

Black, Gold, and Green: Food Waste Management at Bryant University

The Honors Program
Senior Capstone Project
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ABSTRACT

The basis of this project is to examine the food waste management system at Bryant University, and to make feasible, sustainable, and cost-effective solutions for improving the system. An effective, sustainable food waste management system is an important achievement for the university in particular as Rhode Island's landfill is quickly reaching its capacity. The study focuses on analyzing the advantages and disadvantages of the university's current solution of sending the waste to a local pig farmer versus alternative options such as composting the waste. Research methods include surveying local food recycling and composting experts and key stakeholders, a numeric ranking system to analyze different options for Bryant, as well as benchmarking with comparable colleges and universities that have launched successful food waste management solutions.

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INTRODUCTION

The purpose of this project is to investigate innovative food waste management systems at comparable colleges and universities, and use the findings to provide feasible, sustainable, and cost-effective recommendations for Bryant University.

Thousands of tons of waste are sent to landfills and incinerators annually by educational institutions. Composting has a huge potential for significantly reducing the amount of food waste that is sent to landfills. Therefore, different models for composting programs are compared in this study. The research specifically looks at how cost effective composting is compared to sending the waste to a landfill or pig farm. Potential obstacles related to implementing a composting program will be analyzed as well.

In addition to published literature and webinars on food waste management programs at universities and colleges that are similar to Bryant, information on the university's current situation is equally important in benchmarking where the university is and potential for improvement. Surveys and interviews with key stakeholders from Dining Services as well as prominent local experts and members of organizations dealing with waste management and composting are included in this research.

Nobody likes to think about what happens to their banana peel after it leaves their hands. Food waste management, however, is one of the largest environmental challenges that the world faces today. The Environmental Protection Agency (EPA) reports that in 2013, 33 million tons of food were disposed of in the United States. This is the single largest component of municipal solid waste at 21% (EPA "Composting"). Therefore, managing food waste is an enormous problem, but also presents a vast opportunity to cut down on landfill waste. A large amount of food waste comes from big commercial institutions such as colleges and universities. There are three main types of food waste. The first is pre-consumer food waste, which includes food waste from the kitchen such as outer lettuce leaves and frying grease. The second category is postconsumer food waste which is food that is served to students and faculty but not consumed. Lastly, packaging and food containers make up the rest (Creighton 179). In order to diminish the food waste that colleges and universities throw

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away, it is necessary to examine different food waste management strategies and programs because there is no one size fits all.

Composting is an increasingly popular way to turn waste from something that is feared or ignored into something that is valued. Many colleges and universities across the nation compost the food waste produced by their dining halls and on-campus restaurants. This study will analyze how feasible composting will be for Bryant, and will compare the possibility of an on-site composting operation to sending waste to an off-site location.

The research and findings from this project can be used as a jumping off point for other waste management projects. Ultimately, the project will attempt to answer the question of how the university can develop environmentally sustainable food waste management strategies to divert waste from Rhode Island's landfill, increase cost savings, and build a reputation as a sustainable campus for eco-conscious prospective students.

The research questions that were examined by this study included:

RQ1: How can a large institution such as Bryant University pinpoint and then initiate the best solution to food waste management?

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Bryant University

There have been many changes at Bryant University with respect to the food waste management system in place as the university recently switched food providers from Sodexo to Aramark last summer. Aramark is committed to incorporating sustainability into its operations. The company takes waste management seriously at its thousands of client locations. They have successful food recycling and composting programs in place at many client locations.

The food waste management process at Bryant starts before one even gets to the kitchen. Food purchasing is as equally important as what is done with the scraps left on the plates. Food services is in the process of discovering different options for purchasing locally grown food products. Aramark does not indicate what percentage of food purchasing is spend on local and community based products, but the dining hall plans on increasing this number so that at least 20% of food purchases will be from local sources (Bryant University, 26).

The interview with Aramark employee Kate Moran indicated that virtually all of the pre-consumer and post-consumer food waste in Salmanson, the main dining hall, is picked up by the farmer of My Blue Heaven Farm. The pig farm is located about 12 miles from the university in Pascoag, Rhode Island. She also described the tray-less dining initiative that is 100% complete. When trays are removed from the dining hall, it discourages students from taking more food than they are going to eat because they instead need to go back up for a second plate. This is important in Bryant's main dining hall, Salmanson, where a lot of the food is served to students by employees. The dining hall is buffet-style, so once a student swipes in, he or she can take as much food as they want.

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According to EPA's Food Recovery Hierarchy depicted in Figure 1, the most preferred way to reduce food waste is source reduction.

Source reduction is preventing the generation of waste in the first place, for example, through tracking inventory so that the correct amount of food can be purchased. A second popular action to limit food waste in college and university dining halls is to get rid of the option for students to use a tray.

This has been a proven way at many universities to cut back on the initial generation of food waste, and has been put into place at Bryant (Appendix C).

The initiative at Bryant University to feed the waste to pigs follows the preferred methods of the food hierarchy (EPA "Composting").

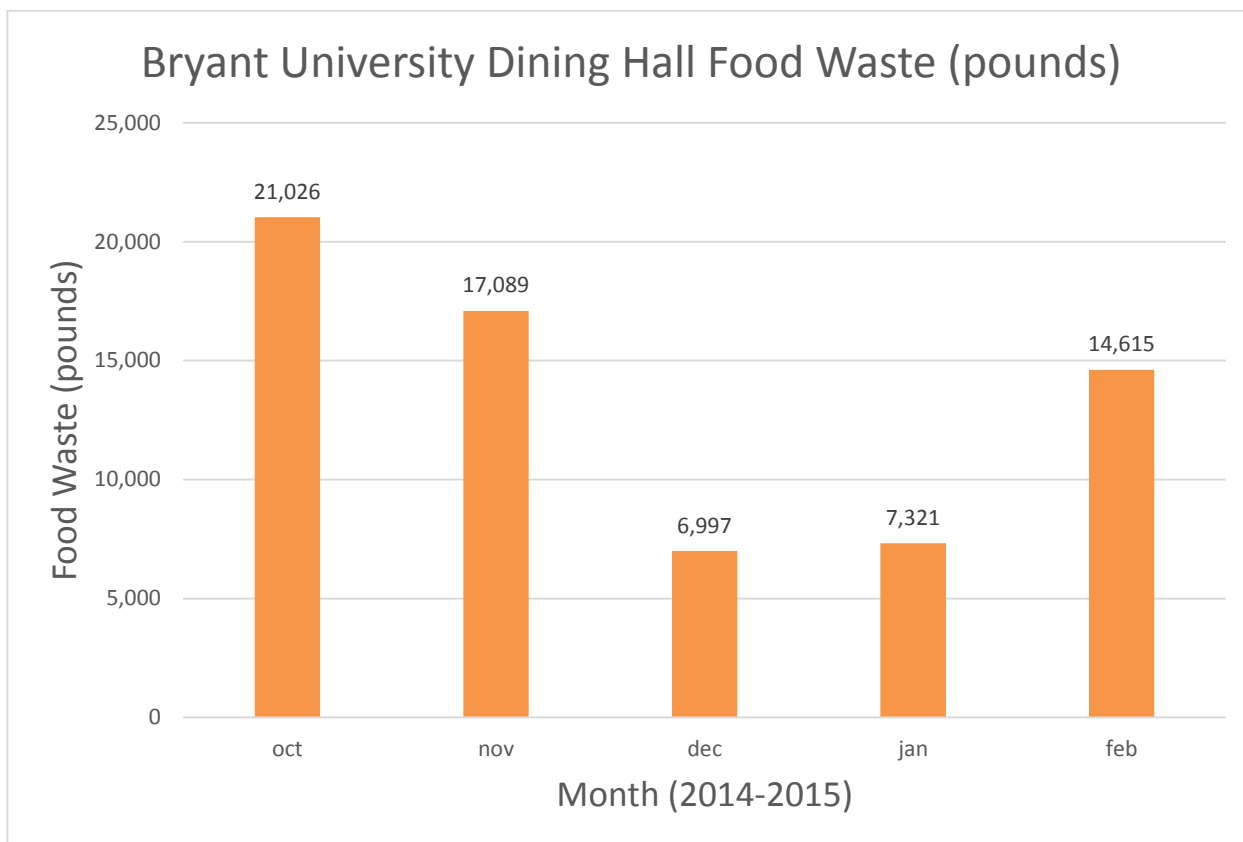
On an average week, the university generates 13,410 pounds of food waste per month (see figure 2). According to the food waste numbers provided by Aramark, this totals to about 113,982 pounds, or 57 tons per year. This can be broken down to about 1.7 tons on average per week. The months that the dining hall had tracked food waste included the winter vacation that takes place in December into January; as well as February, which is a shorter month. Therefore, the estimated food waste figures may be slightly lower than the actual volume. In Bryant's 2014 Sustainability Plan, the opportunity for developing a "transparent tracking system for dining services supply chain" was identified (25). The recognition of this goal is a huge step in working towards improving the food waste management system.



Figure 1: EPA Food Hierarchy Pyramid

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Figure 2: Tons of food waste generated at Bryant University



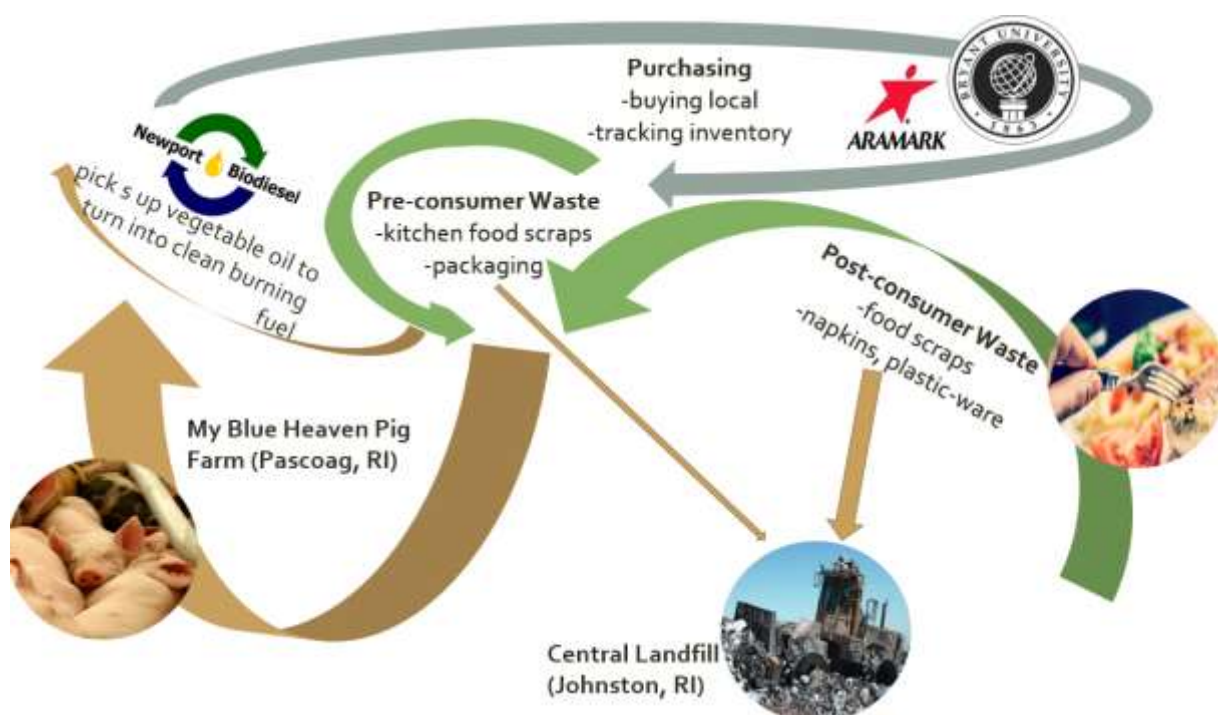
After purchasing activities, the next point in the waste management system is the pre-consumer waste and then the post-consumer waste that students leave uneaten on their plates. Currently, all of the pre-consumer and post-consumer food waste at Bryant is picked up by a farmer at My Blue Heaven Pig Farm. This farm is located about 12 miles from campus. The farmer provides Dining Services with the food scrap bins and picks up the bins two or three times every week to bring back to his farm to use as pig feed (Appendix B). Therefore, there is no cost to the university, and the heaviest part of the waste stream is being diverted from the landfill. This results in a cost savings for the university, while the food scraps are being utilized by the farm to feed the pigs.

A second important part of Bryant's food waste management system is their partnership with Newport Biodiesel. This company picks up the used vegetable oil in the kitchen and turns it into clean burning fuel (Figure 3). According to the EPA Food Recovery pyramid, Newport Biodiesel would be considered an industrial use. Items that the dining hall is still sending to

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the landfill include any non-recyclable packaging, napkins, plastic utensils, and food scraps that are not sorted properly. Students are supposed to place paper products in the trash bins and leave all food leftovers on the conveyor belt to be sorted in the back of the house by employees. There are times, however, when students or faculty do not follow the instructions on the waste bins and end up scraping their plates into the waste bins.

Figure 3: Current Food Waste Management Process at Bryant University



The food scraps are being diverted from the Central Landfill, and are instead being used to feed animals, which follows the EPA Food Recovery pyramid. Overall, Aramark at Bryant University has made impressive improvements to its food waste management system over the course of this research study.

METHODOLOGY

The current food waste management system was examined through Bryant's Sustainability Report and other secondary research, benchmarking with universities that have successful food recycling programs, and surveys and interviews with local experts on the topic of composting and food recycling. Survey research explored the experts' opinions, concerns, and knowledge about composting challenges in addition to recommended practices (Appendix A). After

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survey responses were compared and analyzed, interviews with a composting expert and an Aramark employee directly involved in the sustainability of the dining hall were conducted. The goal of the interviews was to dive deeper into the topic of food waste management for large institutions and to gain insight into current food waste management initiatives taking place in the dining hall. This information was used in combination with a benchmark at comparable colleges and universities to pinpoint recommendations for Bryant University.

Benchmark

In order for Bryant University to make improvements to its food recycling efforts, it is necessary to examine the way other institutions have successfully implemented food recycling and composting programs. Bentley University and Brown University were selected out of a comprehensive list of colleges and universities with successful food waste management systems. These two schools were selected because they are similar to Bryant in terms of student body size. Therefore, the volume of waste flowing through the system is around the same. All three institutions are private, successful schools that were more likely to have similar budgets.

Another important reason why Bentley and Brown were selected for the benchmark is that the state of Massachusetts has a food waste ban in place. A food waste ban prevents institutions, such as universities, from tipping food waste at a landfill if they produce a certain amount of food waste per week and are located with a reasonable distance from a food recycling plant or farm. For example, the food waste ban in Massachusetts applies to institutions generating over one ton of food waste per week; regardless of proximity to a facility. This ban was put in place on October 1st of 2014, and the government has helped institutions prepare for the past few years leading up to the ban (Faulkner; Mass.gov). Bentley University and other institutions have had time to plan and then develop their waste management strategies.

Rhode Island institutions have organic waste limitations facing them as well. The state has passed a similar food waste ban that will officially go into effect on January 1, 2016. Rhode Island's ban applies to institutions generating over two tons of food waste per week and located within 15 miles of a facility (Faulkner). Comparing universities located in states that have comparable organic waste policies made the benchmark an especially valuable part of

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the study.

Experts Survey

The questionnaire consisted of six open-ended questions to gather detailed insight and opinions from the four experts who were surveyed. Questions were structured to probe experts for knowledge on what challenges can be expected for large institutions implementing a composting program, concerns about composting, and the factors to consider when completing a budget for food composting operations. The sample was not random; these experts were notified of the study and agreed to provide their thoughtful input.

The experts surveyed included:

1. Leo Pollock, RI Food Policy Council
2. Kevin Proft, Programs Manager at ecoRI Earth
3. Greg Gerritt, RI Compost Initiative and Environment Council of Rhode Island

Survey takers were selected based on their involvement with local food waste management and composting initiatives, policies, and businesses. The survey was taken and distributed online over email to the experts' email addresses. Survey responses were then grouped into four main categories. These categories were the benefits of composting, cost factors that an institution should consider when implementing food recycling, common obstacles to food recycling, and any suggestions they have for an institution working to compost or recycle food scraps.

Expert and Key Stakeholder Interviews

In order to gather more detailed input from the experts, an interview with composting expert Greg Gerritt of the Environment Council of Rhode Island was conducted; as well as an interview with Kate Moran of Aramark at Bryant University. The interviews were semi-structured informal interviews. A list of questions and topics to cover during each interview was developed. The goal of interviewing Greg Gerritt was to dig deeper into the food waste management policies and current events in Rhode Island. Kate Moran's interview focused on gathering information about the current system at Bryant, the changes that occurred when

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Bryant switched food providers last summer, and any challenges the dining hall staff is experiencing in regards to food waste management.

Develop Ranking System

A way to quantitatively measure and objectively analyze the strengths and weaknesses of each option for Bryant to manage its food waste was created. The ranking system took into account the four options that the university has, which include sending the dining hall food scraps to the Central Landfill, a local pig farm, the off-site commercial compost plant, or building and operating an on-site compost plant. Each option was evaluated on four criteria, including environmental impact, educational value, economic cost, and feasibility. The options were ranked from least preferred to most preferred option based on the four criteria.

RESULTS

Benchmark

The benchmark with Bentley University and Brown University revealed useful information because both schools have comprehensive food waste management systems. The top differences between Bryant University and the two schools were highlighted to reveal ideas for improving Bryant's food recycling programs.

Bentley University

Bentley University in Waltham, Massachusetts, diverts their food scraps from the landfill in a few different ways. Their food provider, Sodexo, works closely with Bentley's Office of Sustainability to come up with sustainable solutions. They have a similar goal to the one indicated in Bryant's Sustainability Plan in terms of increasing the number of food purchased from local vendors. Bentley currently purchases 15% of the dining hall food products from local vendors (Bentley University, "Green").

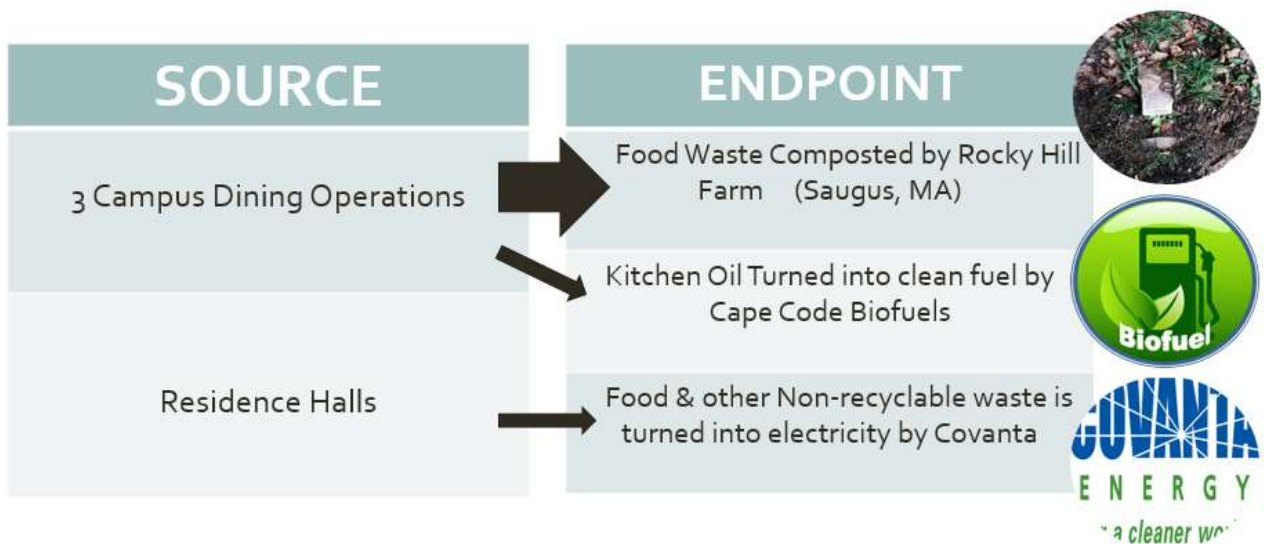
The university's three main dining halls send the pre-consumer and post-consumer food

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scraps to a local compost farm called Rocky Hill Farm located in Saugus, MA. Bentley University promotes this initiative on a separate composting page on their website. The web page describes the composting process and provides a map illustrating where the food scraps are sent to (Bentley University, “Composting”). According to the EPA Food Hierarchy, it is a more preferred method of food recycling to feed food scraps to animals. Therefore, Bryant University’s current solution is getting the most utility out of the food waste.

Bentley also has a similar agreement with a company that picks up its used kitchen oil to turn into clean burning fuel (Figure 4). An interesting part of the waste management system at Bentley is that all non-recyclable waste from the residence halls, which would include any food waste from the residence halls, is sent to a waste to energy plant. This company, called Covanta, combusts the municipal solid waste at high temperatures, producing steam, that turns turbines and generates electricity that is sent back into the grid (Bentley University, “What”). This is an alternative option for non-recyclable waste that would otherwise be sent to a landfill.

Figure 4: Food Waste Management System at Bentley University



Brown University

Brown University in Providence, Rhode Island takes ownership of their leadership in sustainability. They have branded their sustainability efforts as ‘BiG: Brown is Green,’ and

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the student body is very involved in the various initiatives. Brown University's food waste management begins with purchasing local food and helping local farms. For example, the university has a Community Harvest program that began in 2002. The program focuses on educational programs and purchasing local, sustainable food by providing local farms with a large-scale, steady purchaser. According to Brown's 2014 Sustainability Report, Dining Services works with more than 30 local farmers (25). A group of students founded the Real Food Initiative in 2009 that helped create a process to ensure that all purchasing decisions consider whether the foods are local, ecological, fair, and humane. Dining Services used this system when purchasing, and the initiative has spread to over 340 other colleges and universities (Brown University 26).

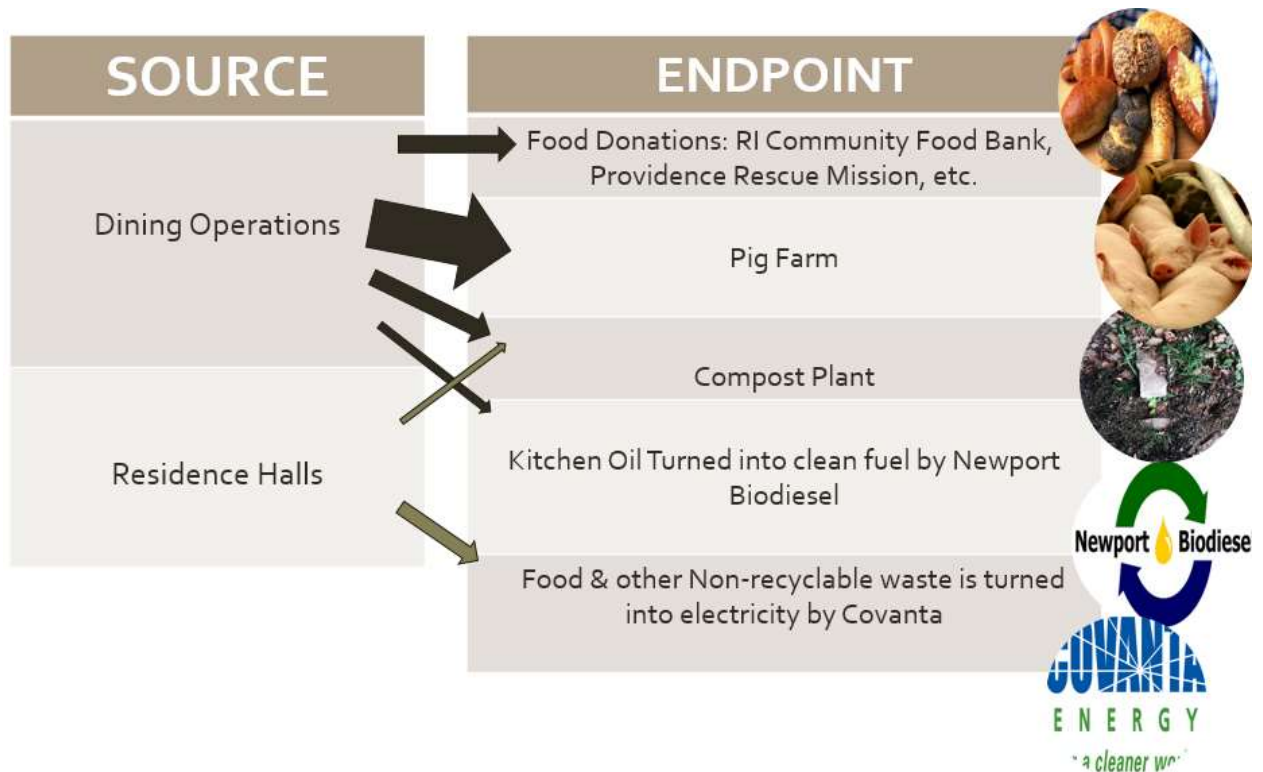
In addition to purchasing, Brown focuses on using leftover food to feed people in need. The school partners with over 15 local food banks and food donation centers, such as the Rhode Island Community Food Bank (Brown University 27). This brings the university closer to the community while diverting food from the landfill. Figure 5 illustrates the other waste diversion methods; beginning with donating pre and post-consumer food scraps to a local pig farm. Any organic waste and the 12,000 pounds of meat scraps per year are processed into compost. An interesting initiative is their compostable takeout containers that allow students to bring food out of the dining hall in compost-friendly containers. The university partners with Newport Biodiesel as well for their used kitchen oil (Brown University 28).

Food waste generated in residence halls can be difficult for universities to track and divert from the waste stream because it is up to the students. Brown University as a composting group on campus called SCRAP that educates and raises awareness about the benefits and importance of composting. Their mission is "to provide students with a campus-wide composting system" ("Brown Students"). A zero-waste food cycle is a significant goal for a student organization to tackle. The group has built composting bins around campus where students can drop off their food waste that is collected in buckets provided to the students ("Brown Students"). When students do not divert their food scraps, waste from the residence halls is sent to a waste to energy plant similar to the one that Bentley contracts with. Brown University effectively diverts food waste utilizing the most preferred methods according to

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the EPA Food Recovery Hierarchy.

Figure 5: Food Waste Management System at Brown University



Expert Survey

The expert survey revealed that an on-site composting operation at Bryant University would most likely not be feasible. This was one of the suggestions derived from the survey that helped shape the study and recommendations for Bryant. Figure 6 reveals the findings from the survey. The survey questions were related to four main categories, including the benefits of food composting, what cost factors a university needs to consider when implementing food recycling, common challenges, and overall suggestions.

These survey responses affirmed previous research on the benefits of composting and costs that will need to be considered. The experts emphasized the need to make education part of the food waste management system. They suggested building sustainable and cost-effective food waste management into the curriculum. This is important because students need to be made aware of their huge role in the process. If they are aware of the benefits of food recycling and the efforts Bryant is making to manage the waste in a sustainable way, they will be more likely to make Dining Services' job easier.

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The open-ended questions were well-received and utilized by all of the respondents, and allowed them to answer the question honestly using their expertise as they saw fit. Many respondents shared the opinion that there is not enough being done in terms of composting and waste management, but were optimistic about the future of sustainable food waste management in Rhode Island.

Figure 6: Expert Survey Responses by Subject Category



Expert Interviews

The two in-depth interviews conducted had a major influence on the study. Greg Gerritt's wealth of knowledge about state policy and the composting process was invaluable. He was incredibly optimistic about the expansion of food composting in Rhode Island. Greg spoke about The Compost Plant, which is a business that picks up food scraps from institutions and transports them to be turned into compost at Earth Care Farm in Charlestown, RI. This is the only commercial composting plant in the state that currently accepts food waste. The Compost Plant has demonstrated the need for a second commercial food composting plant. While Greg was very

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excited about composting, he emphasized the importance of following the EPA Food Recovery Hierarchy that illustrates how food scraps should first be used to feed something before being sent to a compost plant. Also, his comment about food waste being the heaviest part of the waste stream highlighted the importance of the study for the university. When an institution diverts food from the landfill, this often results in a cost-savings because waste is a cost that the institution is already paying for (Appendix B).

Kate Moran of Aramark shed light on what Bryant University Dining Services is currently working on terms of sustainable food waste management. It was difficult to connect with management when Bryant had Sodexo as a food provider, but Aramark was much more responsive. Kate was enthusiastic about the sustainability initiatives and was interested in the research study. It was impressive to hear about the changes in the food waste system that were accomplished with the pig farm partnership while dealing with the change management from Sodexo to Aramark. A significant initiative that Kate spoke about was the Weigh the Waste events in the dining hall. At these events, students scrape their food waste into a clear bin and the waste is weighed and tracked every hour. The next event is scheduled for April 28th – 30th, and will be run by a student organization called Community Activism and Leadership Organization (CALO) (Appendix C). This was sensational news because a major challenging but necessary part in changing the way a university manages its waste is getting the students involved.

Ranking System

A ranking system was created to weigh the four options Bryant has for waste management. The four categories studied include economic cost, environmental impact, educational value, and feasibility. A ranking of 1 indicates the most preferred option, while a ranking of 4 indicates the least preferred. The system showed that economically, sending waste to a pig farm is the most preferred option. This is largely due to the fact that it is an even exchange between the university and the farmer who provides the food scrap bins and uses his own truck to pick them up. Many of the subcategories examined, including employee salary, training, equipment, and land prep, were tied to the on-site composting option. This is because the other three options

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simply require factoring in the cost to haul the waste somewhere else (see fig. 2).

Table 1. Ranking System Results: Economic Costs

	Landfill	Piggery	Compost (off-site)	Compost (on-site)
ECONOMIC COSTS:				
Hauling (trucking & tipping fee)	4	1	3	1
Employee Salary	1	1	2	4
Employee Training	1	2	2	4
Equipment/Vehicles	1	1	1	4
Land Prep	1	1	1	4
TOTAL:	8	6	9	17
Economic Ranking:	2	1	3	4

The second criteria ranked was environmental impact. The first subcategory evaluated was trucking distance because the further the food scraps must be transported, the more gas this uses and the less sustainable it is. Bryant’s food waste would need to travel the furthest distance if it were sent to the commercial food composting plant as it is located 40 miles from campus. The subcategory of visual pollution refers to how each option impairs or would impair one’s ability to enjoy a view or an environment. For example, the landfill ranked as the least preferred option because residents living in the surrounding area of the Central Landfill are subject to unpleasant views and odors. The landfill is nearly 570 feet above sea level (Rhode Island Resource Recovery Corporation).

If Bryant University were to construct a compost site on campus, the university owns enough acres that it would likely be able to position the site where it would not be visible to buildings or neighbors. Habitat loss is an environmental issue whenever people develop land, whether it is for

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a landfill or agriculture. The landfill covers the most area at 230 acres, which resulted in its ranking as least preferred in terms of habitat loss (Rhode Island Resource Recovery Corporation). A compost site and the local pig farm cover a similar amount of land between 15-20 acres (see table 3). When food is diverted from the landfill, this allows it to be turned into something useful that supports local agriculture and closes the loop. For instance, were Bryant to compost on-site, the university could hypothetically use the compost to grow food for the dining hall in a community garden. This would be both closing the loop because instead of ending up at a dead-end in a landfill, the food would be sent back through the system as useful compost to grow something. It would also raise awareness of the local agricultural system by exposing students to locally grown products.

Table 2. Ranking System Results: Environmental Impacts

	Landfill	Piggery	Compost (off-site)	Compost (on-site)
ENVIRONMENTAL IMPACTS:				
Trucking Distance	2	2	4	1
Visual Pollution	4	3	2	2
Habitat Loss	3	2	2	2
Support of Local Agriculture	4	2	2	2
Closed Loop	4	2	2	1
TOTAL:	17	11	12	8
Environmental Ranking:	4	2	3	1

Thirdly, the educational value of each option was evaluated. There is a huge opportunity for raising awareness and educating students and faculty as well as the local community about sustainable waste management. The on-site composting option received the ranking of most

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preferred for educational value because it would be an extremely visible initiative when compared to the other options that consist of simply sending the waste elsewhere (see table 4). Composting could be built into the curriculum for science and business courses. As the waste ban goes into effect, new business ventures will need to be created to serve large institutions recycling their food waste and people will be needed to market the ideas to institutions. Additionally, Bryant University could get the local community involved by offering educational tours and even volunteers at the compost site. This would also build the university's reputation as an educational institution that is striving for sustainability.

Table 3. Ranking System Results: Educational Value

	Landfill	Piggery	Compost (off-site)	Compost (on-site)
EDUCATIONAL VALUE:				
Creates Awareness	4	3	3	1
Research & Curriculum Opportunities for Students	4	3	3	1
Community Outreach Opportunities	4	3	2	1
Shows Bryant's Commitment to Environ.	4	2	2	1
Educates Students/Faculty about Recycling Food Waste	4	2	2	1
TOTAL:	20	13	12	5
Educational Ranking:	4	3	2	1

The last criteria was feasibility because while an option may rank highly in the other three categories, if it is not feasible then the option may be ruled out. First, how the option would affect any neighbors was taken into account. This is because if there is enough public opposition to a new site, such as another compost facility, it may not happen. The Central Landfill currently receives a lot of outrage from the public, and building a new landfill after this one is full would

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face a lot of opposition from the public. Therefore, sending Bryant's waste to this landfill may not be feasible in the long-term.

A second feasibility aspect that was necessary to evaluate was the protected wetlands areas. The on-site compost plant would be affected by this because much of Rhode Island, including Smithfield, RI where the university is located, is a wetlands area that is under regulatory jurisdiction. This would not rule out the option of on-site composting, but could make it more difficult to get approval for building a road or composting facility on campus (Rhode Island Free Public Records).

The need for student involvement would be especially significant for on-site composting. For a university to build its own on-site compost plant, the students would need to be able to and want to play a role in keeping the system going. An example of this is the residence hall composting initiative at Brown University that was started by a group of students. A similar point is the need for long-term commitment. This is less important for the pig farm, landfill, and off-site composting options because the university could easily switch solutions when a contract ends. If Bryant were to invest in an on-site compost plant, however, the university would need to have long-term commitment to this due to the high startup costs.

Lastly, it would probably be difficult for the on-site compost plant to receive a lot of support from upper management and administration at this time. This is largely because, unlike Bentley or Brown, Bryant does not have an Office of Sustainability on campus or full-time paid sustainability positions within the university. Bryant has developed a Sustainability Plan and has a Sustainability Committee, but the members act only in an advisory capacity. The members represent different departments and programs and meet once every other month. Most of them are strongly committed to sustainability principles, and are willing to extend the university's Sustainability Plan. However, without a support staff and day to day administrative presence, an advisory committee is seldom effective in moving rapidly forward on sustainability initiatives. The university has received significant assistance from the environmental consulting company EcoMotion, but it would be important for Bryant to create an on-campus position overseeing sustainability efforts as we move forward (Bryant University, "Bryant" 26).

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Table 4. Ranking System Results: Feasibility

	Landfill	Piggery	Compost (off-site)	Compost (on-site)
FEASIBILITY:				
Neighbors	4	2	2	2
Wetlands Constraints	1	1	1	3
Need for Student Involvement	1	2	2	4
Long-Term Commitment	2	1	1	4
Support of Administration	1	2	2	4
TOTAL:	9	8	8	17
Feasibility Ranking:	3	2	2	4

An overall ranking was assigned to each option by totaling the ranking from each criteria, and then assigning a rank of 1 through 4. In accordance with the preceding tables, the option with the highest total was the least preferred option, while the option with the lowest total received the ranking of most preferred. The results revealed that the pig farm is the most preferred option. This is largely due to the low economic costs, and was reasonable because Bryant is currently utilizing this option. The least preferred option ended up being the landfill (see Table 5).

There are limitations to this ranking system. The first is that it is impossible to know the different degrees between each rank. For instance, an option with an overall rank of 4 may be much less preferred than an option with a rank of 3, but this can't be shown in the tables. Also, the options available are constantly changing. For instance, if a second commercial compost site opens up closer to the university, this would add a viable option for managing food waste at Bryant.

Table 5. Ranking System Results: Overall Ranking

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	Landfill	Piggery	Compost (off-site)	Compost (on-site)
CRITERIA RANKINGS:				
ECONOMIC RANKING	2	1	3	4
ENVIRONMENTAL RANKING	4	2	3	1
EDUCATIONAL RANKING	4	3	2	1
FEASIBILITY RANKING	3	2	2	4
TOTAL:	13	8	10	10
OVERALL RANKING:	3	1	2	2

DISCUSSION OF RESULTS

The benchmark with Bentley and Brown, coupled with the expert survey, interviews, and the ranking system, worked together to show how the university is currently managing food waste by sending it to the local pig farm, along with the best way to improve the system. Brown University sets a perfect example of what initiatives Bryant should be striving for to reach a zero-waste food cycle throughout campus.

Lessons from the benchmark were helpful when reviewing the results from the ranking system because it demonstrated how the different options were being combined and utilized by two universities that are comparable to Bryant. While there is no one size fits all for food waste management systems, it was useful to examine what solutions are working for similar institutions with successful food recycling programs.

Looking back on the literature, Sarah H. Creighton lists the essential ingredients for university environmental change. One of the main items for environmental stewardship initiatives to be successful is for the institution’s leaders to “make a visible and meaningful commitment to environmental action.” She acknowledges that, while support for

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sustainability initiatives may start at the student or staff level, buy-in from upper management such as the president, vice president, and deans is necessary (17). This was apparent in the expert survey and interviews because each expert identified the need for upper management and administration to be committed to campus sustainability. Also, the two universities with successful food recycling programs that Bryant was benchmarked against both had appointed sustainability leaders such as a Sustainability Director.

The results of this study should be of particular interest to the university because diverting waste, especially food waste, from the landfill often results in cost savings. Also, by partnering with local farms and businesses such as a compost plant and the pig farm, Bryant is building a positive relationship and reputation within the community. The research and findings from this project can be used as a jumping off point for other waste management, recycling, and sustainability projects.

Significant improvements have been made to the waste management system over the past year, and the university should capitalize on this momentum and keep working towards a zero-waste food cycle.

SUMMARY

With regard to the research question set forth in the opening of this paper, the study confirmed that there are feasible, sustainable, and cost-effective solutions for managing the food waste of a large institution such as Bryant University. As determined from the expert survey and interviews, an on-site compost site is not a feasible solution for the university. This was supported by the benchmark with Brown and Bentley because both universities are similar to Bryant and send their food waste off campus to be recycled or composted.

The current food waste management system has proved to be feasible and cost-effective, and follows the EPA Food Recovery hierarchy where food scraps are being used to feed animals before resorting to a compost plant or landfill. Information provided by the experts and Aramark demonstrated that the current solution is on the right track, but there are many improvements that can be made to divert even more waste from the Central Landfill.

RECOMMENDATIONS

Overall, Bryant University is making leaps towards diverting organic waste from the local landfill. There is, however, a lot of room for making the system more effective and sustainable.

First, the university can look into off-site composting of food waste that is unsuitable for pigs, such as paper products. This would allow the university to purchase compostable napkins and utensils for the main dining hall as well as Nick's Place and the Gulski Dining Room. The solution is similar to Brown University where they send food waste to a local pig farm and compostable waste and other food scraps to a compost plant.

The study body needs to be better educated about the benefits of food waste management and be aware of the initiatives. A recommendation to aid in this is to provide information to incoming freshmen at summer orientation about what the university is doing in terms of sustainable waste management and how they can help. Although the food scraps are being sent elsewhere, it is the students eating in the dining areas who are responsible for separating their waste to ensure that what can be diverted from the landfill is. A second suggestion with respect to education and raising awareness is to get student organizations more involved. Student organizations play a huge role on Bryant's campus, and this should be taken advantage of. To help raise awareness and accelerate sustainability initiatives in the dining hall, Dining Services could create a work study job or an internship for students who are passionate about sustainability. There are always students looking for work study opportunities and internships, and based on the interview with Kate Moran, she wears many hats and could use the help of a student worker (Appendix C). Bryant could easily build food waste management into the curriculum. Case studies about how the university sources, purchases, and manages the food and food waste could be examined in supply chain, operations management, marketing, and other courses. As the food waste ban gets adopted by states around the nation, innovative business ventures can break into this opportunity and create companies that help large institutions manage food waste sustainably. Bryant University develops and prepares entrepreneurial minded young professionals who can play a major role in this.

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For future studies on the Bryant University campus, it would be beneficial to assess student and faculty perceptions about composting, food recycling, and food waste in general. It would be interesting to see the level of knowledge the students and faculty body have about food waste management and what the university is doing in terms of sustainable food waste management. Student and faculty are directly involved in the process, and it is necessary to educate them and assess their awareness of the system.

Ultimately, food is a resource and never a waste, and there are sustainable, cost-effective, and feasible solutions for institutions such as Bryant University to divert food scraps from the landfill.

APPENDICES

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Appendix A - Expert Survey Responses

Q1: What name and title would you like to be referred to in the survey findings (ex: John Smith (Programs Manager), Environmental Council member, Anonymous, etc.)?

Greg Geritt Coordinator RI Compost Initiative Environment Council of Rhode Island

Q2: Why do you think food composting is a preferred method of food waste management?

First is only order enough, second is feed humans, third is feed animals 4th is compost. But what must be composted defonitely should be composted . Benefits include reduced carbon budgets and soil replenishment

Q3: What are the biggest logistical challenges for a large institution interested in composting?

Having the right space and training people to operate the system

Q4: How do you make the decision of where to do the composting; i.e., what parameters would an institution need to take into account when deciding on on-site versus off-site treatment?

Cost, location, transportation, what the compost will be used for, can it fit in to curriculum? Who would manage the system? equipment needed,

Q5: What are the various elements and factors to account for when planning a budget for food composting operations (storage, pick up, etc.)? And more specifically, do you have any recommendations on the best way to calculate the cost comparison of an off-site versus on-site composting program?

Same as above, do not have a secret method

Q6: How could a large institution account for the variability in food waste volume (due to large banquets/graduation and then the low volume during summer vacation months)?

You do not need to add the same amount to a compost pile each day. You could use a batch system sized accouding to the amount of food served seasonally. BAnquets and graduation might overwhelm the system for a day or two, so have extra capacity.

Q7: What are your greatest concerns about the expansion of food composting in general?

That it is not happening fast enough

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Q1: What name and title would you like to be referred to in the survey findings (ex: John Smith (Programs Manager), Environmental Council member, Anonymous, etc.)?

Leo Pollock, Co-founder, The Compost Plant; Network Coordinator, Rhode Island Food Policy Council

Q2: Why do you think food composting is a preferred method of food waste management?

Takes a "waste" product and turns it into a resource, by recycling all of the nutrients, vitamins, minerals in food scraps back into soil. Has double benefit of preserving landfill space, and increasing soil health and production capacity for local agriculture.

Q3: What are the biggest logistical challenges for a large institution interested in composting?

Ensuring clean source separation (education, staff training). This gets even more difficult when we're talking about post-consumer waste disposal.

Q4: How do you make the decision of where to do the composting; i.e., what parameters would an institution need to take into account when deciding on on-site versus off-site treatment?

Unless a site is managing an on-site anaerobic digester, I don't believe it would be cost-effective or realistic for an institution to compost its own food scraps. The volumes generated by most institutions would be too large to make this feasible, and the staff capacity and expertise needed would be a substantial cost to the institution to have on-staff.

Q5: What are the various elements and factors to account for when planning a budget for food composting operations (storage, pick up, etc.)? And more specifically, do you have any recommendations on the best way to calculate the cost comparison of an off-site versus on-site composting program?

The only budget to plan for is the cost of a compost pickup service, and the training hours necessary for educating staff. In general, since this is waste that the institution is already paying for in terms of trash hauling, there should be an overall cost savings or neutral cost to separating waste and paying for compost collection. Again, I do not believe most institutions would be able to manage on-site programs, unless they used an in-vessel composter or AD...and those tend to be enormously expensive.

Q6: How could a large institution account for the variability in food waste volume (due to large banquets/graduation and then the low volume during summer vacation months)?

Waste audit would be the only way to account for this. But as a business that offers collections services, we understand that this is part of working with educational institutions: there is very little volume during breaks and summer, and there is high volume during events. This isn't a concern, but the logistics of extra capacity and flexible pickups can be worked out easily.

Q7: What are your greatest concerns about the expansion of food composting in general?

As interest in diversion of food waste increases, there will not be enough processing capacity to handle it. I would also be concerned about ability to keep food waste cleanly separated, with no trash or other contaminants mixed in.

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Q1: What name and title would you like to be referred to in the survey findings (ex: John Smith (Programs Manager), Environmental Council member, Anonymous, etc.)?

Kevin Proff
Programs Managaer
ecoRI News

Q2: Why do you think food composting is a preferred method of food waste management?

The benefits of composting over landfilling are many.

First, Rhode Island's landfill will reach capacity within 20-25 years. At that point, options will include starting a new landfill, incinerating trash, or shipping it out of state. None of these options are particularly environmentally friendly, and all will cost a lot of money. Diverting food scrap from the landfill, postpones the point at which the landfill reaches capacity.

Second, when food scrap breaks down in a landfill it emits methane which can escape into the atmosphere and cause global warming at a much faster rate than CO₂. While it is true that the landfill captures much of its methane before it escapes and turns it into energy, it is unlikely that it catches it all. Composted food scrap creates CO₂ when it breaks down, which, as mentioned above, is less harmful than methane.

Third, Composting is a form of recycling. We take a waste product (food scrap) and turn it into something that is very beneficial for our environment and the soil on our farms (compost).

Q3: What are the biggest logistical challenges for a large institution interested in composting?

Large scale composting efforts are limited in RI by a number of reasons.

First, there are limited places to bring food scrap to be composted. Earth Care Farm is the only large-scale compost facility in RI. It is located in Charlestown.

Second, there are limited food scrap waste haulers. Earth Care Farm, while large in scale, is only a composting facility and does not haul people's waste to its massive compost piles. Businesses and institutions have to get the food scrap to Earth Care Farm on their own.

With the introduction of Compost Plant, a food scrap hauling service for businesses and institutions around Providence, the equation has changed ever-so slightly. Compost Plant transports food scrap to Earth Care Farm for a reasonable fee, thus making the logistics of composting possible for their customers.

That said, it will take more than one hauler and one composting site to scale up composting in RI. Compost Plant hopes to have its own composting facility up and running by the end of the year.

PF Trading is another waste hauler that hauls food scrap and will service businesses in RI. The company is based out of New Bedford. They currently work with Blue Cross Blue Shield's headquarters in Providence to divert food waste.

Another obstacle is staff training and education about what can and cannot be composted. At a university, students may need to be educated in addition to kitchen staff, making the logistics even more complicated.

Q4: How do you make the decision of where to do the composting; i.e., what parameters would an institution need to take into account when deciding on on-site versus off-site treatment?

Leo is the best person to answer this question. There are regulations about how much food scrap you can compost before needing a plan and permit, etc.

Q5: What are the various elements and factors to account for when planning a budget for food composting operations (storage, pick up, etc.)? And more specifically, do you have any recommendations on the best way to calculate the cost comparison of an off-site versus on-site composting program?

I am not qualified to answer this question.

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Q6: How could a large institution account for the variability in food waste volume (due to large banquets/graduation and then the low volume during summer vacation months)?

Again I defer to compost plant.

In terms of traditional composting, it would not be a problem if you added less scrap to a pile during the summer and more after banquets as long as you keep the ratio of greens to browns correct, and as long as you are turning the piles properly.

Q7: What are your greatest concerns about the expansion of food composting in general?

I do not have concerns about the expansion of compost. I do not see a drawback.

Obstacles to compost ramping up include:

Politicians not passing forceful enough legislation to attract composting companies. Compost facilities will only come if the state has mandates that require businesses to compost. Otherwise, they will not be guaranteed customers if they set up shop in RI.

Regulatory agencies not enforcing composting mandates strictly. As a result, many (or most) companies will simply not compost and hope they do not get caught/fined. This is exactly what happens with recycling in RI.

The artificially low cost of dumping waste in the landfill. As long as it is cheaper to throw food scraps away than it is to compost them, businesses and municipalities will choose to throw food scrap away (unless they are forced to do otherwise by strong mandates). Until the landfill raises its tipping fee for trash (which the landfill operators want to do, but Statehouse politicians refuse to touch for fear of upsetting the waste hauling industry and constituents who would have the higher tipping fee passed along to them via taxes or pay systems) it will be difficult for composting companies to compete and make a reasonable profit on their efforts. Currently, for each ton of municipal trash dumped at the landfill, RIRRC actually loses money because of the artificially low tipping fee, last raised to \$32 in the early 1990s.

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Appendix B – (Semi-Structured Informal Interview with Greg Gerritt, Coordinator of RI Compost Initiative and Environmental Council of Rhode Island)

Pig Farmer vs. Composting

Bryant University currently sends its food scraps to a pig farmer (My Blue Heaven Farms). So the current process is as follows: students leave food on their plates and put them on a sort of conveyor system, dining hall employees scrape plates into bins that we pay a pig farmer to truck to their site.

Q: Do you feel that this is a better use of the food scraps than sending it to a compost facility?

FEED something first – compost the pig manure

Q: But napkins, plastic utensils, cups, can't be recycled/composted with this method – an issue?

If you're buying composted napkins etc., this needs to be composted or else it is a waste.
EPA food hierarchy – feed people, then animals, last is to compost it

Q: Pig farmer vs. composting – cost comparison? Typically the same – just pay to get it trucked away?

You typically save money sending it to pig farm – pay tipping fee for compost
If pig farmer can take all food scraps – that's the way to go

Q: Would you recommend that institutions do both?

Ideally, Bryant sends scraps to pig farmer, and the pig farmer composts the manure/unused scraps

Q: Costs to take into account: the bins to store the food waste, trucking fee, employee time, missing any?

That's all.

Waste management landfill - trucking fee and tipping fee

Food waste is heaviest part of waste stream – so this is a huge cost savings in terms of tipping fees by the ton at the landfill

Benchmarking

Q: I'm currently looking at Johnson & Wales and Bentley University as they are comparable to Bryant in student body size – any other local colleges/universities that you'd recommend I look at?

JWU had purchased food digesters -- Grind up food, cook it, dehydrate it →this only shrinks it. I think they may not still have them, these broke quite frequently ... JWU has likely gotten rid of them and I'm not sure what they do now

BROWN has recently started sending their food scrap out through the Compost Plant – new business in RI that trucks to one licensed compost facility in the state – but they are intending to open their own composting location

Brown began with one day a week, now they do four runs a week to Charlestown compost plant
Also the Compost Plant business has demonstrated that there are enough food scraps to open another large facility in RI

Q: Has RI officially passed a food recycling bills passed like the one in place in Massachusetts? I know they were looking at a bill requiring institutions producing over 2 tons of food per week if a facility that can compost/digest is w/in 15 miles.
We have passed a ban that only covers the largest businesses – colleges and universities are included, Bryant University 2 tons per week if compost facility is close January 1 2016
Brown contracted with compost plant, other institutions working towards it

Q: I feel like a question that people may ask – that may turn them off from composting – is if there are any safety/health issues with composting – so if someone had a disease/virus, and we feed pigs the scraps that were touched by this person, is there a danger in the hogs being contaminated (or compost and then the plants) and it spreading?
Commercial compost facility must compost the scraps right, and this means you have to get the temperatures high enough to kill all of the bad microbes/etc.
Compost facilities need to be run properly, and there will be no problem.
A really well-run facility will not have odor – need to have right amount of oxygen – compost aerobically – balance of nitrogen and carbon
Proper composting should handle almost all of those issues

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Appendix C – (Semi-Structured Informal Interview with Kate Moran, Aramark at Bryant University)

Q: What were the results from the annual food audit/have we done one? Where are they posted?

I'll send it to you!

Q: Was this the first weigh the waste challenge Bryant has done/anything you compared it to?

Yes as far as I know.

This year it was a two day event – We had 100 pounds in 3 hours.

On campus organization called Calo is having a green student initiative they will hold another Weigh the Waste event on the 28th – 30th of April

Partnering with students and student organizations, educating students on the dish disposal process and how they can help is very important and this is also a challenge

I know that currently, we have a pig farmer that picks up the waste. Can you tell me a bit more about the process?

Back of the house/kitchen pre-consumer and post-consumer waste is composted with blue heaven farms

I believe the pig farm composts the manure so nothing is wasted.

We also locally source food from other local farmers.

One thing I work on is teaching students how to choose food wisely, take less food, and it's about giving them the tools to do so

Q: What are the hurdles to food recycling that the Aramark is facing?

Educating the employees using helpful signage on bins and marketing materials

It's a process – it's a lot. Changing management, structure, and policy

Takes time for people to adjust

Q: Sustainability Plan 2014 says we divert 600- 900 pounds of food scraps weekly... what percentage of total food waste is this? / What percentage of our food waste is the pig farmer taking?

He handles all of it – pre and post-consumer

At Aramark we use an online program called green thread – sustainability program – I can get any images or information you need

Is there an active effort in Aramark like a policy for sustainability? Are there other schools they serve that are more advanced?

Waste management is important, we initiated tray less dining, food recycling

Reusable to go containers is an option they are looking at – it's a meal swipe

Sustainability plan

Can you give me a cost figure for the pig farmer picking up the food scraps (trucking fees, etc.)

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The farmer provides the bins for the food scraps, picks up the bins in his own truck, and Ron the farmer comes 2-3 times every week. This is of no cost to the university.

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