



USF Campus Food Waste Recovery Project – Progress Report

Funded by the USF Student Green Energy Fee on
September 21, 2018

Progress report submitted on
March 27, 2019

PI: Whitney Fung

Student Team: Gviana Goldberg, Kara Panesar, Osayamen Orhue, & Shelby Peterson

Alumni Advisors: Phillip Dixon & Li Zhu

Faculty Advisors:

- Dr. Jennifer Marshall, Public Health
- Dr. Sarina Ergas, Civil Engineering
- Dr. Thomas H. Culhane, Patel College of Global Sustainability
- Dr. David Himmelgreen, Anthropology

Brief Summary

Since being funded, the project team started meeting weekly in October 2018. We meet Fridays from 1:00pm to 2:00 at OPM 108. All are welcome to join, and we often have volunteers attend to learn more about the project. During our meetings, we have project updates and we work towards our goals as laid out in the project proposal. We have learned a lot in the past six months and hope to share with the full advisory committee soon. We look forward to meeting hopefully in April 2019!

This progress report provides updates according to each project phase: Implementation, Biodigesters & Anaerobic Digestion, and Student Engagement & Well-Being. We also wanted to write a thank you note to the USF team that has provided a lot of time and support to ensure that this project is able to accomplish our goals.

Acknowledgements & Collaborators

We are sincerely grateful to the USF Facilities team for helping us implement this project. In particular, we wanted to thank Nainan Desai, Suchi Daniels, and Chris Martin for their continual guidance, time, and support for this project. We also wanted to thank Tom Schlick, Ray Miller, Kim Tomkinson, Ray Curbelo, and the Facilities purchasing team for all their help.

We also thank the USF Aramark/Dining Services for their continual support, time, and guidance in this project. We are grateful for their vision for USF to be a sustainable campus and appreciate all their staff support and donations.

Lastly, we are so grateful to the faculty advisors and entire project team (current and graduated students). Also, thanks to all the media support, especially to the College of Public Health Relations Team.

Project Collaborators:

- Ms. Jessica Cicalese (USF Aramark)
- Ms. Suchi Daniels (USF Facilities)
- Mr. Nainan Desai (USF Facilities)
- Dr. Jenny Friedman (Sociology)
- Mr. Scott Grace (USF Athletics)
- Dr. Laurel Graham (Sociology)
- Ms. Katie Jones (USF Feed-a-Bull)
- Dr. Babu Joseph (Engineering)
- Mr. Reginald Lee (Education)
- Dr. Russell Kirby (Public Health)
- Mr. Paul Mack (USF Aramark)
- Dr. Mahmooda Pasha (USF Social Marketing Group)
- Dr. Peter Stiling (USF Office of Global Sustainability)
- Dr. Qiong Zhang (Engineering)
- Mr. Dell deChant (Religious Studies)
- Dr. Connie Walker (Behavioral Studies)

Implementation

Led by Shelby Peterson, Undergraduate in Chemical Engineering

Logistics

- A Memorandum of Understanding was developed for project partnership with Aramark/USF Dining Services; this is Appendix A.
- The plan is to pick up 6 containers of food waste every Wednesday and Friday via golf cart (donated by Facilities) from Champions Choice. Once picked up, the waste content will be recorded and then go directly into the insinkerator to be grinded. From there it will be loaded into the digesters so that no food waste will need to be stored on our end.
- Food waste containers will be cleaned at Champion's Choice and brought back the following pick up day.
- Gloves and goggles, provided by Suchi, will be used when handling food waste.
- A general SOP was developed for the collection of food waste from dining halls, see Appendix B.
- Food waste was picked up on 3 occasions at the end of January from Champion's Choice. The content was examined and recorded, and the waste was given to Dr. Culhane, a professor for the Patel College of Sustainability, to be used at the Rosebud Continuum, non-profit educational farm in Pasco County.

Date	Amount	#pounds of food	Type of food
1/25/2019	4 buckets	To be collected for future pick-ups	Pre-consumer service waste
1/30/2019	6 buckets	To be collected for future pick-ups	Pre-consumer service waste
2/1/2019	6 buckets	To be collected for future pick-ups	Pre-consumer service waste (some leftover breakfast items)
	Total = 16 buckets to date		

- Pick-up was halted until biodigesters are complete but allowed the team to become familiar with pick up procedures.
- The group plans on speaking with someone who works with the land-fill scale biodigester at UC Davis to gain details about their facility to develop the best implementation methods for landfill scale at USF, scheduled for 3/27/19.
- Further literature review will continue to explore the best recovery and utilization methods for landfill scale anaerobic biodigesters as well as the utilization of the byproducts includes using the biogas to power small motor vehicles and providing electricity to the campus.

Food Waste Audit

Led by Osayamen Orhue, Undergraduate in Environmental Science and Policy

- Plan to be discussed with Li Zhu, Whitney, and Osayamen

Biodigesters & Anaerobic Digestion

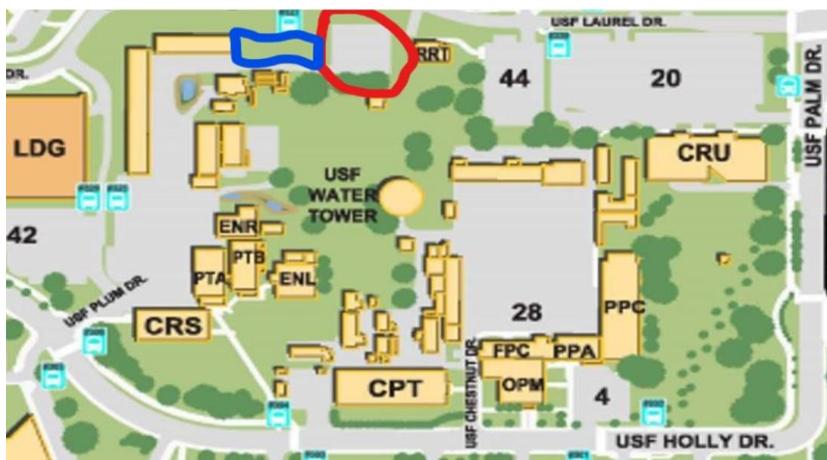
Led by Kara Panesar, Undergraduate in Chemical Engineering

Purchasing parts

- All materials necessary for building biodigesters have been purchased
- Materials required to ensure max efficiency for feeding biodigesters have been obtained such as
 - Golf cart donated from Facilities to ensure safe and efficient transport of food waste
 - Insinkerator donated to ensure food waste is in an easily digestible form

Build days

- A build date to build biodigesters has been set, March 29, 2019
 - This event is open for everyone to join!
- Three, double IBC tank Solar Cities anaerobic digesters designed by Dr. TH Culhane are set to be built on March 29th and will be located at USF Facilities (circled in red, below).



Biogas calculation and filtration

- Numerous biodigester calculations have been done including but not limited to
 - Loading rates of food waste/day
 - Maximum biogas generation when operating at peak efficiency
 - Typical concentrations of digestible solids in food waste
- The Engineering team has searched the literature to figure out how best to purify biogas and eliminate undesirable gases. They are identifying several methods.

Our plans with the biodigesters going forward include

- Obtaining already acclimated inoculum (bacteria that will break the food down and help produce methane gas) from Dr Culhane (Patel College of Sustainability) to ensure food waste can begin digesting as quick as possible
- Begin running biodigesters by the beginning of April after the build date
- Verify our biogas calculations to our actual output to ensure that we are running the digesters as efficiently as possible
- Test the food waste going in and coming out to ensure that the digesters are running as efficiently as possible using monitoring parameters such as
 - pH
 - volatile solids concentration
 - concentration of methane in biogas
- Decide on final best biogas purification method

Student Well-Being & Engagement

Led by Whitney Fung, Doctoral Student in Public Health

USF Course Involvement

This project is an example for research, teaching, and practice. Whitney Fung has been working with faculty members to involve students in the project, e.g., Dr. Jenny Friedman (Dept. of Sociology), Dr. Qiong Zhang (College of Engineering). For various courses, Whitney works with Professors to use the project to apply course material where students will use the Campus Food Waste Recovery project to complete their course assignments. Courses and their products are included below.

Professor	Course	Deliverables
Dr. Mahmooda Pasha	Social Marketing – Fall 2018	Final paper with interviews with USF students to understand motivations, barriers, and incentives to reduce food waste
Dr. Anna Armstrong	Public Health Intervention Methods - Spring 2019	Final project with food waste prevention materials (pre-tested) and data from 200 online students about food waste behaviors
Dr. Robert Dedrick	Advanced Measurement I & II – Fall 2018 and Spring 2019	Whitney Fung is developing the campus-wide survey for the class project and will run analyses for instrument validation.

Development of Social Marketing Campaign

- As a project to inform the development of a social marketing campaign, we were exempt from IRB oversight. We applied and got an IRB exempt letter.
- We are currently conducting expert panel reviews and will distribute the campus-wide survey to understand student knowledge and awareness of sustainable food systems in April 2019.
- The plan to implement the campaign on campus is as follows:

Phase 1: Campus-wide Knowledge/Awareness and Interest Survey of Food Systems (Spring 2019)

- What is the current level of student awareness and interest of food systems?
- What is the current food insecurity rate on USF campus?

Tasks:

- ✓ Complete and submit IRB protocol
- ✓ Finalize draft survey
- ✓ Conduct expert review of draft survey
- Conduct cognitive interviews of survey
- Disseminate survey

Phase 2: Identify high-interest behaviors (from Phase 1 survey) and conduct formative research to develop social marketing campaign to reduce food waste on campus (Summer 2019)

- What behaviors and interventions may provide the most return on investment?
- Who will we target on USF campus?
- What are messages that the target audience will relate to in order to meet target behavior?

Tasks:

- Summarize data from Phase 1 data collection
- Identify high-interest behaviors
- Identify target audience and behaviors
- Collect data to identify values, motivations, and messages that target audience will relate to for social marketing campaign.

Phase 3: Use data from formative research to develop social marketing campaign for USF campus (Fall 2019)

- Which messages best resonate with USF vision for food waste reduction?
- What methods are most feasible to implement the social marketing campaign on campus to reduce food waste?

Tasks:

- Develop social marketing campaign at USF Dining Halls

- Evaluate social marketing campaign

Volunteer & Marketing

Led by Gviana Goldberg, Undergraduate in Anthropology & Women's Studies

Volunteer Recruitment

- We are open and welcome to new volunteers and actively recruit during outreach activities such as presentations and tabling. We have had several students reach out to us to help volunteer.
- A new volunteer, Osayamen Orhue, is dedicated to creating a food audit that will contribute to our understanding of food waste on USF campus.
- Another volunteer named Disha Jain joined our Friday meeting and expressed an interest in the aiding the social marketing research and initiatives
- Volunteers from Dr. Culhane's class will be helping build the biodigesters on March 29th

Marketing & Outreach

- Bull Market is space for volunteering that connects our team to students for recruiting volunteers and passing out flyers
 - Starting 3/20/19, the student team is tabling at the USF Bull Market weekly on Wednesdays from 9:30am-12:30pm to raise awareness for the project.
- We are exploring opportunities to do outreach and education in Champion's Choice as well.

Video

- The College of Public Health media relations team has worked with the project team to produce a series of food waste education videos that includes information about our project. The video is still in production but should be done by April 2019.

Flyers

- We have developed marketing flyers to pass out for our project (See Appendix C) as well as educational flyers for students to learn about food waste reduction.

Media articles

- <http://www.usforacle.com/news/view.php/1035344/Dining-puts-focus-on-reducing-daily-food>
- <http://www.usforacle.com/news/view.php/1035547/Grant-helps-food-waste-project-move-forw>
- <https://hscweb3.hsc.usf.edu/health/publichealth/news/whitney-fung-leads-student-effort-to-reduce-usfs-food-waste-2/>

Professional presentations

- USF Student Sustainability Conference, October 2018, presented by Whitney Fung
- Food Recovery Summit, April 20, 2019, presented by Whitney Fung
- Alche conference, accepted for presented at the 43 Annual International Phosphate Fertilizer & Sulfuric Acid Technology Conference, June 7-8, 2019, led by Kara & Engineering team
 - https://aiche-cf.org/Clearwater_Conference

Appendix A

USF Campus Food Waste Recovery Project

Funded by the USF Student Green Energy Fee in 2018

Memorandum of Understanding

This agreement specifies the details of the partnership between USF Aramark/Dining Services and the USF Campus Food Waste Recovery Project. If any changes are expected, each party will be responsible for notifying the other in a timely manner.

- **Food waste pick up**

Dining sites. The selected pilot site is Champion's Choice.

Personnel. The project team will work directly with Mr. Larry Gonzalez Rivera and Mr. Brad Davenport to coordinate food waste pick up from Champion's Choice. The USF SGEF team will contact the Champion's Choice team via email and/or phone to coordinate pick up; the team consists of several student members. Contact information for project leaders include:

- Mr. Brad Davenport, Food Service Director, Aramark/USF Dining
 - Davenport-bradley@aramark.com
 - 813 476-5610
- Mr. Larry Gonzalez Rivera, Champion's Choice Manager, Aramark/USF Dining
 - Gonzalezrivera-Larry@aramark.com
 - 813 297-3376
- Ms. Whitney Fung, Project principal investigator
 - whitneyfung@health.usf.edu
 - (954) 415-2201
- Dr. Jennifer Marshall, Project faculty advisor
 - jmarshall@health.usf.edu
 - (813) 396-2672

Schedule. The team will adjust the schedule according to the most convenient for Aramark staff. Currently, we are pilot testing pick-ups twice a week (Wednesday and Friday) at 2pm, when the dining site closes. Other options may be Monday, Wednesday, and Friday, or potentially more/less depending on convenience and need.

Food waste amount and content. Currently, the capacity of our pilot-scale biodigesters only allow a maximum limit of one 5-gallon buckets of food waste per day. The arranged amount of pick-up on Wednesday and Friday is **four 5-gallon buckets per pick-up.** The amount and content may vary and will be coordinated with the Aramark staff monthly. For example, the current schedule is as follows:

Pick-ups to date (after 2/1 pick-up, we have paused pick up for now until biodigesters are ready to be fed)

Date	Amount	#pounds of food	Type of food
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1/25/2019	4 buckets	To be collected for future pick-ups	Pre-consumer service waste
1/30/2019	6 buckets	To be collected for future pick-ups	Pre-consumer service waste
2/1/2019	6 buckets	To be collected for future pick-ups	Pre-consumer service waste (some leftover breakfast items)
	Total = 16 buckets to date		

Materials. We thank USF Dining services for purchasing the food-grade buckets for us. In total, 18 were purchased. The SGEF team will rotate the buckets and bring back **cleaned** buckets at every pick-up. USF Dining services plans to purchase a Granger bucket tool as well; we will keep track of materials in a separate document shared with USF Dining Services.

Cleaning. The SGEF team will be responsible for all cleaning of buckets and project materials. We plan to wash the buckets primarily at a location closer to USF Facilities (at the Marshall Student Center), however, we may at times use the Champion's Choice wash-out area in the back of the facility as well. We will always notify Aramark personnel if we are to use the facilities including the wash-out area.

- **Extent of food waste use**

Currently, the food waste is given at no charge, and there is no charge to pick up the food waste. This project is to explore the potential cost benefits/savings to recover the food waste internally on campus through USF Facilities. All the food waste that is picked up will be used for project purposes only, which may include record-keeping/documenting details or recovered for compost/biodigester use. At times if the biodigester is at capacity, food waste may be taken off campus to non-profit, community composting sites. We have acquired all necessary permits and approvals through the USF Environmental Health and Protection to ensure that we are following all safety regulations and rules to transport the food waste. There has also been discussion about recovering edible, safe-to-consume food to donate to local organizations that feed hungry people, e.g., USF Feed-a-Bull Food pantry; we hope that this is something we may continue to discuss for future ideas. Currently, we will not recover any food to donate to local charities, and ALL food waste will only be used for composting/biodigesters.

- **USF Aramark/Dining Services Marketing**

Our project team is working in partnership with USF Dining Services to increase student outreach and education in the dining halls. We fully support USF Aramark's marketing initiatives such as the Green Thread program and will work to promote projects in conjunction with Aramark's values. All marketing that includes USF Dining Services will be sent to Ms. Jessica Cicalese and Mr. Paul Mack for approval before implementing. Marketing and outreach efforts may also include, but is not limited to, tabling at dining halls or passing out educational flyers.

- **Usage of data and any information collected from USF Aramark/Dining Services**

Lean Path. With approval from Ms. Cicalese and Mr. Mack, we are planning to use the Lean path data to help USF track food waste. This may help in a more comprehensive approach to track campus-wide food waste. For project purposes, this will help to understand how much food waste exists and how much the project helps to recover. The data may be shared with the public

or for project presentations, however, the team will always send notification to Ms. Cicalese and Mr. Mack before doing so. Additionally, our team is aware of how the data may be portrayed and will work to ensure that USF Aramark's excellent food waste prevention efforts are accurately depicted.

Data Collection. To ensure smooth transition and convenience of Aramark staff, we do request permission to talk to staff for certain stages of the project. For example, we would like to know about facilitators and barriers of storing food waste at a facility (currently in food-grade containers in the fridge that are clearly labeled). We would like to understand staff perceptions so that we can implement a campaign and project plan that works for all stakeholders involved, including Aramark dining staff, customers, students, and Facilities staff. All data collected can be shared with the Aramark team.

Reports and tracking. The project is required to submit quarterly report forms to the Student Green Energy Fund Council. These reports will be relayed to USF Dining Services as well and open for suggestions/comments. We will share all data, reports, and tracking of food waste with USF Aramark and/or other Aramark stakeholders. Our project is NOT research; however, we may propose to share our project results as a form of lessons learned or quality improvement project to support green initiatives on campus.

Additionally, the SGEF Team will send updates to Ms. Jessica Cicalese (Marketing Director, Aramark/USF Dining) and Mr. Paul Mack (Director of Operations, Aramark/USF Dining) as needed and quarterly with the project Advisory Council Committee. The Advisory Council Committee meets at least once a year and may request meetings more often to provide updates and coordinate next steps, which both Ms. Cicalese and Mr. Mack are always welcome and invited. Other Aramark staff are also welcomed to attend.

On behalf of the SGEF Campus Food Waste Recovery team, we sincerely thank Aramark and USF Dining Services for all the support to promote a more sustainable USF campus. We are extremely grateful for Ms. Cicalese and Mr. Mack's time and willingness to help with this project, as well as the staff at Champion's Choice. We especially thank USF Dining Services for their generosity and support. Our team is always open to suggestions from Aramark, and if we can be of help in any way to share our project results with Aramark at the corporate level, we are certainly more than happy to do that. Please feel free to contact me if there are any questions – Whitney Fung at whitneyfung@health.usf.edu or (954) 415-2201.

Sincerely,

Whitney Fung

February 25, 2019

Principal Investigator, USF Campus Food Waste Recovery Project

PhD Student, College of Public Health

Appendix B
STANDARD OPERATING PROCEDURES
FACILITIES MANAGEMENT DEPARTMENT
UNIVERSITY OF SOUTH FLORIDA

SOP#: 1
1

Date Issued: 10/18

Date Revised: NA

Page 1 of

TITLE: SGEF Campus Food Waste Recovery Project

SCOPE: Student Leads, Collaborators, and Volunteers

RESPONSIBILITY: Food Waste Collector, All Food Waste Recovery Project Personnel

PURPOSE: To Outline the Program of Food Waste Collection from the Dining Halls.

I. PURPOSE

1. To establish safe and appropriate guidelines for the collection, storage and cleaning of food waste containers from dining centers on campus.

II. RESPONSIBILITY

1. Student employees and volunteers are responsible for following procedures outlined in this SOP.
2. Coordinating logistics regarding food waste collection from dining centers.
3. Students employees and volunteers are responsible for proper handling, storing, and cleaning of food waste containers.
4. Maintain records of all visits to pick up food waste and notes about the food waste recovered.

III. PROCEDURES

- 1) Determine point of contact with director of dining centers and discuss food waste recovery methods.
- 2) Determine how and what food waste will be collected.
- 3) Schedule when and where food waste will be picked up and dropped off.
- 4) Employees and/or volunteers will collect sealed food waste containers from dining halls and record visits.
- 5) Employees and/or volunteers will identify and note content of waste.
- 6) Food waste will be directly input into digesters after recording content.
- 7) Emptied food waste containers will be resealed and stored until next collection day.
- 8) Food waste containers will be washed in designated cleaning area before each collection and returned to dining center.

SPECIAL HANDLING AND STORAGE REQUIREMENTS

- Use appropriate hand and eye protection when handling food waste.
- Avoid spills when taking food waste out of container and always seal containers.

PPE Requirements:

Long pants or clothing that covers all skin below the waist

Shoes that cover the entire foot^[1]_{SEP}

Gloves; indicate type: Latex or Nitrile Gloves

Inspect gloves before use. Use proper glove removal technique to avoid skin contact with outer surface of glove. Wash hands after removing gloves.

Safety glasses

Appendix C

The infographic features a dark green background with a light green diagonal stripe in the top-left and bottom-right corners. At the top, the title "USF CAMPUS FOOD WASTE RECOVERY PROJECT" is written in large, bold, white capital letters. Below the title, six hexagonal shapes are arranged in a honeycomb pattern, each containing a different benefit of the project. The hexagons are colored in various shades of green and blue. At the bottom, a white text box provides contact information for volunteering.

USF CAMPUS FOOD WASTE RECOVERY PROJECT

- Support Campus Hunger Relief
- Student Engagement
- Student Environment
- Promote Green Campus
- Research, Teaching & Practice
- Student Health & Well-Being

For more information on volunteering please contact Whitney Fung at whitneyfung@health.usf.edu