

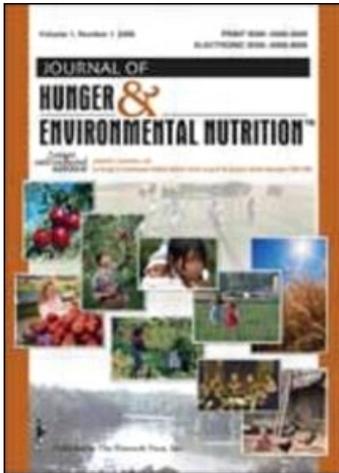
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### Food and Non-Edible, Compostable Waste in a University Dining Facility

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## RESEARCH BRIEF

# Food and Non-Edible, Compostable Waste in a University Dining Facility

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*National data indicate that 91 billion pounds of food are lost by consumers and food service annually. With growing concerns about the environment, economy, and food production, it is important to be resourceful about food. The goal of this study was to analyze differences in food and compostable waste with and without the use of trays in an all-you-can-eat university dining facility. The results indicated that the use of trays resulted in significantly more waste ( $p < .05$ ) than no access to trays, with 5829 pounds of edible waste and 1111 pounds of inedible waste being generated in 1 week.*

**KEYWORDS** *food waste, compost, college, dining, institution, tray*

## INTRODUCTION

According to national data, 91 billion pounds of food were lost by consumers and food service in 1995, 26% of all edible food available for human consumption in the country for the year.<sup>1</sup> Further, the US Environmental

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Protection Agency estimated that food scraps were responsible for 12.4% of municipal solid waste in 2006.<sup>2</sup>

Recently, there have been growing concerns about food production,<sup>3,4</sup> global warming,<sup>5</sup> increasing food prices,<sup>6</sup> and the economy.<sup>7,8</sup> Therefore, it is important to explore opportunities for reducing food waste to be environmentally and economically responsible. Though several studies have examined contributors to food waste in institutional settings ranging from elementary schools<sup>9</sup> to hospitals<sup>10</sup> and licensed food establishments,<sup>11</sup> to date no studies have been found on food waste in the context of colleges and/or universities.

Approximately 17 million students are enrolled in colleges or universities (based on 2006 data) in the United States,<sup>12</sup> of which 15.1 million are undergraduates.<sup>13</sup> There are no published data on the number and/or percentage of calories served to students in those institutions. However, it is clear that on-campus dining facilities may be a central and primary source of food and food waste for thousands of college students, particularly those who reside on-campus. The goal of this project was to explore food waste at a university dining facility and to analyze differences in food and compostable waste with and without the use of trays. A study conducted in a continuing care retirement community found that tray service generated more food waste than family-style service or wait-staff service.<sup>14</sup>

## METHODS

### Description of the Facility

The dining facility analyzed as part of this study, D<sub>2</sub>, is located centrally on-campus and represents 1 of 2 all-you-can eat facilities coordinated by Virginia Polytechnic Institute and State University (Virginia Tech). The university coordinates a total of 11 different facilities. These facilities, though located on campus, are open to all interested parties, regardless of affiliation with the university or residence; a designated purchasing card is requisite, however. The 2 all-you-can eat facilities are based on a flat fee, whereas the other facilities sell items à la carte or priced by weight. The D<sub>2</sub> facility has 7 different serving stations, all with a different variety and theme. When individuals are finished with their meal, they are expected to return trays and/or plates to an automated, rotating tray rack, whereby the trays and plates are rotated to the dishwashing area for collection and cleaning.

### Data Collection

A waste analysis was performed Monday through Friday for 2 separate weeks in spring 2008 during the food service hours of the D<sub>2</sub> dining facility:

breakfast, 7 am to 9 am; lunch, 11 am to 2 pm; and dinner, 5 pm to 7 pm. The first week was with trays (tray) and the second was without access or use of trays (trayless). Food waste (FW)—uneaten items from plates and excess food remaining on the service lines (at the serving stations)—was collected and measured for each meal period and compared for the 2 different weeks (tray versus trayless). All food was classified as edible compostable (EC) or inedible compostable (IC). Edible compostable refers to all foods that can be consumed by humans, whereas inedible compostable refers to bones, fruit peelings, and napkins. Inedible non-compostable items, including aluminum foil, plastic wrappers, and anything with plastic wrapping, were not included in this study and were immediately discarded.

Excess consumer food waste (CFW) was collected from the dish-washing area off the tray rack and divided into EC and IC bins. EC and IC items were then weighed in pounds, recorded, and then discarded. Excess production food waste (PFW; food “off the line”) was classified entirely as EC. It was collected after meal periods for Tuesday through Thursday only, weighed and recorded, and then discarded. Liquids, including milk, soda, salad dressings, soups, and nacho cheese were not analyzed in this study. The number of patrons was determined based on the number of transactions recorded by the facility’s registers located at entry to the facility. Paired t-test analyses from the Statistical Package for the Social Sciences (SPSS, release 15.0, 2006, SPSS, Chicago, Ill) were used to determine differences between tray and trayless by day for EC, IC, CFW, PFW, and total compostable waste. For CFW and PFW analyses, only Tuesday (lunch) through Thursday (dinner) meals were included in analyses; for all others, all meals from Monday (breakfast) through Friday (dinner) were utilized.

## RESULTS

### Meals Served

The tray week had a total of 14 512 patrons, an average of 2902 meals per day, and the trayless week 14 308, an average of 2862 meals per day. For days where edible waste was separated out for CFW and PFW (Tuesday lunch through Thursday dinner), 7694 patrons had access to trays and 8262 no trays.

### Total Food Waste

During the tray week there was a total of 6940 pounds of food waste (FW), including 5829 pounds of edible waste (EC) (including both CFW and PFW) and 1111 pounds of inedible compostable waste (IC). The trayless week

had statistically significant lower waste in all categories with total FW waste at 5150 pounds, of which 4103 was EC (CFW and PFW) and 1047 IC. When estimated into annual figures, based on academic school year and week days only, EC (both CFW and PFW) with trays is 169 055 and edible waste without trays is 119 132 pounds. Annual estimates for total compostable waste are 202 797 pounds with the use of trays and 149 495 pounds without the use of trays.

### Food Waste by Consumers and Producers

There was more food waste from consumers (CFW) than producers (food service) (PFW). For the tray week, CFW accounted for 43% to 70% of edible food waste and for trayless 44% to 88% for each meal analyzed and .257 pounds per person with trays and .197 without trays. This equated with 248.3 mean pounds of CFW and 187.5 pounds of PFW per meal for the tray week and 202.7 and 52.3, respectively, for the trayless week (Table 1), significantly different. Inedible compostable waste (IC) was slightly higher during the trayless week, but not statistically significant: 79.9 pounds versus 78.4 pounds for trays.

### Waste by Meals

Significant differences ( $p < .01$ ) existed for waste by meals. Breakfast had the lowest amount of FW in all categories—CFW, PFW, and IC—and dinner the highest (Table 2). The patron count at breakfast was also the lowest suggesting that this meal is least popular for unknown reasons.

**TABLE 1** Food and Inedible Compostable Waste for Tray Versus Trayless per Meal<sup>a</sup>

	Patron count (mean)	Excess consumer food waste (CFW) (lbs) mean/meal (range)	Excess production food waste (PFW) (lbs) mean/meal (range)	Inedible compostable waste (IC) (lbs) mean/meal (range)	Total compostable waste (EC) (lbs) mean/meal +/- SD (range)
Tray	962	248.3 (70.6–410.5)	187.5 (40.5–357.1)	78.4 (23.8–132.5)	514.2 (154.3–769.7)
Trayless	1033	202.7 (58.2–426.1)	52.3 (23.1–96.6)	79.9 (21.5–131.0)	334.9 (154.3–615.3)
<i>p</i> Value <sup>b</sup>		.001	.001	NS	.001

<sup>a</sup>Based on Tuesday (lunch) through Thursday (dinner) (8 meals).

<sup>b</sup>Based on paired t-tests between tray and trayless.

**TABLE 2** Food and Inedible Compostable Waste per Meal<sup>a</sup>

	Patron count (mean)	Edible compostable (EC) mean	Inedible compostable (IC) mean	Total compostable mean
Breakfast	565	133.9	32.1	166.0
Lunch	1158	311.7	79.4	391.1
Dinner	1158	547.7	94.3	642.0

<sup>a</sup>Based on all meals served from Monday (breakfast) through Friday (dinner), not separating out for tray or trayless (15 meals).

## IMPLICATIONS

Based on the results from this study, the use of trays in an all-you-can-eat university setting promoted more waste similar to the study conducted in a continuing care facility.<sup>14</sup> Although not examined in this study, several studies have demonstrated that increased portion size predicts increased consumption of calories.<sup>15,16</sup> It is possible that the use of trays not only promoted excess waste but excess consumption, especially with a plethora of choices offered at a flat fee.

In many ways, this style of service is a disservice to students because it offers an inaccurate depiction of the “costs” of food. In other words, a flat fee for food, in conjunction with tray service, does not take into consideration all the inputs of food production, delivery, and preparation; the financial burden<sup>17</sup>; or potential outcomes, such as food waste and excess energy and fat intake.<sup>18</sup> The fossil fuel energy that is required to grow, process, package, transport, and prepare the food results in a much larger carbon footprint and contributes to global warming.<sup>19</sup> For example, the average food item travels an estimated 1500 miles before it reaches its destination.<sup>20</sup>

The Virginia Tech dining facilities are currently ranked first in the nation according to the *Princeton Review*.<sup>21</sup> The reviews are based on student evaluations toward their own colleges or universities in a variety of categories.<sup>22</sup> As a result, it is extremely important to ensure that changes in the dining facility are embraced by students without jeopardizing the ranking. Educational and/or social norms campaigns that relate changes to national and international efforts and that emphasize the potential positive outcomes may help ensure that public opinion remain high.<sup>23,24</sup> Ideally the *Princeton Review* would consider additional layers of evaluation criteria, including sustainable practices.

## LIMITATIONS

Despite the strengths of this study, there were several limitations. First, CFW and PFW were not separated out on Monday, Tuesday (breakfast), and Friday.

Therefore, statistical analyses were only available for Tuesday (lunch) through Thursday (dinner). No data are available for liquids or beverages. Given the resources available, this was not possible. A future study should explore the size of drink receptacle and potential waste. Weather and operating hours could have also played a role in the patron count; the dining facility studied is indoor-dining only and offers limited service hours. Finally, this study was purely a cross-sectional analysis of food waste. As a result, the researchers could not determine how many calories were perhaps saved per person and how the trayless option may contribute to overall energy balance or the “Freshman 15” phenomena.

## CONCLUSIONS

Food-service policy should be modified to address growing concerns about the environment, obesity, and the economy. Further, university dining facilities should consider these elements in order to depict a more accurate portrayal of the “costs” of foods to young adults. Colleges and universities (as well as other institutions) have a tremendous opportunity to be catalysts for positive social change and influencing its students (patrons) through practices and policies they adopt, especially considering the number of students they serve. Examples of possible practices and/or policies to address these issues include: economic incentives for students not to waste, such as à la carte pricing; small batch cooking; sourcing locally grown and in-season foods; donating appropriate and safe leftovers to food banks and/or shelters; and composting what cannot be donated. Finally, educational efforts targeted toward students (and food service personnel) are essential in promoting awareness and supporting sustainable practices and any proposed changes. Dietitians and health educators can play a central role in facilitating these processes.<sup>25</sup>

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