. When asked how concerned they are about food waste, the majority (89%) of survey respondents answered that they were either extremely concerned or somewhat concerned about food waste.

In the final two questions of the survey, we asked patrons if they would use an application/program that would allow them to receive a meal at a reduced price for food that would otherwise go to waste, and we asked if patrons were aware of the Madison City Food Scraps Program. 79 respondents said they would be interested in using an application/program for a reduced meal, and 57 said maybe, they need more information. When asked about the Madison City Food Scraps Program, 15 respondents answered yes, that they are aware of the program, whereas 126 respondents answered no, they are not aware of the program.

### ***Results: Restaurant Owners/Managers***

We reached out to 94 restaurants in total, through a combination of emails and filling out the “contact” forms on restaurants’ websites. Out of the 94 restaurants contacted, we received 13 responses from restaurant owners/managers. We asked owners/managers to put their restaurants into one of five categories: (1) Café, (2) Casual/Family Dining, (3) Fine Dining, (4) Fast Food, (5) Other: (please specify). Of the responses to this question, one respondent was listed as a cafe, seven respondents were listed as casual/family dining, three respondents were listed as fine dining, and two respondents were listed in the “other” category. There were no respondents that listed themselves as fast food restaurants. The respondents that selected the “other” category listed that their restaurants were (1) a Bar/Pub, and (2) a Fast Casual restaurant. We then asked restaurant owners to speculate the average number of customers that dine at their restaurants on a daily basis. The responses to this question ranged from a daily average of 45 to 1,000 patrons.

To determine how much food is wasted at these restaurants, we asked restaurant owners/managers to estimate the percentage of food that is wasted at their restaurants on a daily basis, or the number of pounds of food if they did not have a percentage. We received eight responses with percentages, and the restaurant owners/managers estimated that they waste between 1% and 25% of food on a daily basis, with the calculated average percent of food wasted being 10%. Three respondents gave us the estimated amount in pounds, which ranged from a few pounds per day, to 60 pounds per day, and 50 pounds of coffee grounds, 50 pounds of customer food waste, and 75 pounds of kitchen food waste/food scraps. The last two respondents to this question said that they did not know the estimated amount of food wasted on a daily basis.

To determine food disposal methods in Madison restaurants, we asked restaurant owners/managers what their procedures are for disposing of customer food waste, kitchen food

waste, and cooking oil, fats, and grease. Almost every respondent answered that they throw away customer food waste and kitchen food waste, citing health code and food safety guidelines and standards for reasons why they do not compost. One respondent said that some leftover food is donated to staff members or reused in other items like vegetable stocks or cocktail shrubs, one respondent said that they compost their customer food waste, and another respondent said that kitchen food waste is used as chicken food. For cooking oil, fats, and grease, seven respondents answered that a service picks up this waste to convert it to biofuel, three respondents said that a service picks up and disposes of this waste, one respondent said their restaurant uses a grease trap, and one respondent said their restaurant throws away the leftover grease and fat. We then asked if restaurant owners/managers compost at their restaurants, and, if yes, what service they use. Three respondents answered yes that they compost, and out of these responses, one said that they compost without a service, and one uses Curbside Composter.

The restaurant owners/managers that answered no to having a compost system in place were then asked a series of questions about whether they would be interested in implementing a compost system, and what would make them more likely to implement a compost system. Of the responses to these questions, two respondents answered yes, they would be interested in implementing a compost system, seven respondents answered maybe/need more information, and one respondent answered no, they would not be interested. To determine what would cause restaurant owners/managers to be more likely to implement a compost system, we asked them to rank services and education that could be provided by the City of Madison (see Appendix B, Q9 and Q10). However, there was no definitive answer that was consistently ranked higher than the others. We asked respondents to indicate if they would be likely to join other small businesses to negotiate more favorable terms for compost services. To this question, five respondents

answered yes, seven respondents answered maybe (need more information), and one respondent answered no.

Restaurant owners/managers were then asked if they donate leftover food items and, if yes, where/to whom, and what they think limitations to donating food are. Three restaurant owners/managers stated that they donate food, and that this food goes to a food pantry, catering to various places, or to staff. Restaurant owners/managers most commonly cited health code regulations, lack of knowledge of Madison donation laws, lack of information, and lack of time and resources for donations. The last question of this survey related to the question of the restaurant patrons survey, where we ask restaurant owners if they would be interested in taking part in a program/application that offers meals, which would otherwise be thrown away, to customers for a reduced price (see Appendix A Q9, Appendix B Q14). Four restaurant owners/managers said yes, they would be interested in taking part in a program/application like this, seven said maybe (need more information), and two said no, they would not take part in a program/application like this.

### ***Results: Restaurant Owner/Managers Follow-ups***

The final part of our questionnaire allowed participants interested in further discussing with us to leave their contact information (see Appendix B, Q15). We had four individuals leave their information. After collecting and analyzing our survey results we reached out to these individuals with a few follow-up questions (see Appendix C). Out of the four emails, we received one response from a restaurant association staff member. The respondent informed us that Sanimax picks up their used oil waste and converts it into usable materials.<sup>92</sup> We tried to get

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<sup>92</sup> “Sanimax Provides Used Cooking Oil and Grease Collection in WI, MN, ON.” Sanimax. Accessed December 17, 2019. <https://www.sanimax.com/>.

a better gauge of how many patrons each restaurant has daily but found that it varies a lot between certain days of the week. This association cited the ServeSafe health code guidelines as to why they must throw away customer food (see Figure 6).<sup>93</sup> The association stated that they wish there was an easy way for restaurants and food service businesses to minimize or compost waste, but in the past they have found limitations with current food waste diversion resources, including frequency of food waste pick-up and high prices for services (see Appendix C, Restaurant Association 1).

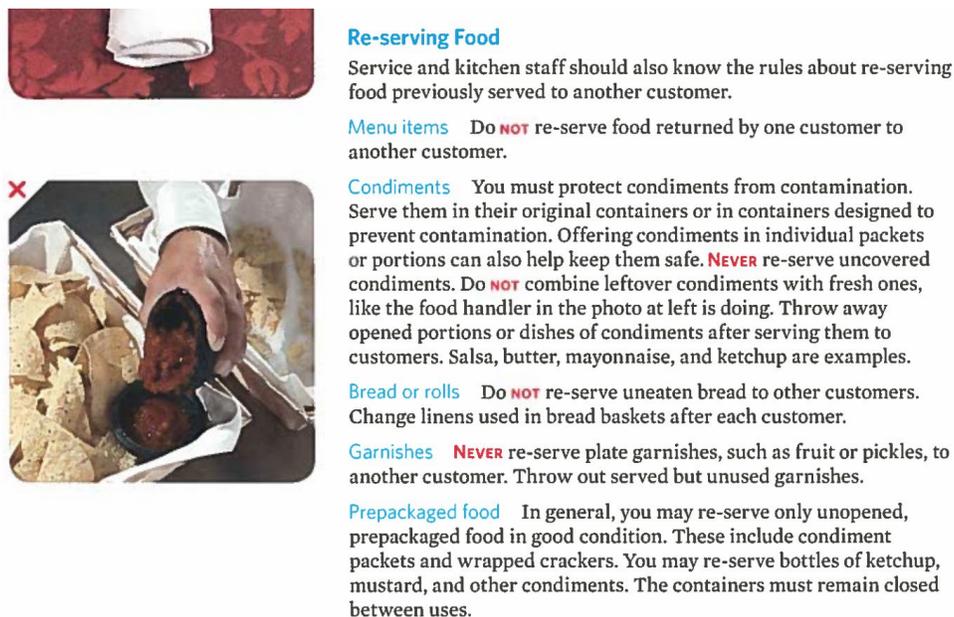


Figure 6. ServeSafe health code guidelines.

### ***Analysis: Restaurant Patrons***

To analyze the results for our surveys, we used the Stats iQ feature on Qualtrics, which helped us describe responses and determine relationships between responses. We were originally

<sup>93</sup> “ServSafe Food Handler.” ServSafe. Accessed December 16, 2019. <https://www.servsafe.com/ServSafe-Food-Handler>.

going to evaluate if college students are more likely to dine at restaurants that compost or donate their leftover food than people who are not in college, but we found that there was no statistically significant relationship between these variables. College students are not more or less likely than people not in college to dine at “green” restaurants than people who are not in college. We rejected our hypothesis about the relationship between college students and the interest in Madison restaurants that compost/donate leftovers. Therefore, we continued to analyze our data for other relationships.

In analyzing our data, we found that there are significant statistical relationships between many of the responses in the restaurant patrons survey. We found that there are strong statistically significant relationships between Q6 and Q7, Q6 and Q8, and Q7 and Q8 (see Appendix A). We used the Qualtrics Stats iQ function to perform a Chi-Squared Test for independence to figure out the relationships between the responses for these questions. Table 1, Table 2, and Table 3 include the statistical analyses of these relationships.

All of the Chi-Squared Tests have a P-Value that is  $<0.00001$ , which shows a strong statistical significance between these questions. This means that restaurant patrons who are more concerned about food waste are more likely to dine at a restaurant that composts their food waste or donates their leftover food, and restaurant patrons who are more likely to dine at a restaurant that composts their food waste are also more likely to dine at a restaurant that donates their leftover food.

**Table 1.** *The relationship between Q7: How concerned are you about food waste? and Q6: Would you be more likely to dine at a restaurant that you know composts their food waste?*

|                     | Definitely yes | Probably yes | Probably not | Total      |
|---------------------|----------------|--------------|--------------|------------|
| Extremely concerned | 37 (26.1%)     | 12 (8.5%)    | 0 (0.0%)     | 49 (34.6%) |

|                                   |                   |                   |                   |                     |
|-----------------------------------|-------------------|-------------------|-------------------|---------------------|
| Somewhat concerned                | 22 (15.5%)        | 47 (33.1%)        | 8 (5.6%)          | 77 (54.2%)          |
| Neither concerned nor unconcerned | 0 (0.0%)          | 4 (2.8%)          | 6 (4.2%)          | 10 (7.0%)           |
| Somewhat unconcerned              | 2 (1.4%)          | 1 (0.7%)          | 3 (2.1%)          | 6 (4.2%)            |
| <b>Total</b>                      | <b>61 (43.0%)</b> | <b>64 (45.1%)</b> | <b>17 (11.9%)</b> | <b>142 (100.0%)</b> |

*P-Value: <0.00001. n=142. Data from Qualtrics Stats iQ. A Chi-Squared Test suggests that we can reject the null hypothesis that there is no correlation between concern over food waste and likeliness to dine at a restaurant that composts their food waste.*

**Table 2.** *The relationship between Q7: How concerned are you about food waste? and Q8: Would you be more likely to dine at a restaurant that you know donates their leftover food?*

|                                   | Definitely yes     | Probably yes      | Probably not    | Total               |
|-----------------------------------|--------------------|-------------------|-----------------|---------------------|
| Extremely concerned               | 43 (30.3%)         | 6 (4.2%)          | 0 (0.0%)        | 49 (34.5%)          |
| Somewhat concerned                | 53 (37.3%)         | 23 (16.2%)        | 1 (0.7%)        | 77 (54.2%)          |
| Neither concerned nor unconcerned | 2 (1.4%)           | 5 (3.5%)          | 3 (2.1%)        | 10 (7.0%)           |
| Somewhat unconcerned              | 2 (1.4%)           | 3 (2.1%)          | 1 (0.7%)        | 6 (4.2%)            |
| <b>Total</b>                      | <b>100 (70.4%)</b> | <b>37 (26.1%)</b> | <b>5 (3.5%)</b> | <b>142 (100.0%)</b> |

*P-Value: <0.00001. n=142. Data from Qualtrics Stats iQ. A Chi-Squared Test suggests that we can reject the null hypothesis that there is no correlation between concern over food waste and likeliness to dine at a restaurant that donates their leftover food.*

**Table 3.** *The relationship between Q6: Would you be more likely to dine at a restaurant that you know composts their food waste? and Q8: Would you be more likely to dine at a restaurant that you know donates their leftover food?*

|                | Definitely yes | Probably yes | Probably not | Total        |
|----------------|----------------|--------------|--------------|--------------|
| Definitely yes | 58 (40.8%)     | 3 (2.1%)     | 0 (0.0%)     | 61 (43.0%)   |
| Probably yes   | 39 (27.5%)     | 24 (16.9%)   | 1 (0.7%)     | 64 (45.1%)   |
| Probably not   | 3 (2.1%)       | 10 (7.0%)    | 4 (2.8%)     | 17 (12.0%)   |
| Total          | 100 (70.4%)    | 37 (26.1%)   | 5 (3.5%)     | 142 (100.0%) |

*P-Value: <0.00001. n=142. Data from Qualtrics Stats iQ. A Chi-Squared Test suggests that we can reject the null hypothesis that there is no correlation between likeliness to dine at a restaurant that composts food waste and likeliness to dine at a restaurant that donates leftover food.*

### ***Analysis: Restaurant Owners/Managers***

To evaluate the results from the restaurant owners/managers survey, we did not use a statistical analysis, but compared responses to assess general trends in food waste and food waste disposal methods within restaurants. Figure 7 shows the trend in percentages of food waste in each restaurant, according to restaurant owners/managers. This graph does not show all of the estimated food waste, as some respondents gave us the estimated amount of food waste in pounds, and some respondents were not sure how much food was wasted on average at their restaurant. As stated in our results section, the majority of the restaurants we surveyed do not employ a composting service, and the food waste that is created is thrown away.

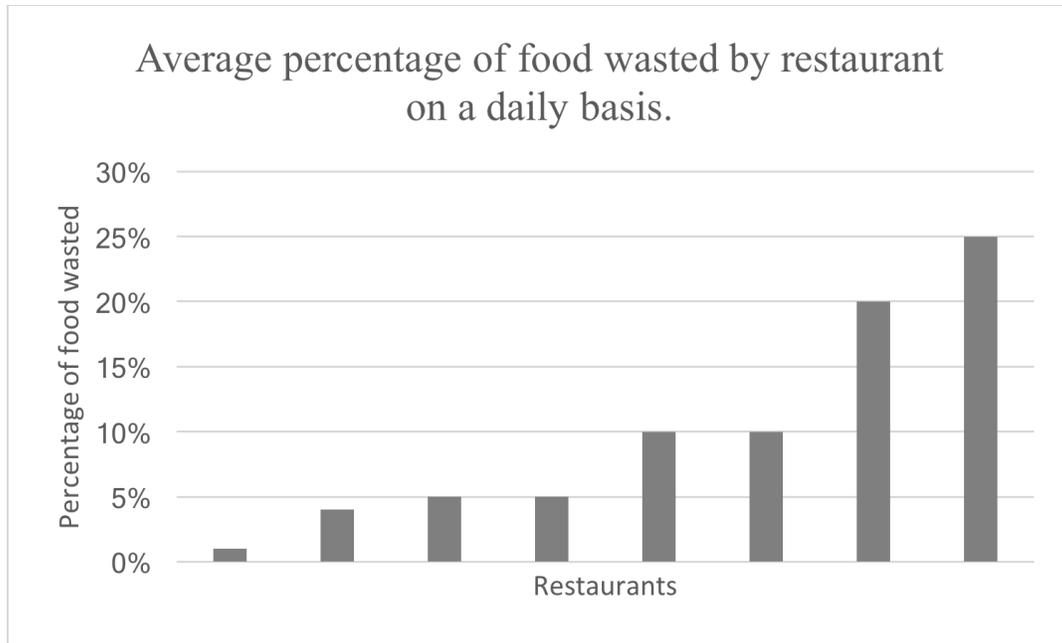


Figure 7. Graph of the percentage of food wasted by each restaurant.

Through this survey, we wanted to determine how much food is wasted by restaurants, and figure out the most common disposal method for food waste. According to the results for this survey, the most common method of food waste disposal is simply throwing food away, with 12 (92.3%) restaurant owners/managers answering that customer food waste is thrown away, and 10 (76.9%) restaurant owners/managers answering that kitchen food waste is thrown away. 3 (23.1%) restaurant owners/managers said that kitchen food scraps are reused or composted. The general consensus for customer food waste, though, is that it has to be thrown away due to health code and food safety regulations.

## Discussion

Concerns over food waste have become increasingly prevalent, as we are realizing the environmental impacts and the inequalities in access to food highlighted by food waste. Our research looks to evaluate composting as a sustainable disposal method and a solution to the food waste problem. In our literature review, we found that food waste is occurring at many different

points in the food life cycle on a global scale. There are steps that restaurateurs can take to reduce food waste, including serving smaller portion sizes, adopting sustainable disposal strategies, and donating leftover food instead of throwing it away. Customer perceptions on food waste and sustainable dining are also becoming “greener,” as customers are more aware of the environmental impacts of eating out at restaurants and the food waste this can create.

Through our surveys, we found that restaurant patrons that are more concerned about food waste are more likely to dine at restaurants that compost food waste or donate leftover food, and that demographics like age and education do not have as much of an effect on these choices as we had previously thought. Restaurant patrons are also more likely to dine at a restaurant that they know donates leftover food than they are to dine at a restaurant that they know composts food waste. This relates to the EPA Food Recovery Hierarchy (see *Key Terms* section), as “Feed Hungry People” is more preferred than composting. Patron concerns mirror the structure of the EPA hierarchy, as donating leftover food makes restaurants more attractive than composting food waste. The amount of times that patrons dine at restaurants every month is extremely varied from person to person. This shows that food waste varies drastically between restaurant patrons, and there needs to be multiple approaches to customer food waste that fit different patrons’ lifestyles and food waste habits.

The restaurant owners/managers survey provided us with insights into what owners/managers see as the biggest limitations to donating food, and initiatives that the City of Madison can take to make composting more accessible for restaurants. There was not a clear answer for what the City of Madison could do to make composting more accessible, as the responses to this question varied by restaurant. This shows that every restaurant has different needs to be met when it comes to composting and other waste disposal strategies. We hoped to determine what different restaurant owners/managers would prefer that the City of Madison does

to make composting more feasible and accessible for restaurants by reaching out to the restaurant owners/managers that left their contact information for follow-up questions. Our survey did not ask restaurant owners/managers to specify where the majority of their food waste comes from. Including more specific details like where the majority of food waste is produced may help restaurant owners/managers come up with interventions to reduce the amount of food waste at various points within their restaurant's operations.

The two infographics we created took information gained from our surveys and summarized it into a reader friendly graphic. The first one, "Current Madison, WI Restaurant Food Waste Actions," takes data like the estimation of daily patrons, the estimation of food waste, and the different disposal strategies taken by restaurants from the restaurant owner questionnaire (see Appendix B). This graphic can be useful to anyone who would like to understand the extent and current practices of food waste in Madison. The second graphic, "Food Waste Management Tips for Madison Restaurants," acts as a guide restaurants can use to help reduce food waste and become more sustainable. This information was derived from our literature review, the EPA food recovery hierarchy, and the restaurant patrons survey (see Appendix A).

# Current Madison, WI Restaurant Food Waste Actions

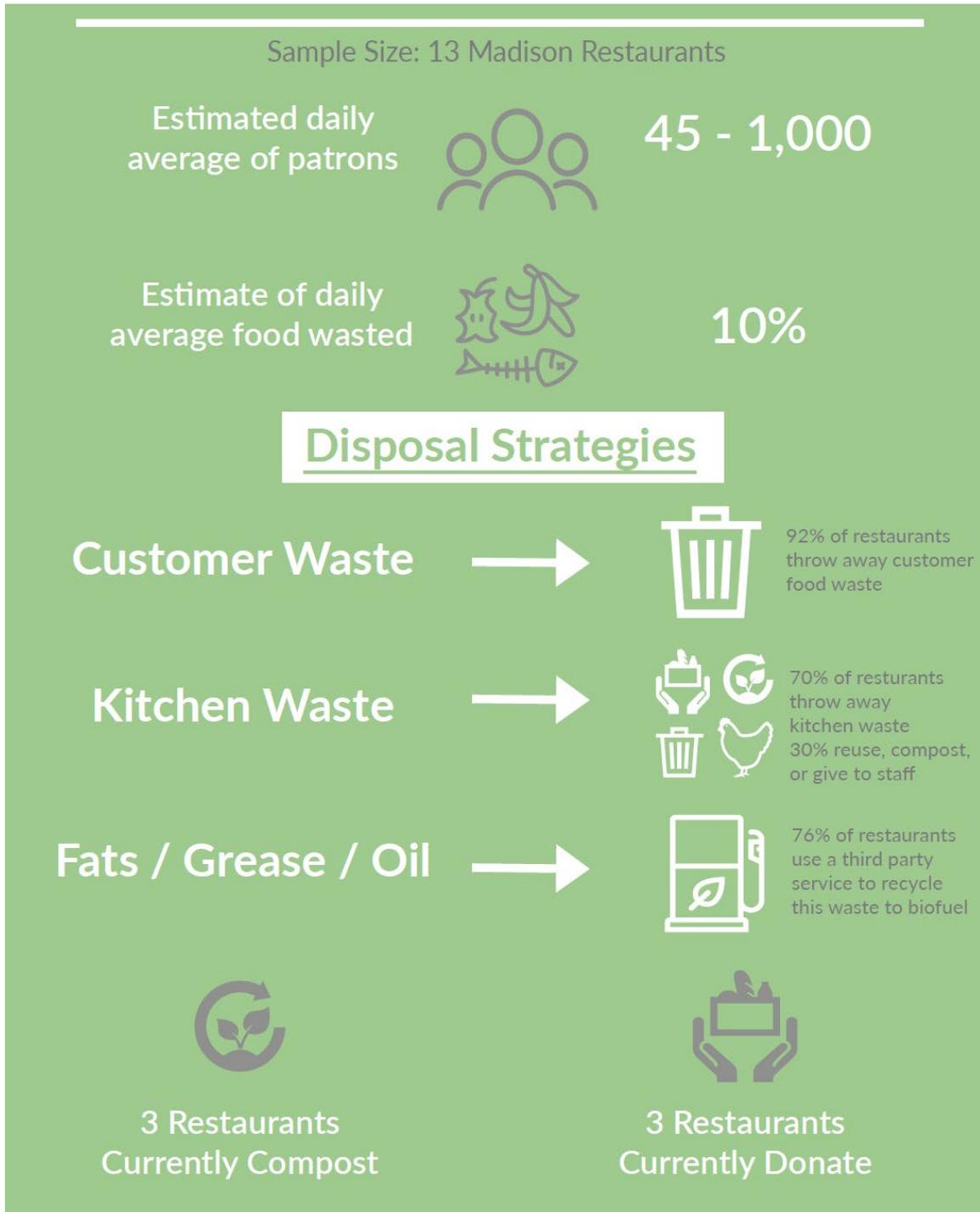


Figure 8. Original Infographic, “Current Madison, WI Restaurant Food Waste Actions.”

# Food Waste Management Tips for Madison Restaurants



89% of restaurant patrons are concerned about food waste

Provide smaller portion sizes

Advertise and provide to-go boxes

Become familiar with local donation laws

Partner with other restaurants in your business association:

Buy in bulk and share excess food

Share the cost of a composting service

70% of patrons would definitely be more likely to dine at a restaurant that they knew **donated** their leftover food



According to the EPA\*, donating food to the hungry is the most preferred method for preventing food waste

43% of patrons would definitely be more likely to dine at a restaurant that they knew **composted** their leftover food



Partner with a local composting service such as Curbside Composter, Earth Stew, or Rooted Curbside Compost

\*<https://www.epa.gov/sustainable-management-food/food-recovery-hierarchy>

Figure 9. Original Infographic, “Food Waste Management Tips for Madison Restaurants.”

## *Limitations*

Some of the limitations to this study have to do with the amount of time we had to collect the data, the restaurant owner/manager response rate, and the analysis for some text-box questions. We only had a semester to complete this research project, and our surveys were up for only a month each. This affected the number of responses we received from restaurant owners/managers. Having more responses from restaurant owners/managers would have given us better knowledge of common disposal strategies and of the average amount of food wasted by different restaurants. We included two questions in the restaurant patron survey that required survey-takers to fill out text-boxes, which made our data hard to analyze. We should have changed Q5 (see appendix A) to a Yes/No multiple choice question, with a text box response that would appear if patrons knew of any restaurants in Madison that compost. This would have made it more feasible to evaluate the number of patrons that knew of restaurants in Madison that composts versus the number of patrons that did not know about restaurants in Madison that compost. The patrons survey was also skewed by the large amount of college students that took the survey, which could have affected responses and the analysis of these responses. Additionally, we realize it might have been more beneficial, and have gotten a more accurate measurement of food waste in each restaurant if we were to ask people who worked in the kitchen or as a busser instead of the restaurant owner (Appendix B, Q3). We also recognize that if we had a better response rate for our owner follow-up emails, only getting one response out of four, we may have had a more in-depth look at food waste and food waste strategies in restaurants (Appendix C).

### ***Future Research***

These surveys suggest that future research should be done on evaluating restaurant patrons' perceptions on food waste, and managing food waste disposal strategies in restaurants. Future researchers may want to evaluate what affects restaurant patrons' perceptions of food waste, and how these perceptions affect patrons' dining habits. This may help to influence diners' perceptions on food waste, and make them more aware that their dining habits have repercussions in adding to food waste problems.

Our research helped to establish a foundation for estimating how much food is wasted in Madison restaurants, the common disposal strategies for this food waste, and assessed strategies the City of Madison can take to make composting more accessible for Madison restaurants. A future research project could work more in-depth with restaurants to figure out where the majority of food waste is coming from in restaurants, whether it comes from customer food waste or kitchen food waste, and how to mitigate this and prevent food waste at different points in the restaurants' operations. This work can be done through a participant ethnography in restaurants, so researchers can have first-hand experience in understanding and evaluating where food waste comes from in restaurants. Researchers could also work with the City of Madison and composting programs around Madison to determine how to best meet the needs of restaurants and how to create more sustainable disposal strategies. Researchers may also want to evaluate not only how much food is wasted at restaurants, but how much non-food waste is created, in the form of disposable utensils, napkins, coffee filters, etc. This will help determine how much waste is created overall in Madison restaurants, and how we can implement initiatives to help restaurants use less disposable items, and develop a more sustainable practice.

## Conclusion

The purpose of our research was to examine the extent of food waste in Madison restaurants and better understand owners' and patrons' perceptions of food waste and disposal strategies. While there were limitations regarding feedback accurately portraying such a large issue, our surveys provided some beneficial insights. The amount of food wasted greatly varies from restaurant to restaurant. However, there were significant trends in disposal strategies: customer waste is typically thrown out; kitchen food waste is sometimes reused for things such as cocktail shrubs and chicken food or it is composted; fats, oil, and grease is often taken by a third party service and recycled or converted into biofuel. Out of the 13 responses from restaurant owners/managers, three establishments compost and three donate. According to our survey results, owners often felt deterred to compost or donate due to restrictions and local regulations. This was especially prevalent when looking at limitations of donating leftover food as lack of information, time, and resources to provide up-to-code items were common responses. Moreover, the two survey questions asking about programs the City of Madison could implement to make composting more feasible did not provide a clear answer. The variance between owners' perceptions help portray that each restaurant runs differently and has unique needs. Because of this, more nuanced research, like active participation in restaurant functionings by researchers, is essential to provide solutions for individuals to combat food waste.

Through our survey and our questionnaire, we found that both patrons and restaurant owners/managers are interested in implementing more sustainable habits, but there is a lack of knowledge about how to implement sustainable practices in restaurants. Most of our respondents indicated that they either want to, or are interested in being sustainable producers and consumers. The responses we received from patrons gave evidence that the majority of customers eating out in Madison are concerned about food waste and want restaurants to be more sustainable. Our

data showed a strong correlation between patrons' concerns of wasted food and the likelihood that they will dine at a restaurant that composts or donates leftover food. Additionally, many respondents from our questionnaire and survey stated that they would use an application/program allowing customers to get a meal, which would otherwise be thrown out, at a reduced price. While there is currently no such program in Wisconsin, our data helps show that people are interested in a food waste prevention strategy like this. The issue of food waste in restaurants is prevalent and slowly being mitigated. This paper is a start in the direction of diverting food waste in restaurants in Madison, Wisconsin. Moreover, we will not see a real change in food waste without cooperation between restaurant patrons, owners, and officials in the City of Madison.

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Tommasetti, Aurelio, Pierpaolo Singer, Orlando Troisi, and Gennaro Maione. "Extended Theory of Planned Behavior (ETPB): Investigating Customers' Perception of Restaurants' Sustainability by Testing a Structural Equation Model." *Sustainability* 10, no. 7 (2018). doi:<http://dx.doi.org.ezproxy.library.wisc.edu/10.3390/su10072580>.

“Types of Composting and Understanding the Process.” EPA. Environmental Protection Agency, August 29, 2016. <https://www.epa.gov/sustainable-management-food/types-composting-and-understanding-process>.

“What Is AD?: ADDBA: Anaerobic Digestion & Bioresources Association.” ADDBA | Anaerobic Digestion & Bioresources Association. Accessed November 23, 2019. <http://adbioresources.org/about-ad/what-is-ad>.

## Appendices/Figures and Tables

### *Appendix A*

#### **Survey to Patrons**

#### **Privacy Policy and Informed Consent**

#### **Geography Undergraduate Colloquium, University of Wisconsin - Madison**

Researchers: Jackie Millonzi, [jmillonzi@wisc.edu](mailto:jmillonzi@wisc.edu); Chloe Frankovic, [frankovic@wisc.edu](mailto:frankovic@wisc.edu); and Claire Stowe, [cstowe2@wisc.edu](mailto:cstowe2@wisc.edu)

We are geography majors at UW-Madison working on our senior thesis project. We are interested in Madison restaurant-goers' perceptions on food waste in Madison restaurants. The survey consists of 10 questions and should take less than 5 minutes to complete. Your participation is voluntary – you may skip any question or exit the survey at any time. We are not collecting any personal information. Finally, your responses are confidential. We will destroy all individual surveys once the results are tabulated.

You are cordially invited to attend a free public symposium on Tuesday evening, 10 December 2019, at 180 Science Hall on the UW-Madison campus, where we will present the results of our research. Our paper will be archived at the Minds@UW website, which is password protected. We will also send you a digital copy of our paper upon request. Simply contact one of us through an email address listed above.

By participating in the survey, you indicate that you: (1) have read the above privacy policy and consent statement, (2) understand how we will protect your privacy, and (3) voluntarily agree to participate.

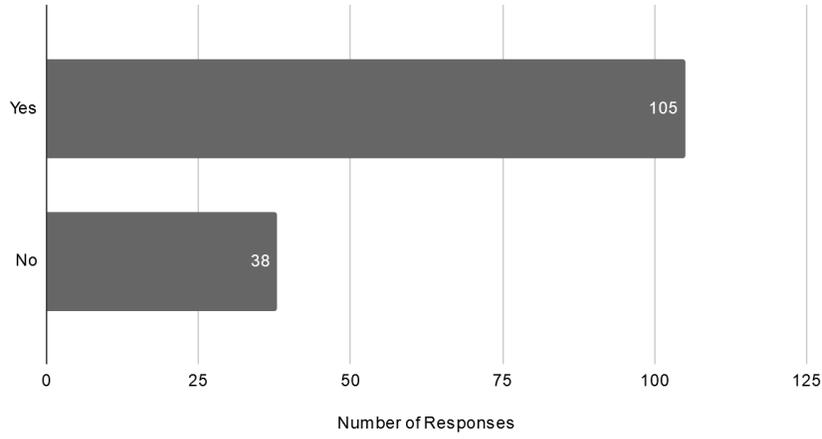
Thank-you for helping us with our senior project!

If you have any comments, questions, or concerns about this project, please contact Dr William Gustav Gartner, 115D Science Hall, Department of Geography, UW-Madison, 550 N Park St, Madison, WI 53706. Phone: (608) 890-3816. Email: [wgartner@wisc.edu](mailto:wgartner@wisc.edu)

### Q1 Are you a college student?

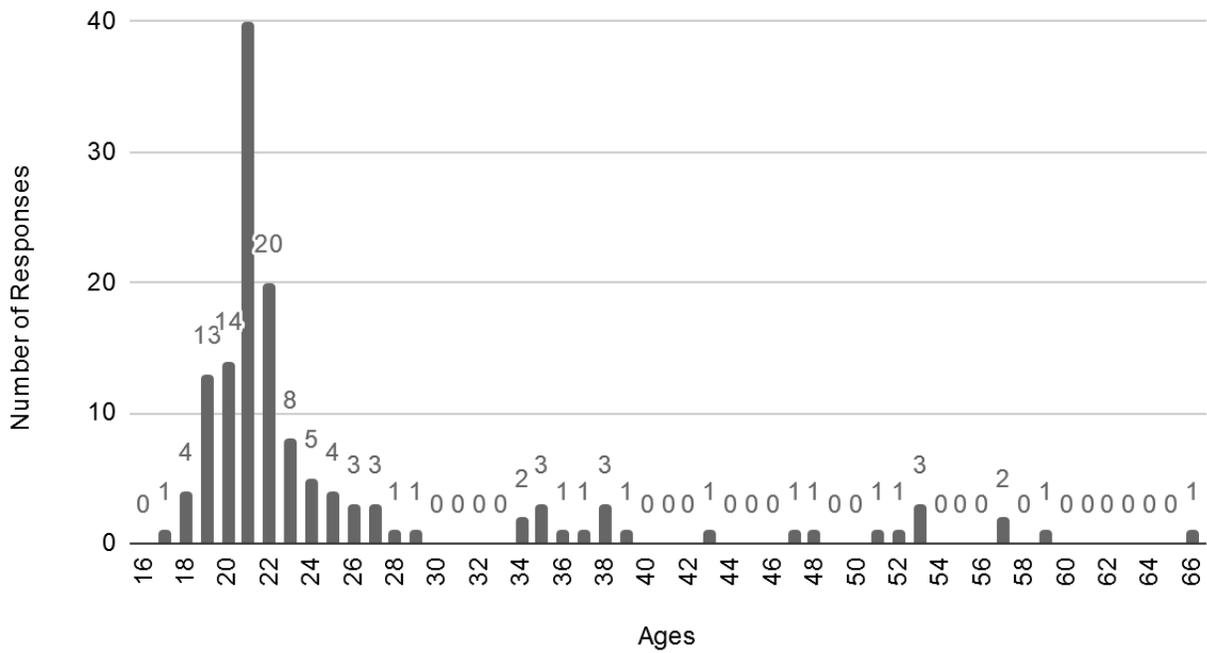
- Yes
- No

Q1 Are you a college student?



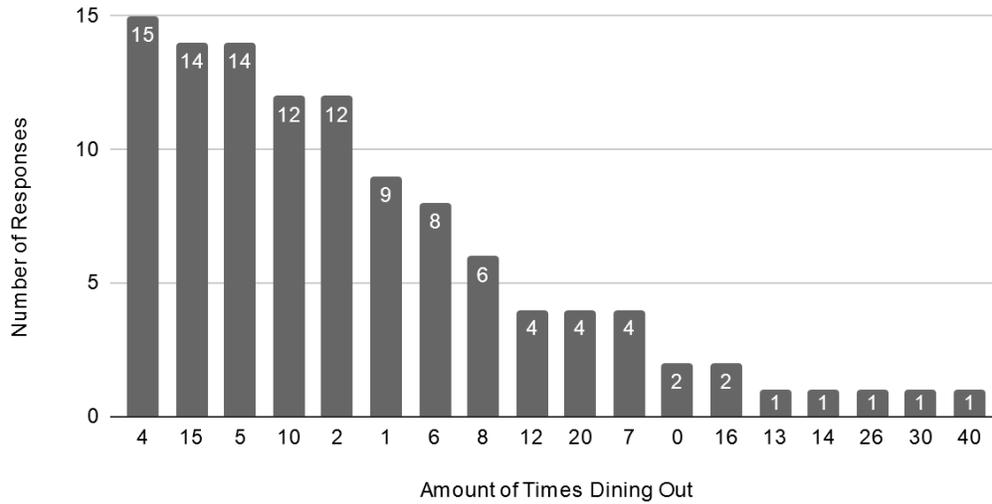
### Q2 What is your age?

Q2 What is your age?



**Q3 On average, how many times each month do you at restaurants in Madison?**

Q3 On average, how many times each month do you at restaurants in Madison?



Other responses to Q3

---

4 – 5

5 – 8

1 – 2

30+

7 – 8

5 – 10

5 – 10

10+

...way too many to count...

Maybe once

8 – 10

Daily

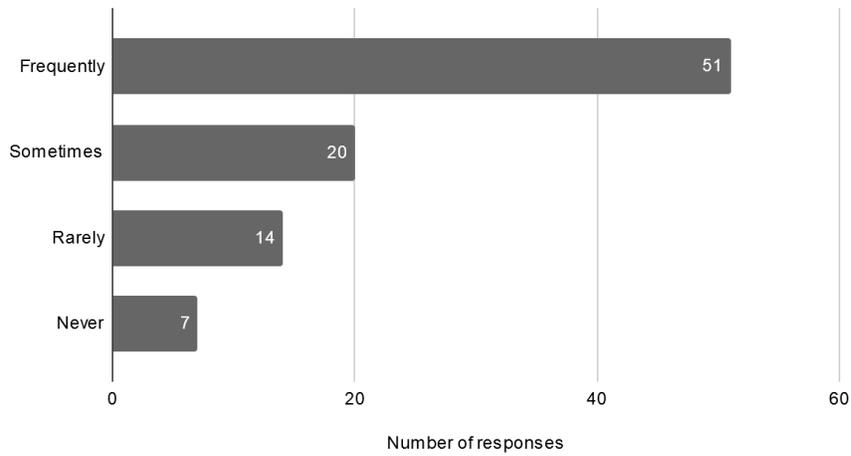
Like every day

10 – 12 ish times

**Q4 How often do you take your leftover food home?**

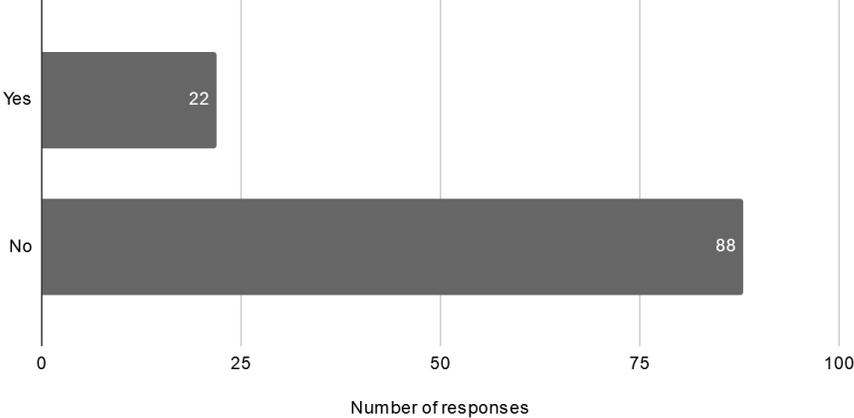
- Always
- Frequently
- Sometimes
- Rarely
- Never

Q4 How often do you take your leftover food home?



**Q5 Do you know any of any restaurants that compost in Madison? If so, which?**

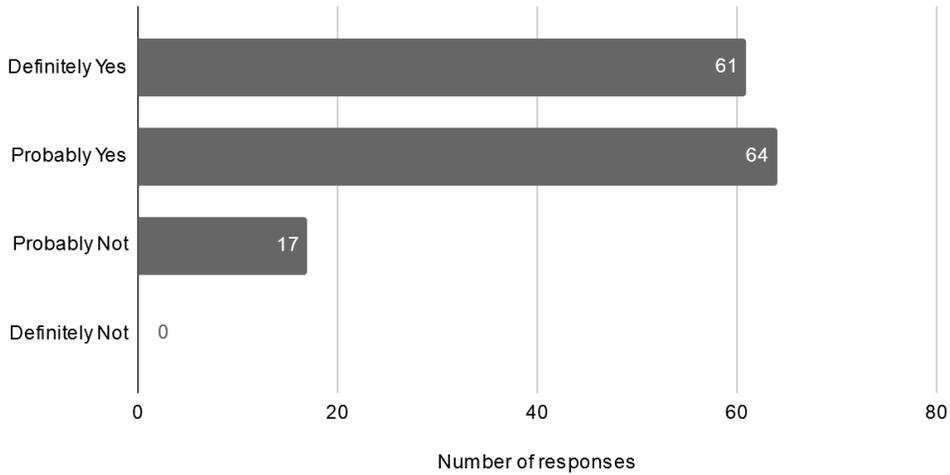
Q5 Do you know any of any restaurants that compost in Madison? If so, which?



**Q6 Would you be more likely to dine at a restaurant that you know composts their food waste?**

- Definitely yes**
- Probably yes**
- Probably not**
- Definitely not**

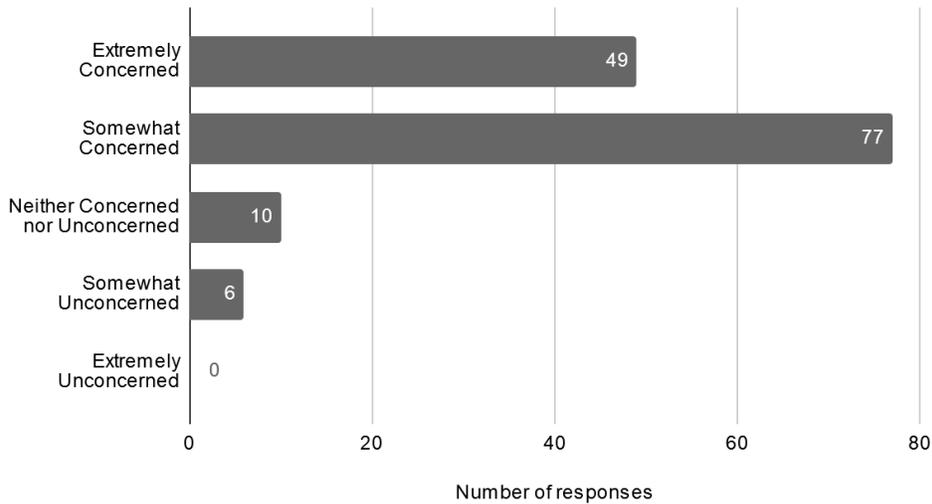
Q6 Would you be more likely to dine at a restaurant that you know composts their food waste?



**Q7 How concerned are you about food waste?**

- Extremely concerned**
- Somewhat concerned**
- Neither concerned or unconcerned**
- Somewhat uncensored**
- Extremely unconcerned**

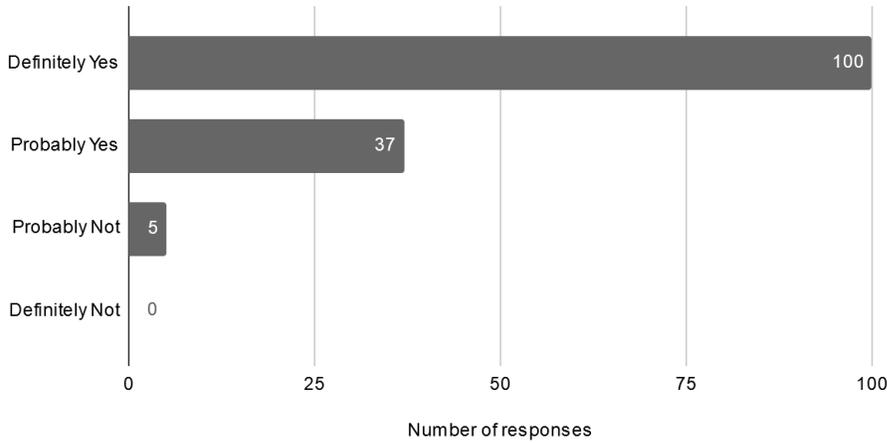
Q7 How concerned are you about food waste?



**Q8 Would you be more likely to dine at a restaurant that you know donates their leftover food?**

- Definitely yes**
- Probably yes**
- Probably not**
- Definitely not**

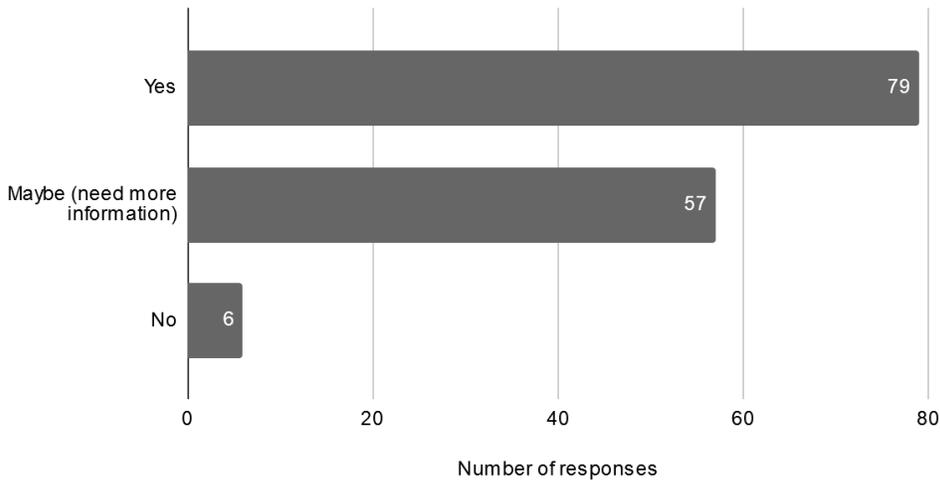
Q8 Would you be more likely to dine at a restaurant that you know donates their leftover food?



**Q9 Would you use an application/program that allows you to get a meal for a reduced price for food that would otherwise go to waste?**

- Yes**
- Maybe (need more information)**
- No**

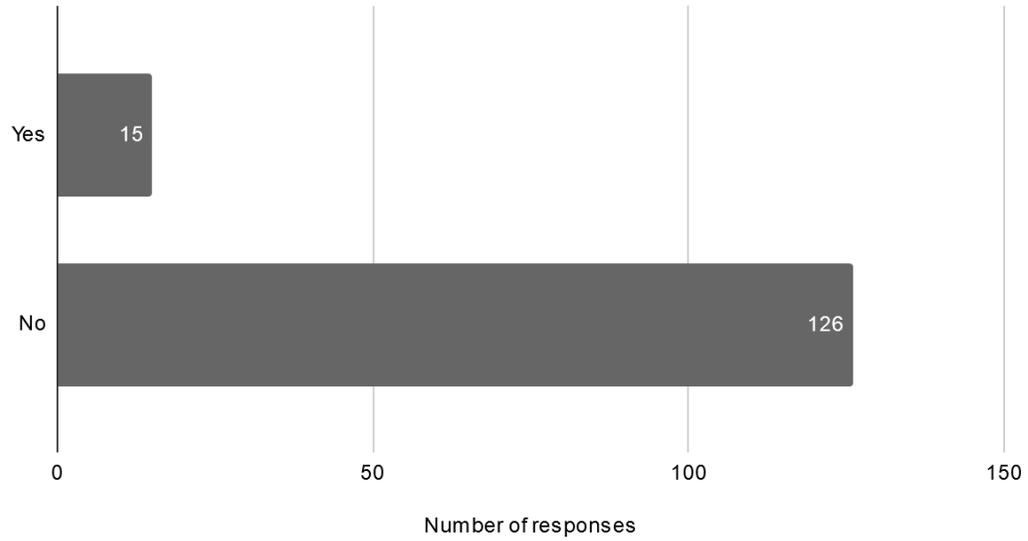
Q9 Would you use an application/program that allows you to get a meal for a reduced price for food that would otherwise...



**Q10 Are you aware of the Madison City Food Scraps Program?**

- Yes**
- No**

Q10 Are you aware of the Madison City Food Scraps Program?



## *Appendix B*

### **Survey to Restaurant Owners**

#### **Privacy Policy and Informed Consent**

#### **Geography Undergraduate Colloquium, University of Wisconsin - Madison**

Researchers: Jackie Millonzi, [jmillonzi@wisc.edu](mailto:jmillonzi@wisc.edu); Chloe Frankovic, [frankovic@wisc.edu](mailto:frankovic@wisc.edu); and Claire Stowe, [cstowe2@wisc.edu](mailto:cstowe2@wisc.edu)

We are geography majors at the UW-Madison working on our senior thesis project. We are interested in food waste in Madison restaurants. The survey consists of 16 questions and should take less than 8 minutes to complete. Your participation is voluntary – you may skip any question or exit the survey at any time. We are not collecting any personally identifiable information unless you voluntarily offer personal or contact information in the last question of the survey. Finally, your responses are confidential. We will destroy all individual surveys once the results are tabulated.

You are cordially invited to attend a free public symposium on Tuesday evening, 10 December 2019, at 180 Science Hall on the UW-Madison campus, where we will present the results of our research. Our paper will be archived at the Minds@UW website, which is password protected. We will also send you a digital copy of our paper upon request. Simply contact one of us through an email address listed above.

By participating in the survey, you indicate that you: (1) have read the above privacy policy and consent statement, (2) understand how we will protect your privacy, and (3) voluntarily agree to participate.

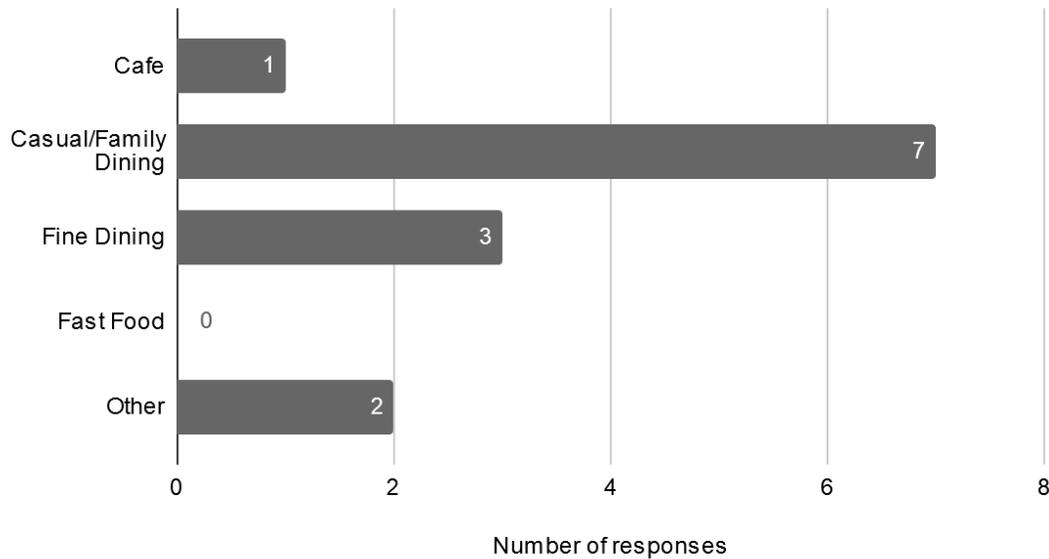
Thank-you for helping us with our senior project!

If you have any comments, questions, or concerns about this project, please contact Dr William Gustav Gartner, 115D Science Hall, Department of Geography, UW-Madison, 550 N Park St, Madison, WI 53706. Phone: (608) 890-3816. Email: [wgartner@wisc.edu](mailto:wgartner@wisc.edu)

**Q1 Which of the following categories best describes your restaurant?**

- Cafe**
- Casual / Family Dining**
- Fine Dining**
- Fast Food**
- Other: (please specify)**

Q1 Which of the following categories best describes your restaurant?



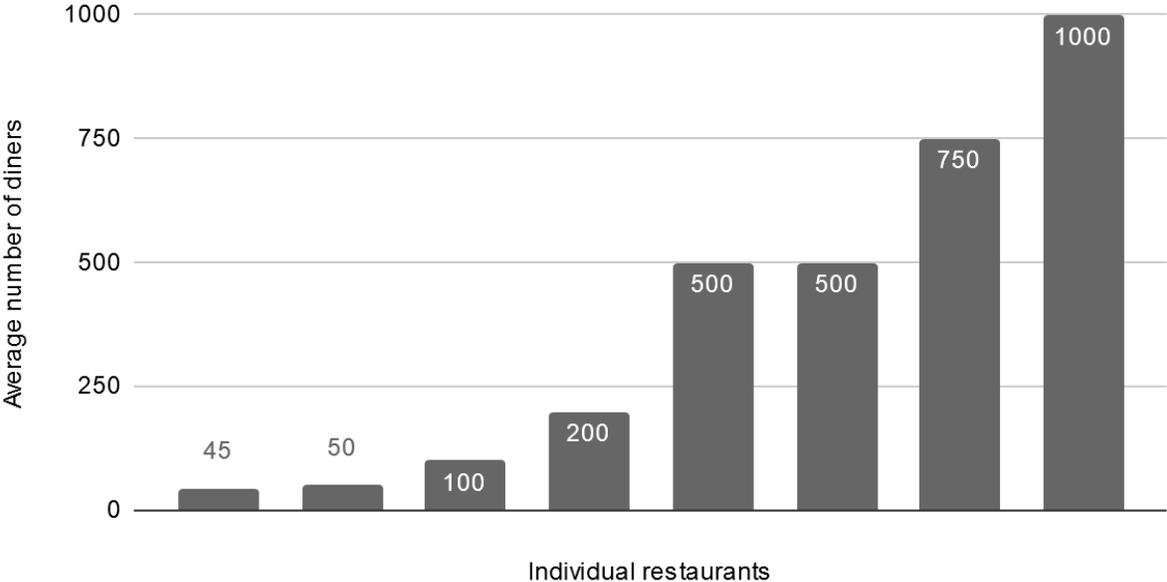
“Other” category responses

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1. Bar/Pub
2. Fast Casual

**Q2 On average, how many people dine at your restaurant daily?**

Q2 On average, how many people dine at your restaurant daily?

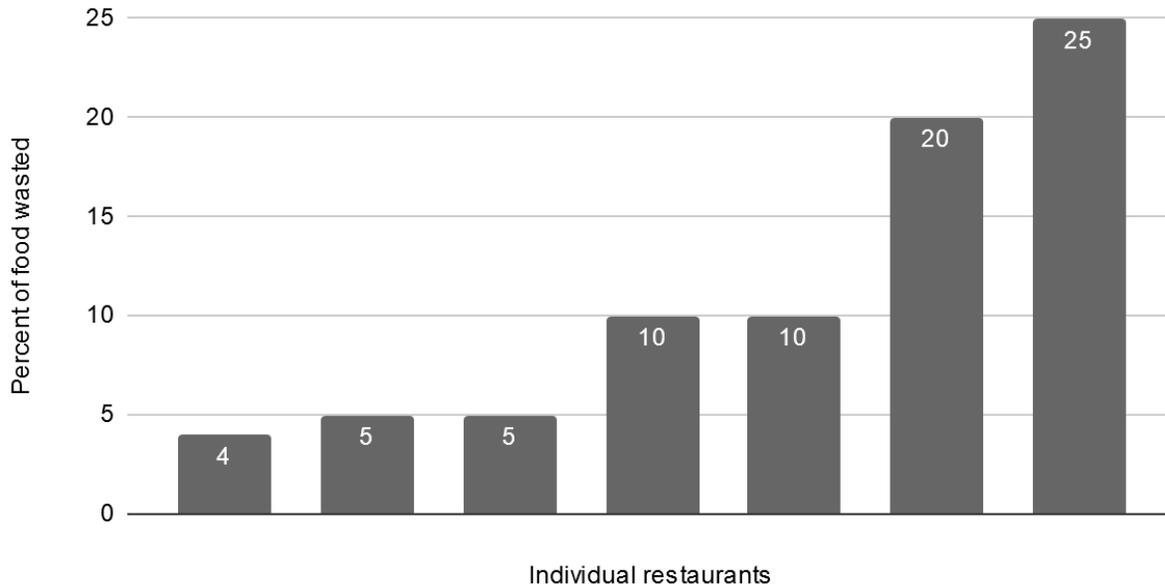


Other responses to Q2

- 
1. 200 – 250 (average is tilted by very busy Fridays – Sundays)
  2. 300 – 600

**Q3 What is the estimated volume of food that is wasted at your restaurant on a daily basis? (please provide a percentage or, if it's more convenient, you may provide an estimate by weight or volume)**

Q3 What is the estimated volume of food that is wasted at your restaurant on a daily basis? (please provide a percentage or,...



Other responses to Q3

- 
1. 50# [o]f coffee grounds/ 50# of customer food waste/ 75# of kitchen food/prep scraps
  2. 60 lbs
  3. Hard to review as most is eaten
  4. I'm not sure
  5. No more than a few lbs per day, including food ends (celery butts, onion peels, etc) and what customers don't eat. Kitchen does not waste a lot, and almost never has food gone bad.

**Q4 What is your procedure for disposing of customer food waste?**

*Q4 What is your procedure for disposing of customer food waste?*

---

1. Trash
2. Garbage
3. Compost
4. Tossing everything the customer touched, but did not consume.
5. Garbage disposal or garbage
6. Garbage
7. Garbage
8. If something is left when they are done eating, we throw it in the trash
9. Throw in the garbage
10. Trash
11. Garbage (illegal to compost meat waste; not sure if it's legal to compost customer food)
12. Trash can and then picked up by Pelletier
13. Have to throw it away; health code

## **Q5 What is your procedure for disposing of kitchen food waste?**

*Q5 What is your procedure for disposing of kitchen food waste?*

---

1. Trash
2. Garbage or disposal
3. Trash
4. Reuse as much as possible, but stick to Food Safety guidelines and standards. Disposing when necessary
5. Chicken food
6. Garbage
7. Pellit[te]ri
8. If something is expired or has to be wasted for health code reasons we throw it in the trash
9. Throw in the garbage
10. Trash
11. Garbage
12. Compost
13. If it's food our staff can eat, it's donated to them; if it's kitchen scraps from prepping, much is used in other items, like creating cocktail shrubs or vegetable stocks, etc.

**Q6 What is your procedure for disposing of cooking oil, fats, and grease?**

*Q6 What is your procedure for disposing of cooking oil, fats, and grease?*

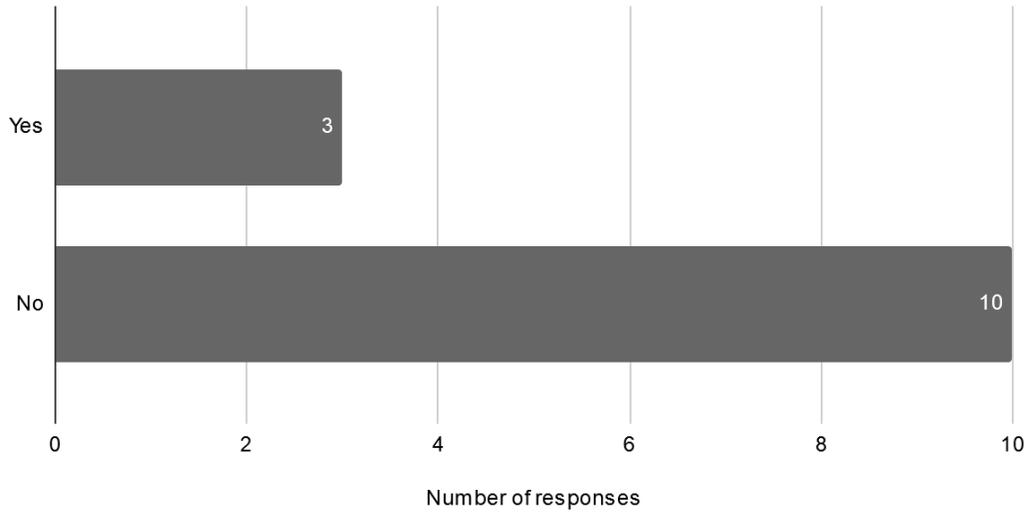
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1. Service picks it up
2. Recycled oil w/ Blue Honey Bio Fuels, but any run off from flat top grill is collected in 5 gal buckets and then thrown in garbage
3. We work with a company that picks up all our cooking oil to be reused
4. Recycle
5. Third party service pick-up
6. Recycled to make bi[o]diesel
7. We have a large grease dump container and we pay a third party to come pick it up and dispose of it for us
8. Grease trap
9. No oil, grease and fat in trash
10. Recycling service
11. Company picks up fat and grease for bio-diesel
12. A service picks up our grease waste to convert into fuel

**Q7 Does your restaurant compost? If yes, what service do you use?**

- Yes**
- No**

Q7 Does your restaurant compost? If yes, what service do you use?



**Restaurant compost systems**

---

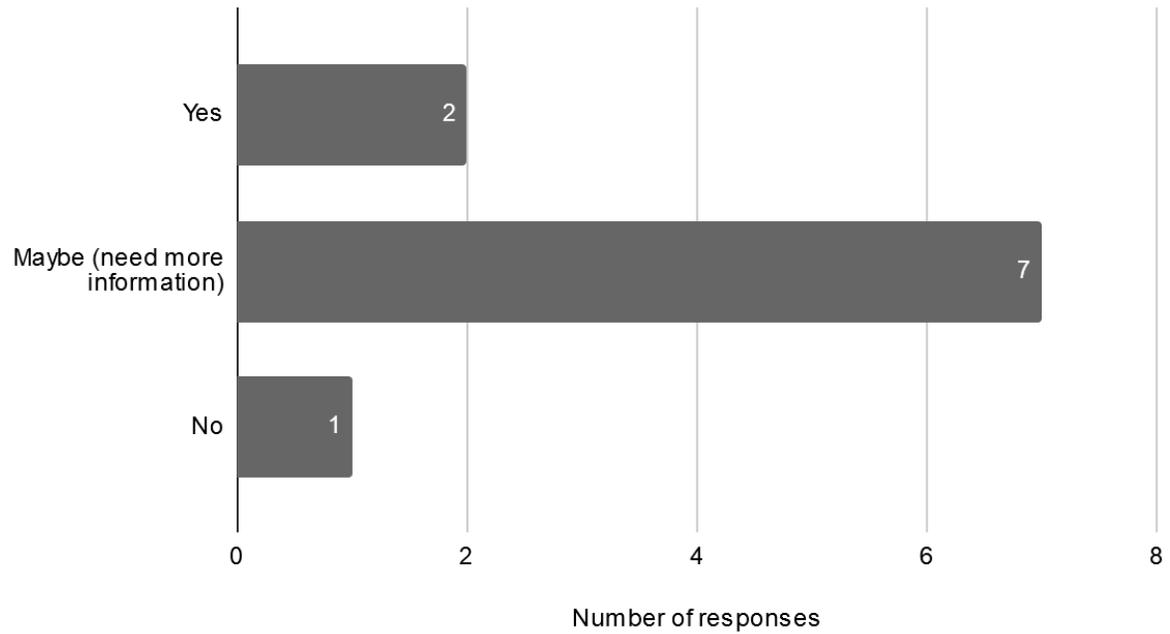
1. We compost, no service
2. Curbside Composter

***\*\*Automatic skip to Q11 if answer to Q7 = Yes\*\****

**Q8 Are you interested in implementing a compost system?**

- Yes**
- Maybe (need more information)**
- No**

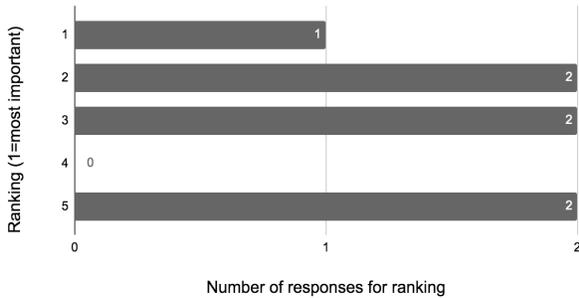
Q8 Are you interested in implementing a compost system?



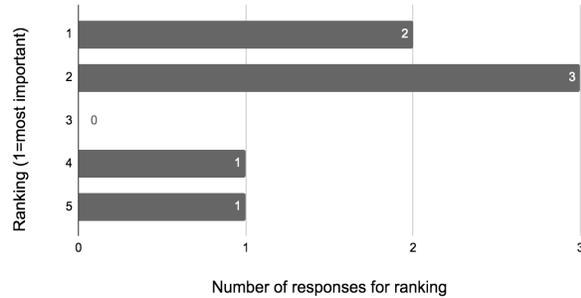
**Q9 Would you be more likely to compost food waste if the City of Madison: (rank in order of importance, 1 being most important)**

- \_\_\_ (Option 1) Offered fee-based curbside collection services for food waste
- \_\_\_ (Option 2) Provided one or more 64-gallon compost bins for curbside pickup
- \_\_\_ (Option 3) Collected food scraps including cooked items, baked goods, meat and dairy products
- \_\_\_ (Option 4) Collected food scraps including eggshells and nut shells
- \_\_\_ (Option 5) Partnered with local organic farms to distribute compost

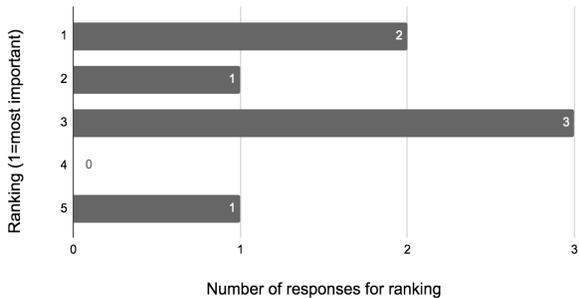
Option 1: Offered fee-based curbside collection services for food waste



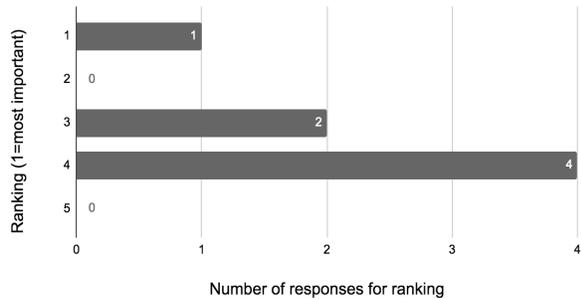
Option 2: Provided one or more 64-gallon compost bins for curbside pickup



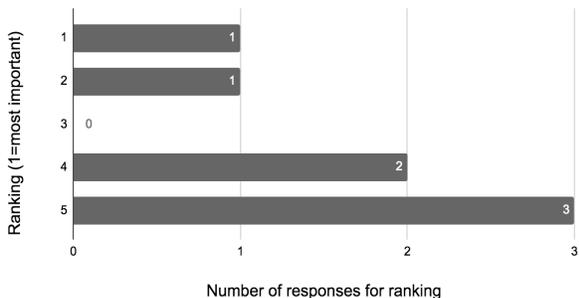
Option 3: Collected food scraps including cooked items, baked goods, meat and dairy products



Option 4: Collected food scraps including eggshells and nut shells



Option 5: Partnered with local organic farms to distribute compost



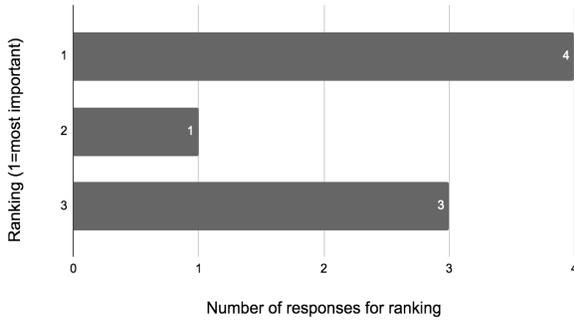
**Q10 Would you be more likely to compost if the City of Madison offered the following educational services: (rank in order of importance, 1 being most important)**

\_\_\_ (Option 1) **Provided in-person service and support**

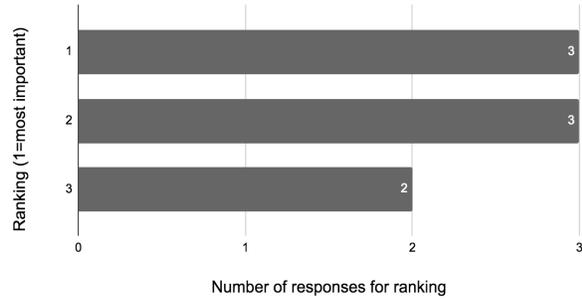
\_\_\_ (Option 2) **Provided print materials and signage about composting**

\_\_\_ (Option 3) **Provided free online tools for composting support**

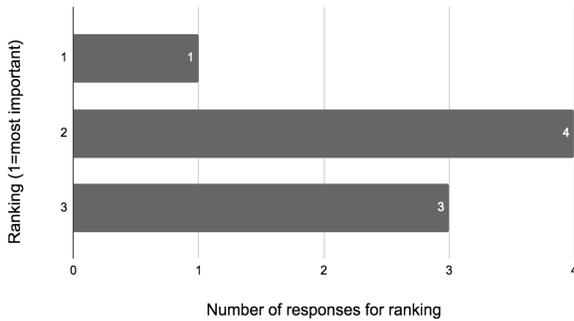
Option 1: Provided in-person service and support



Option 2: Provided print materials and signage about composting



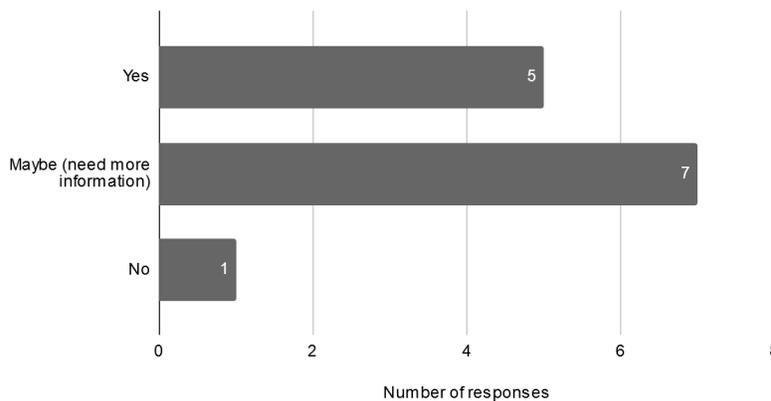
Option 3: Provided free online tools for composting support



**Q11 Would you consider joining other small businesses (perhaps within your restaurant association) to negotiate a more favorable contract for composting services?**

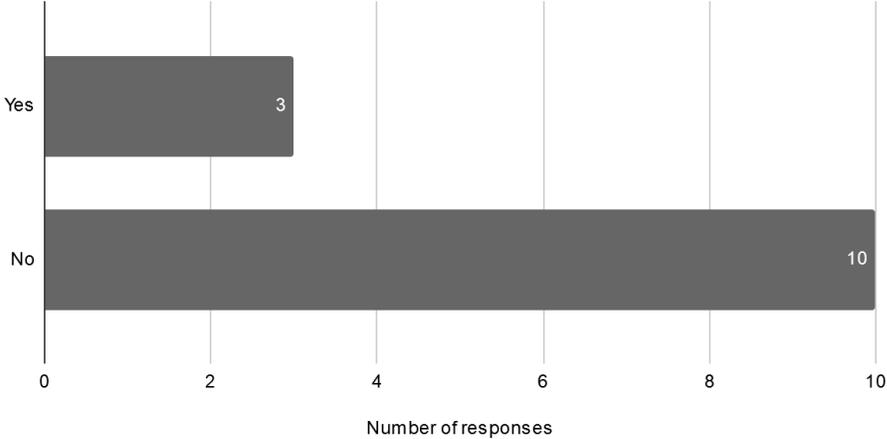
- Yes**
- Maybe (need more information)**
- No**

Q11 Would you consider joining other small businesses (perhaps within your restaurant association) to negotiate a m...



**Q12 Do you donate leftover food items? If yes, where/to whom?**

Q12 Do you donate leftover food items? If yes, where/to whom?



Where restaurants donate their leftover food

---

1. Food pantry
2. Bread, some catering to various place[s]
3. Staff

**Q13 Do you think there are limitations to donating food (e.g. rules for proper donation, accessibility, or location)? Please explain:**

*Q13 Do you think there are limitations to donating food (e.g. rules for proper donation, accessibility, or location)? Please explain:*

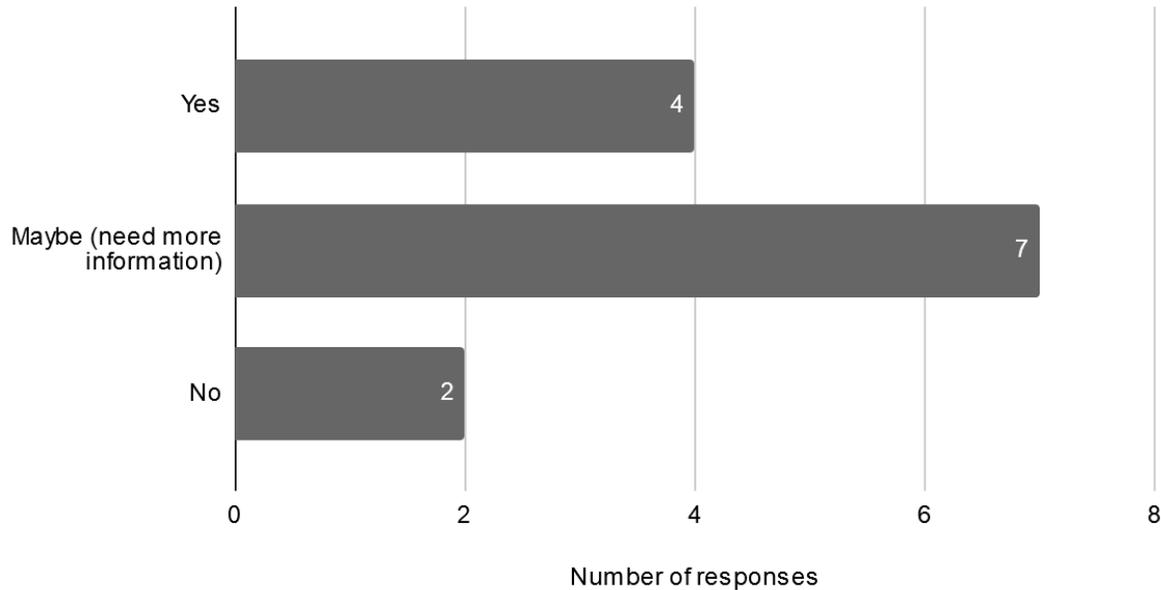
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1. Health risks
2. Health code should dictate what can and can't be donated. Foodborne illness is nothing to mess around with. If composting I would not consider anything that had been served to a customer, just food scraps from kitchen (which can add up to a lot)... and it would have to be managed well by whatever agency so as to limit animal/insect infestation.
3. Yes. I do not remember the specifics, but there are limitations in packaging, etc. that eliminated it as an option.
4. The rules can be hard to stick to and result in more work for our small business
5. Madison law says we cannot donate leftovers
6. For us we just don't have anything that would qualify. Our only food waste is if something is expired. We don't have baked goods or things like that where you can donate because it's still good
7. Yes, not sure the legalities of donating food.
8. Lack of information and means to deliver
9. Not enough time. I work 80-100 hours a week. I don't have time to deal with that.
10. Pick up is irregular
11. Accessibility to populations that would want food donations; lack of staffing/time/resources to get items to those populations.

**Q14 There are applications/programs in other cities that offer meals, which would otherwise be thrown away, to customers at a reduced price.**

**Would you be interested in taking part in a program like this if it was implemented in Madison?**

Q14 There are applications/programs in other cities that offer meals, which would otherwise be thrown away, to customers...



**Q15 If you are willing to meet with us to further discuss the issue of food waste in Madison restaurants or give additional insights into food waste disposal, please provide your contact information so we can follow up:**

**Name:** \_\_\_\_\_

**Email:** \_\_\_\_\_

**Phone:** \_\_\_\_\_

**Thanks for your participation! Please remember to click the final "Next Page" button to submit your survey.**

## *Appendix C*

### **Privacy Policy and Informed Consent**

#### **Geography Undergraduate Colloquium, University of Wisconsin - Madison**

##### **Researchers:**

Jackie Millonzi, [jmillonzi@wisc.edu](mailto:jmillonzi@wisc.edu); Chloe Frankovic, [frankovic@wisc.edu](mailto:frankovic@wisc.edu); and Claire Stowe, [cstowe2@wisc.edu](mailto:cstowe2@wisc.edu)

We are geography majors at the UW-Madison working on our senior thesis project. We are interested in food waste in Madison restaurants. Thank you for completing our questionnaire! We have a couple of follow-up questions that we are hoping you can help us with. This follow-up consists of 4-6 questions and should take less than 10 minutes to complete. Your participation is voluntary – you may skip any question or choose not to respond at all. You have provided your personal information, but your responses are confidential, and we will not use any identifiers in our final paper or presentation. We will destroy all individual responses once the results are tabulated.

You are cordially invited to attend a free public symposium on Tuesday evening, 10 December 2019, at 180 Science Hall on the UW-Madison campus, where we will present the results of our research. Our paper will be archived at the Minds@UW website, which is password protected. We will also send you a digital copy of our paper upon request. Simply contact one of us through an email address listed above.

By sharing your responses, you indicate that you: (1) have read the above privacy policy and consent statement, (2) understand how we will protect your privacy, and (3) voluntarily agree to participate.

Thank you for helping us with our senior project!

If you have any comments, questions, or concerns about this project, please contact Dr William Gustav Gartner, 115D Science Hall, Department of Geography, UW-Madison, 550 N Park St, Madison, WI 53706. Phone: (608) 890-3816. Email: [wgartner@wisc.edu](mailto:wgartner@wisc.edu)

## Restaurant Association 1

1. **On a daily basis, approximately how many patrons dine at each restaurant within the [restaurant association]?**

“It can range wildly, based on season, special events, day of the week, etc. but [Restaurant A] is usually appx. 150 on a Monday and 400 on a Saturday. [Restaurant B] is appx. 20 per on weekdays and 60 per day on weekends. [Restaurant C] is appx. 60s per day on weekdays and 150 per day on weekends.”

2. **On a daily basis, approximately how much food is wasted at each restaurant within the [restaurant association]?**

“I don't know exact numbers for food waste unfortunately. Because we have multiple restaurants, we try to minimize how much waste we have by transferring products among the three so that it gets used.”

3. **Which health code, if you know, requires you to throw away customer food waste?**

“We have to throw away customer food due to ServeSafe health code guidelines. See attachment from the ServeSafe manual.” (see figure 6)

4. **What is the service you use to pick up grease waste and convert it into fuel?**

“Sanimax picks up our used oil to convert into usable material.”

5. **What are your perceptions regarding food waste?**

“As an organization, we wish that there was an easy way for restaurants and other food service businesses to minimize or compost waste that wouldn't lead to any extra costs or violate any health agreements. Unfortunately, due to limitations that we've experienced with current available resources, the amount of compostable waste we create as a business was not picked up often enough without it becoming a health and safety issue. Other options we looked into were too expensive for our business to take on without having to pass on the costs to our customers.”

6. **Are you aware of the Madison City Food Scraps Pilot Program? Do you have any thoughts or comments about this program?**

“I am not aware of the Madison City Food Scraps program. We'd love to hear more!”

## Restaurant 1 (No response)

1. **On a daily basis, approximately how much food is wasted at [this restaurant]?**
2. **How did you learn about Madison's food donation regulations?**
3. **What are your perceptions regarding food waste?**
4. **Are you aware of the Madison City Food Scraps Pilot Program? Do you have any thoughts or comments about this program?**

**Restaurant 2 (No response)**

- 1. How did you learn about the specificities of post-consumer composting regulations?**
- 2. What do you think could help make donating leftover food more accessible and less time-consuming?**
- 3. What are your perceptions regarding food waste?**
- 4. Are you aware of the Madison City Food Scraps Pilot Program? Do you have any thoughts or comments about this program?**

**Restaurant 3 (No response)**

- 1. What composting service do you use?**
- 2. What food pantry do you donate leftover food to?**
- 3. How often do you donate leftover food?**
- 4. What is the service you use for recycling cooking oil, fats, and grease waste? Do you know if they convert into fuel?**
- 5. What are your perceptions regarding food waste?**
- 6. Are you aware of the Madison City Food Scraps Pilot Program? Do you have any thoughts or comments about this program?**