

# ICHRIE Research Report

**Sponsored by Penn State School of Hospitality Management**  
*Translating Research Implications to applications: Industry's commentary*

## **Decreasing Food Waste through Increased Awareness at a University's Dining Facilities**

Scott Taylor, Jr.  
Thomas Pratt



*The Hospitality &  
Tourism Educators*

[www.chrie.org](http://www.chrie.org)

Sponsored by  
PENNSTATE



School of Hospitality Management

## **Decreasing Food Waste through Increased Awareness at a University's Dining Facilities**

Scott Taylor, Jr.  
University of South Carolina  
stt@email.sc.edu

Thomas Pratt  
University of South Carolina  
prattj2@email.sc.edu

## **Abstract**

**Purpose:** The current study was conducted to assess the effectiveness of a semester-long anti-food waste campaign regarding university student diners' food waste behaviors.

**Originality/Value:** Food waste and specifically post-consumer food waste has become one of the most critical concerns in recent years. Post-consumer food waste has also become a major concern and area of interest on U.S. college and university campuses, as numerous administrators have started considering the impact of waste within their dining operations. However, there have been limited examples of how to successfully cut down on food waste that is produced by students. Therefore, this study offers insight into how compiling baseline numbers for food that is wasted on campus and actively engaging and informing students of their impacts, can successfully help decrease the amount of waste that is produced on a university campus.

**Relevance to the Topic:** Food waste on college and university campuses has become increasingly important to administrators and foodservice providers due to environmental and fiscal concerns. Finding ways to successfully decrease the amount of food that is wasted has the potential to both save money and improve regional waste management systems. However, to cut down on the amount of waste produced by students, they must first be made aware of their personal impact, and the overall goals of the university. Thus, by obtaining information regarding the amount of food that is wasted in a given week, and developing an anti-food waste campaign, administrators and foodservice providers may be able to recognize a decrease in postconsumer food waste on their campuses.

**Design/Methodology/Approach:** Utilizing a quasi-experimental design, the current study assessed the effect that a semester-long anti-food waste campaign had on student diners' food waste behaviors. The project was conducted over lunch hours (11:30-1:30) and dinner hours (5-7) during the first and last full weeks of classes during the Fall 2016 semester.

**Key Findings:** Overall post-consumer food waste decreased by almost 10% regarding the two weeks that were tested, this despite an increase of nearly 2400 diners in the second week.

**Implications for Practice:** Results indicate that by actively engaging university students, and increasing awareness of food waste on campus, foodservice operators can potentially decrease the amount of food that is wasted, thus increasing sustainability efforts and lowering the overall negative impact on the global environment.

## **Introduction**

Food waste is quickly becoming one of the most critical issues of the 21st Century. One study found that Americans waste up to 40% of their food (Gunders, 2012). It has also been estimated that in the U.S., over 150 million metric tons of food is wasted post-harvest per year (Dou, Ferguson, Galligan, Kelly, Finn & Giegengack, 2016). Of that, US college campuses are suspected of contributing nearly 22 million tons annually (Poon, 2015). This number should not be surprising considering that the US Department of Education reported that more than 27.8 million students attended American colleges and universities in 2013-14 (USDE, n.d.), and researchers have found that American residential college students generate approximately 141.75 pounds of food waste per student per year (RecyclingWorks Massachusetts, n.d.). Given, both the potential loss of productive farmland caused by global warming and the predicted population rise to 9 billion people by 2050, 4.2 billion people could be at risk for malnourishment (Dawson, Perryman & Osborne, 2016; Schmidhuber, & Tubiello 2007). Furthermore, although hunger had been virtually eliminated during the 1970's, today more than 20 million Americans now suffer from malnutrition. Ironically, researchers have found that only a 15% decrease in food waste could feed more 25 million people, making this a very solvable issue (Gunders, 2012).

As the ramifications of this food waste have become better understood, many college and university administrators have begun to evaluate their school's policies (Creighton, 1998). As these schools begin to look at their practices, reducing solid waste has become a priority (Smyth, Fredeen & Booth 2010). Schools that can adopt a more sustainable model have the potential to not only reduce the negative impact that they have on a region's waste management system, but also to reduce economic costs (Thyberg & Tonjes, 2016).

Researchers examining this topic have determined that dining facilities are responsible for the largest amount of compostable waste material on college campuses (Gallardo, Edo-Alcón, Carlos & Renau, 2016), with most of the waste being generated Monday through Friday (Gallardo et al., 2016). Another study also suggested that consumers and the preparers of the food in these facilities, were the largest contributors to food waste on campuses. As students are traditionally the largest consumers at these facilities, this study focused on potential solutions to alter their food waste behaviors.

### *Potential Solutions*

One method that has been found to potentially reduce student food waste on American campuses is creating a marketing program to better inform the students of the impact of food waste (Whitehair, Shanklin & Brannon, 2013). Additionally, researchers have found that it is important to incorporate student leadership when attempting to alter campus culture (Cox, 2015). Recently, a study found that advertising and raising awareness may influence student food waste behavior and even has the potential to affect student behavior outside of the school (Whitehair et al., 2013).

### *Purpose of study*

Ultimately, the purpose of this study is to improve the understanding of student generated food waste on an American university campus. Few if any studies have evaluated the amount of waste generated per student at the all-you-care-to-eat dining facilities of a major U.S. university. Furthermore, additional assessment of the potential impact of marketing on student behavior regarding food waste may offer a less expensive solution to the food waste problem, and therefore will also be examined in this study.

## **Background**

During the fall of 2015, a 2-week (56 total hours) weigh the waste (WTW) project was conducted at a major university in the Southeastern U.S., in one of three all-you-care-to-eat dining facilities. This project had two main goals: (1) to assess how much food was being wasted by students at dining halls over the course of a week, and (2) to assess if students would actively engage in scraping their food scraps into a collection bin. During the first week, a volunteer was stationed near the dish-return area and asked students to scrape their left-over food waste into a collection bin atop a scale, the volunteer tallied the number of students who actively scraped their food waste into the bin. Signage was also posted above the volunteer's table using slogans and pictures to direct and inform students.

For the second week, the set-up of the collection bin on the scale and the signage were all kept the same; however, this time the volunteer was seated nearby in the dining room where they could see the collection bin and tally the number of students who actively engaged. At the end of the two weeks, the total number of students that dined during the 2-hour meal periods were recorded based on point-of-sales data. During this time, over 384 lbs. of waste was collected,

however only 27% (1,700) of the diners who visited actually scraped their food-waste into the collection bin. Provided the low engagement amongst students, it was determined that to successfully reduce the amount of waste being generated on campus, student diners would need to be engaged and informed of their impact. Thus, the goals of the current study were to:

1. Assess baseline post-consumer food waste numbers at all 3 all-you-care-to-eat dining locations.
2. Conduct marketing efforts to cut post-consumer food waste on campus and assess effectiveness of said efforts.

### **Research Methodology**

With these goals in mind, a second WTW project was developed, and carried out during the two busiest weeks (Monday-Sunday) of the Fall 2016 semester: the first and the last full week of classes. Similarly to the initial study, this study also took place in the all-you-care-to-eat dining facilities, as they were among the most popular and the biggest contributors to the food waste issue on campus. The project was conducted during lunch hours (11:30-1:30) and dinner hours (5-7) for both weeks, and student volunteers were seated at a table near the dish return area in each of the three all-you-care-to-eat dining locations. These volunteers requested that diners scrape any remaining food scraps into a bin that was placed on top of a scale. The weights of the wasted food were then calculated and recorded at each facility.

Subsequently, a marketing campaign was developed and implemented that included the use of signage, social media, live events and finally improved employee training regarding food waste on campus. This campaign began during the first full week of classes and evolved throughout the semester to further educate the students about this issue. The food waste weights were then totaled for each meal at each location and analyzed to determine the effectiveness of the marketing campaign. The results of this analysis are recorded below.

## Findings and Solutions

During the first week, a total of 835 lbs. of food waste was collected from 8,886 guests, Table 1 below provides a detailed breakdown of the amount of waste collected at each location for the meal periods.

**Table 1: Week 1 Waste (in pounds)**

First Week of Classes									
	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Tot.	Avg.
Bates Lunch	1	43	25	21	14.5	28	22	155.5	22
Bates Dinner	29	12	8.5	23	22.5	14	18	127	18
Gibbes Lunch	28	30	28	28	26	26	26	192	27.5
Gibbes Dinner	16	20	20	25	36	C*	23.5	140.5	23.5
Honors Lunch	21	31.5	24.5	26	27	C*	C*	130	26
Honors Dinner	11.5	9	23	19	C*	C*	27.5	90	18
								<b>835</b>	<b>22.5</b>

*Note: C\* - Location was closed during the meal period*

During the second week, a total of 755.5 lbs. of food waste was collected from 11,276 guests, Table 2 below provides a detailed breakdown of the amount of waste collected at each location for the meal periods.

**Table 2: Week 2 Waste (in pounds)**

Last Week of Classes									
	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Tot.	Avg.
Bates Lunch	19	17	8	13	13	10.5	9.5	182	13
Bates Dinner	13	12	23	12	11	10	11	92	13
Gibbes Lunch	15	33	33	11	34	18	22	166	24
Gibbes Dinner	20	15	33	18	4	C*	19	109	18
Honors Lunch	11	22	6.5	19	12	C*	C*	70.5	14
Honors Dinner	27	21	34	27	C*	C*	27	136	27
								<b>755.5</b>	<b>18</b>

*Note: C\* - Location was closed during the meal period*

These findings display a significant difference regarding the weight of the food waste collected during week one and week two. Moreover, an increase in student volume from week one's total of 8,886 students to week two's total of 11,276 students was noted. These results imply that the difference in the weights of the food waste collected were not a result of a decline in the number of students using the facilities.

### **Implications for Practice**

The results of this study indicate that a potential relationship may exist between the reduction in food waste at the all-you-care-to-eat facilities and the anti-food waste marketing campaign carried out on campus. It is important to note that the marketing campaign that was carried out, involved multiple-connected aspects. These included placing signage designed to both promote food waste awareness and to encourage students to end wasteful behaviors along with utilizing social media as a platform to raise awareness about the ramifications of campus food waste. Furthermore, live events were held to increase student awareness of the size and scope of the food waste issues on campus, and finally, implementing an employee training program designed to promote employee awareness of food waste and encourage employees to interact with students regarding this issue.

The study's findings showed that there was a nearly 10% reduction in overall weekly food waste at the all-you-care-to-eat dining locations examined, even as the total number of guests increased by more than 25%. While other factors may have contributed to this reduction, this could indicate that the above marketing effort was related to the reduction in food waste. These suggestions are in accordance with the findings of previous research regarding the use of marketing as a potential method to reduce food waste behaviors among students on campus, and if true may lead to alternative and less expensive ways to combat the food waste problem on American campuses (Whitehair, Shanklin & Brannon, 2013).

Moreover, these results may also add support regarding the Theories of Planned Behavior and Reasoned Action. The results may imply that both the students and patrons of the examined facilities were influenced by a marketing campaign that was developed to both build awareness of the issue and then provide potential alternate solutions. As the two of these theories revolve

around a person's ability to act rationally, by providing a better understanding of existing consequences and then offering alternate solutions, a decrease in food waste may potentially indicate that students and patrons did indeed act rationally.

Regarding these results, it is also important to note several potential limitations, including the amount of waste generated was specific to all-you-care-to-eat facilities and may not be representative of the other dining facilities. Additionally, the current study evaluated a two-hour period for each meal and thus only covered a portion of the actual hours of operation. Also, the decrease in waste cannot be tied directly to a behavioral change induced by the marketing campaign without further study. Lastly, it is important to note an abnormality in the findings. The results for the Honors Dining room dinner period increased from week one to week two (9 lbs.), however, the lunch meal did decrease significantly (12 lbs.) reducing the overall daily average by 3 lbs.

### **Future Research**

Future studies should seek to utilize a similar research design along with follow-up in-person interviews; focus group sessions and surveys to better understand consumer perceptions of the waste reduction campaign. By conducting these follow-up studies researchers could gain further insight into potential best practices for operators. By providing a more comprehensive assessment of a waste reduction program, researchers can provide operators with the knowledge necessary to cut costs and save money. Thus, it is advised that future studies include more comprehensive qualitative and quantitative research methods to provide a better understanding of how best to cut down food waste on college campuses.

### **Annex 1**

#### **Theoretical Underpinnings**

As a better understanding of the relevance of food waste has emerged throughout the literature, researchers have begun to evaluate potential contributors to this phenomenon. One potential contributor that has been identified are the dining facilities on college/university campuses (Gallardo et al., 2016). Studies that have evaluated these, have noted that a large amount of waste is generated both pre-and post-consumer (Sarjahani, Serrano & Johnson, 2009).

Researchers that have evaluated the consumer side of food waste have noted that most people do not pay attention to how much food they waste (Comber and Thieme, 2012). To reduce this potential food waste source, the authors of this study used the following theoretical foundation.

The authors of this study used theory of reasoned action (TRA) and the theory of planned behavior (TPB) to better inform this study, both theories contend that consumers are rational thinkers who consider the outcomes of a behavior before engaging in it (Ajzen, 1991; Fishbein & Ajzen, 1975), and therefore will attempt to avoid any behavior that is not in line with their, attitudes, subjective norms, or perceived behavioral controls. This current study is rooted in this understanding of consumer behavior. This study demonstrated this by collecting and then sharing information regarding this potentially negatively perceived behavior. Furthermore, the subjects were then provided information about how this behavior could be changed and the positive impacts that could result from that change. Next, the study examined if the behavior did in fact change. The results indicated that by continually (i.e., over the course of one academic semester) providing consumers (i.e., college students) with information regarding the negative impact of their wasteful behavior, and by reassuring them that they have the tools necessary to change this behavior, consumers may attempt to realign their behavior with both their attitudes and social norms.

### **Methodological Approach**

The current study utilizes a quasi-experimental design, to assess the effects of a semester long anti-food waste campaign on student diners' food waste behaviors. The study utilized a weigh the waste program at three of the university's all-you-care-to-eat dining facilities during both lunch and dinner during the first and last weeks of classes, along with a semester long marketing campaign designed to both increase student awareness of food waste on campus, and to promote alternative solutions. During the two weeks, the weight of the food waste was measured for each meal at each location; further, guest counts were tabulated to determine any potential influence. Lastly, the dining facilities utilized in the study were chosen due to the similarity in type of meals served during the two week periods. These steps were taken to better account for the variables that may have affected the results but were not fully controllable in this quasi-experimental design (Campbell & Stanley, 2015).

**Table 3. Total and Average Food Waste in Lbs. Both Weeks**

Weigh the Waste Fall 2017: Weight (lbs.)									
	M 8/22	T 8/23	W 8/24	R 8/25	F 8/26	S 8/27	S 8/29	Total	Average
Bates L	1	43	25	21	14.5	28	22	154.5	22.07
Bates D	29	12	8.5	23	22.5	14	18	127	18.14
Gibbes L	28	30	28	28	26	26	26	192	27.43
Gibbes D	16	20	20	25	36	<b>Closed</b>	23.5	140.5	23.42
Honors L	21	31.5	24.5	26	27	<b>Closed</b>	<b>Closed</b>	130	26.00
Honors D	11.5	9	23	19	<b>Closed</b>	<b>Closed</b>	27.5	90	18.00
<i>Total</i>	106.5	145.5	129	142	126	68	117		
<i>Average</i>	17.75	24.25	21.50	23.67	25.20	22.67	23.40		
	M 11/28	T 11/29	W 11/30	R 12/1	F 12/2	S 12/3	S 12/4	Total	Average
Bates L	19	17	8	13	13	10.5	9.5	90	12.86
Bates D	13	12	23	12	11	10	11	92	13.14
Gibbes L	15	33	33	11	34	18	22	166	23.71
Gibbes D	20	15	33	18	4	<b>Closed</b>	19	109	18.17
Honors L	11	22	6.5	19	12	<b>Closed</b>	<b>Closed</b>	70.5	14.10
Honors D	27	21	34	27	<b>Closed</b>	<b>Closed</b>	27	136	27.20
<i>Total</i>	105	120	137.5	100	74	38.5	88.5		
<i>Average</i>	17.50	20.00	22.92	16.67	14.80	12.83	17.70		

## References

- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211.
- Brown, J. L., & Allen, D. (1988). Hunger in America. *Annual review of public health*, 9(1), 503-526.
- Burton, K., Serrano, E., Cox, H., Budowle, R., & Dulys-Nusbaum, E. (2016). Benefits, Barriers, and Challenges to University-Level Food Waste Tracking. *Journal of Hunger & Environmental Nutrition*, 11(3), 428.
- Campbell, D. T., & Stanley, J. C. (2015). *Experimental and quasi-experimental designs for research*. Ravenio Books.
- Comber, R., & Thieme, A. (2012). Designing beyond habit: Opening space for improved recycling and food waste behaviors through processes of persuasion, social influence and aversive affect. *Personal and Ubiquitous Computing*, 17(6), 1197-1210.
- Cox, H. (2015). A Model for Creating a Campus Sustainability Plan. *Planning for Higher Education*, 44(1), 89.
- Creighton, S. (1998). *Greening the Ivory Tower: Improving the Environmental Track Record of Universities, Colleges, and Other Institutions*. Cambridge, Mass: The MIT Press.
- Dou, Z., Ferguson, J. D., Galligan, D. T., Kelly, A. M., Finn, S. M., & Giegengack, R. (2016). Assessing U.S. food wastage and opportunities for reduction. *Global Food Security*, 8, 19-26.
- Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley.
- Food and Agriculture Organization of the United Nations (FAO). (1981). Food loss prevention in perishable crops. FAO Agricultural Service Bulletin, No. 43. FAO Statistics Division, Rome.
- Gallardo, A., Edo-Alcón, N., Carlos, M., & Renau, M. (2016). The determination of waste generation and composition as an essential tool to improve the waste management plan of a university. *Waste Management*, 53, 3-11.
- Gunders, D. (2012). Wasted: How America is losing up to 40 percent of its food from farm to fork to landfill. *Natural Resources Defense Council*, 1-26.
- Poon, L. (2015). When Food Is Too Good to Waste, College Kids Pick Up the Scraps. Retrieved January 29, 2017, from <http://www.npr.org/sections/thesalt/2015/02/27/389284061/when-food-is-too-good-to-waste-college-kids-pick-up-the-scraps>.
- RecyclingWorks Massachusetts, (n.d.). Food Waste Estimation Guide. Retrieved January 29, 2017, from <http://recyclingworksma.com/food-waste-estimation-guide/#Jump01>.
- Sarjahani, A., Serrano, E.L., & Johnson, R. (2009). Food and non-edible, compostable waste in a university dining facility. *Journal of Hunger & Environmental Nutrition*, 4(1), 95-102.
- Thyberg, K. L., & Tonjes, D. J. (2016). Review: Drivers of food waste and their implications for sustainable policy development. *Resources, Conservation & Recycling*, 106, 110-123. U.S. Department of Education, (n.d.). National Center for Education Statistics. Integrated Postsecondary Education Data System (IPEDS). Fall

Enrollment Survey. Retrieved January 29, 2017, from  
<https://nces.ed.gov/ipeds/trendgenerator/tganswer.aspx?sid=2&qid=2>.

Whitehair, K. J., Shanklin, C. W., & Brannon, L. A. (2013). Research: Written Messages Improve Edible Food Waste Behaviors in a University Dining Facility. *Journal of the Academy of Nutrition and Dietetics*, 113, 63-69.

# ICHRIE Research Reports

Sponsored by Penn State School of Hospitality Management

*Translating Research Implications to applications: Industry's commentary*

The purpose of the ICHRIE Research Reports is to generate peer-reviewed research reports that are based on academic research findings, and targeted towards industry practitioners and policymakers. ICHRIE Research Reports translate academic research findings into practical applications, in a timely manner.

Visit the Research Report Website for submission Guidelines at [www.chrie.org](http://www.chrie.org)

## Editorial Board

**Amit Sharma, Ph.D., Editor**  
The Pennsylvania State University  
[aus22@psu.edu](mailto:aus22@psu.edu)

**Peter Ricci, Ed.D.,  
Associate Editor**  
Florida Atlantic University

**Robin DiPietro, Ph.D.,  
Associate Editor**  
University of South Carolina

**Faizan Ali**  
University of South Florida,  
Sarasota-Manatee

**Anna Mattila, Ph.D.**  
The Pennsylvania State University

**Dennis Reynolds, Ph.D.**  
University of Houston

**Hachemi Aliouche, Ph.D.**  
University of New Hampshire

**Dan Mount, DBA**  
The Pennsylvania State University

**Zvi Schwartz, Ph.D.**  
University of Delaware

**Baker Ayoun, Ph.D.**  
Auburn University

**John O'Neill, Ph.D.**  
The Pennsylvania State University

**Marianna Sigala, Ph.D.**  
University of the Aegean

**Maureen Brookes, Ph.D.**  
Oxford Brookes University

**Fevzi Okumus, Ph.D.**  
University of Central Florida

**AJ Singh, Ph.D.**  
Michigan State University

**Murat Kizildag, Ph.D.**  
University of Central Florida

**H.G. Parsa, Ph.D.**  
University of Denver

**Jeannie Sneed, Ph.D.**  
Kansas State University

**Parikshat Manhas, Ph.D.**  
University of Jammu

**Abraham Pizam, Ph.D.**  
University of Central Florida

**Nicholas Thomas, Ph.D.**  
DePaul University

**Donna Quadri-Felitti, Ph.D.**  
The Pennsylvania State University



[www.chrie.org](http://www.chrie.org)

Sponsored by

PENNSTATE



School of Hospitality Management