How are University's Handling Dining Hall Food Waste-UNL Study

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How are Universities Handling Dining Hall Food Waste- UNL Study

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How are Universities Handling Dining Hall Food Waste - UNL Study

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University of Nebraska, 2019

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Key words: Dining hall, Food waste, Anaerobic digester, Composting, Sustainability, Landfill, Big TEN Universities, University of Nebraska Lincoln (UNL), Green House Gases (GHG).

Abstract

One of the biggest challenges with the American food system is that 30-40% of our food is wasted every year (EPA, 2018). There are many reasons why food is being wasted around Universities campuses, and there are many ways to divert that wasted material from the landfill. In 2016, a zero-food waste event was held in Harper dining hall, and they found around 70 pounds a night just from a dinner rush. The main objective is aimed to find out how the University of Nebraska Lincoln (UNL) handles their dining hall food waste. This study will look at what Big TEN Universities do with their food waste. The main question is what are the best option(s) for universities that handle dining hall food waste on a large scale. The Universities will be viewed through the lens of the Food Recovery Hierarchy, which contains the most preferred method of source reduction, donating to non-profits, feed the animals, industrial uses, composting and least preferred landfill/incineration (see image, page 8).

This study will be done using a systematic approach, meaning it will be set up so it can be replicated easily. Specifically, will focus on Universities’ ideas and practices regarding dining hall food waste. In addition, to the research on each Big TEN University, a survey will be sent to the Universities’ dining hall management, as well as interviews with some of the cooks in UNL’s dining halls. The results show that most of the Big TEN Universities reuse their food waste by reducing first, then donating, composting or anaerobic digestors. The surveys show that these Universities are highly aware of the issue, and spend lots of money and time to reduce their footprint. As for UNL, they compare well to other Universities, and they have the resources to handle dining hall food waste on a larger scale. What UNL could do is to track their food waste to get an idea of quantity, and create basic infrastructure and supplies to compost. In addition, they could Increase donation when possible, and think about anaerobic digestors options off campus that will digest the food waste for fertilizer.
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### Introduction

The topic for this project is about how Big TEN Universities handle dining hall food waste as well as, in the University of Nebraska’s dining halls. First, it is important to define what food waste is. Food waste is the discarding of food that is safe for human consumption. Put another way, food waste is the discarding of usable food (Julian, 2010). Imagine the amount of food waste a college campus dining hall could produce. Students should realize that every time they waste food they are also wasting all the energy, water, time that went into making that food. Even worse, wasting food also contributes to UNL’s growing carbon footprint (EPA, 2018). In the Universities’ perspective food waste is also money getting thrown in the trash. With that in mind, the production process of most food items will produce more Green House Gases (GHG) than when the food item is thrown in a landfill and naturally produces GHG (Scherhaufer, 2018). Meaning, the production process adds enough Green House Gases so, it is worth reusing valuable food scraps. A hypothesis is that Universities aim to not produce excess food, but when they do, they don’t want to spend extra money to recycle the food waste.

There are three types of food waste in a University dining hall setting. Those three are pre-consumer food waste, consumer waste (from the students) and post-consumer food waste (leftovers that didn’t get taken). It is also important to note that some food waste is unavoidable like the skins of fruits or rotten items; it can all still be reused beside going to a landfill (Julian, 2010). The study will focus on what UNL is doing with their food waste and what they are doing to reduce food waste. Other Big TEN campuses will be researched to see what they are doing to reuse and reduce their food waste. There are many ways to use food waste besides throwing it in landfill. Some of the general ways to use food waste are to get people to eat as much as possible, so try to give away or donate leftovers. Food waste could be used to feed animals, compost it and use it as soil, or use the food as energy via an anaerobic digestor (Goral, 2018). Some methods are more cost effective and required less labor, but doing something with our food waste is a positive step in the direction of sustainability.

### Background

The Midwest produces a high quantity of food, and have you ever wondered how much of this food is actually used? What happened to the excess? As of today, families have their own little garden in their backyard, and when they don’t utilize all of the harvest, they start composting or giving away their good vegetables. According to the EPA, in 2010 the food loss was 31% of the food supply equaling 133 billion pounds estimated value of $161.6 billion (EPA, 2018). What is crazy is that there are still people on this earth that don’t get to eat. Logistically, it is tough to get perishable foods to people in remote locations, but surely all that waste can be utilized in the community via energy or recycled for future usage.

An interesting study done by students that worked with Prabs and Pam Edwards on a Zero-Food-Waste event/project in Harper dining hall. They set up table tents and conducted food awareness surveys at the entrance of dining hall. The event was busy and some students didn’t like the idea of another step in their lunch process. The line would come to a stop some times while sorting the food from paper, and debating what is food waste. Lots of informed students posed the question is a banana peel, orange peel or certain liquids considered food waste. Technically, yes most of the liquid would be pulped out of the food so that liquid from banana and milk would go back down the drain into our water treatment system. A banana peel and orange peels contain energy and would produce small amount of harmless methane gas, but can ultimately be put to use being recycled instead of in the landfill to be burned. At the end of the
three-night event, they collected 70, 80 and 90 pounds! This was shocking, and they figure if all the dining hall were around this weight, that is 2,000 pound of food waste a day coming from UNL dining halls alone.

**Literature Review**

College students generate around an estimated 20 million pounds of food waste a year, according to the Food Recovery Network (Goral, 2018). The idea of going trayless is a good plan to reduce overall food waste. A study done by Aramark Higher Education in 2008 took away dining trays in an effort to reduce food waste. This study measured food waste from 186,000 meals served at 25 institutions during the 2008 school year. On the days when the school took away trays the school generated 11,505 fewer pounds of waste, 1.2 oz per person. Over all food waste was reduced by 25 to 30 percent. Taking away trays also reduce the water need to clean them. Some campuses thought it would be inconvenient, and complaints would increase, and the administration would be criticized. A survey result reported that out of 92,000 students 79% would accept the elimination of trays (Trayless dining cuts waste, 2009). Going trayless is one of the better ways to cut food waste on a college campus.

There are already some programs set up to help Lincoln divert food waste from the landfill. Brittney Albin created a composting program in 13 Lincoln Public schools, and they hold 2,325 pounds of organic waste from the landfill per day, and recycle 51 percent of their waste a day (Organic Waste Composting, 2018). Some of the ways to reuse food waste in Lincoln are to use a Waste to Energy converter, which changes food waste into natural gas to fuel the collection trucks for Uribe. Also, Prairieland Dairy accepts organic food waste and non-recyclable papers from business and mixes all of that with manure to create compost. Also, Big Red Worms is a worm composting site, they use red wiggler worms to decompose waste into great composted soil (Organic Waste Composting, 2018). It is nice to see companies catering to our excess food waste, otherwise our landfills would be bigger and producing more harmful toxins.

It seems simple to just donate the leftover foods that dining halls produce, but there could be liability issues. But, if a dining hall donates the food to a non-profit then the dining hall cannot get in trouble because of the Bill Emerson Good Samaritan Food Donation Act. Which provides protection for the food donor and recipient non-profit organization. The standard for donating food is that it needs to be prepared in a licensed Food Establishment, and held at proper temperatures (Nebraska Food Waste Policy, 2018).

According to the Nebraska Recycling council, in Nebraska organic material is one of the largest contributors to methane gas (Nebraska Recycling Council, 2018). Also, since Nebraska banned yard waste from going into the landfill, they divert around 150,000 tons of yard waste a year. The yard waste gets mixed with sewage sludge or food waste and made into compost and sold to the public (Nebraska Recycling Council, 2018). Dave Dingman the creator of Nebraska Organics Waste Energy (NOW) has partnered with Uribe Refuse Service to start a pilot project for an anaerobic digestor to divert 1,400 ton annually. Dingman says, “The project could save Uribe Refuse about $39,000 annually in landfill gate fees, and about $20,000 annually in electricity bills. The total return over the 20-year life of the project is estimated at $1.2 million.” (Laukaitis, 2014). Lincoln has the resources to reduce food being wasted in the landfills, but unfortunately it is a tasking job to collect and transport this waste.

What other states have already done is a good model for the future. A study looked at the restaurants in the Berkeley, California area, and found that that 65% of the restaurants measure
the amount of food waste and of them 85% use compost bins to dispose of uneaten food. The most common method used by restaurants are to give the left overs to their employees. However, most restaurants avoid donating food because of legal liability. 14% of surveyed restaurants dump their food into landfills (Sakaguchi, 2018). In Iowa, the Waste Reductior Center gave a grant for $83,000 to build food waste generators throughout the community. This team conducted waste audits, and looks at serving methods and disposal methods, and costs of the food. They tracked food waste from 5,552 students and estimated 0.4 pounds per person per lunch or 74 pounds per student a year (Feeney, 2017).

A case study done out of Cincinnati. The study looked at three types of waste to energy projects. They evaluated wasted cooking oil to biodiesel, paper waste to fuel pellets, and food waste to biogas. These projects would improve campus sustainability by minimizing waste, reducing GHG, and displace some use of fossil fuels. In the project the school diverted 974 gallons of cooking oil waste into 982 gallons of biodiesel. Produced 138 tons of fuel pellets from 133 tons of paper waste. Collected 146 tons of food waste and produced biogas to replace 12,767 m cubed of natural gas (Tu, 2015). Converting food waste into another product is time consuming and costly, but definitely worth the investment.

Universities need assistance to achieve less food waste going into the landfills. To give you an idea of how to go about achieving a zero-waste campus the EPA’s Food Recovery Hierarchy gives schools an idea how to reduce their food waste. It starts at the top with source reduction, reduce volume of food waste generated. Next, is donating to non-profits, feed the animals, use of an anaerobic digester, and lastly compost any food waste because after that it goes to the landfill or is burned and serves no purpose (Goral, 2018). In the past, the University of Nebraska Lincoln (UNL) has started composting from vendors on campus. The Association of Students of the University of Nebraska’s Environmental Sustainability Committee (ASUN) worked to establish a composting program, which is no longer in effect. The food waste from vendor is collected and shipped to big red worms for compost mixing. It is going to cost less to divert to big red worms than to the landfill. Research in 2015 revealed that 80% of the trash at vendors was compostable. Workers at UNL take the food waste to big red worms, to cut back on transport cost (Fedderson, 2016).

The EPA has set a reduction goal and hopefully they push business to cooperate. The USDA and EPA have announced a goal to reduce food loss and waste by half by 2030. Led by USDA and EPA, the federal government is seeking to work with communities to reduce waste by 50% in 15 years. The ways success will be measured by the EPA’s Advancing Sustainable Materials Management, which are facts and figures which provides an estimate of food going into the landfill and combustion. 2010 is the baseline with 218.9 pounds per person. They are aiming for 109.4 pounds per person in 15 years. To track food loss in the U.S. the USDA’s economic research service estimated the amount of available food that went uneaten at the retail and consumer level (EPA, 2018).

The United Nations (UN) has set 17 sustainable development goals, which they hope we achieve by 2030. The goals that work toward reducing food waste are to donate what you don’t use, avoid throwing away food and giving quality education about sustainability (“Sustainable Development”, 2018). All 17 of the goals are tied together and work hand in hand to ensure a sustainable future for all. A couple of the other goals include avoiding wasting water, and using clean energy, which both contribute to big picture of food waste. Every time we waste our food we are also throwing away water, energy, and time someone put into making that product.
Research should be done and popularized to help wake people up to the fact that we throw away money when we toss food in the trash, an estimated value of $161.6 billion per year (EPA, 2018). More importantly, reducing food waste will help the U.S. address climate change because 20 percentage of total U.S. methane emissions come from landfill. By keeping edible food out of the landfill we could help the 42 million America’s that live in food insecure households (EPA, 2018). At a local level, this research could improve the economic benefit for companies, could help feed the people not as well off in the community, or create good soil and gas for vehicles.

**Research Method**

The research question is focused on what UNL dining halls are doing with their food waste, and how UNL can improve. Research will include what other Big TEN Universities are doing to reduce their food waste. Knowing what other schools are doing will give UNL administration an idea of what is working on other big campuses. The type of analysis being used is a systematic qualitative approach. This approach involves reviewing published and unpublished literature. A systemic review identifies, and synthesizes research evidence relevant to the question, using a method that is reproducible and leads to minimum bias. The results are summarized but are not statically combined. To help with the paper structure, the 27 step PRISMA checklist as well as Dr. Gosselin’s resources will aid in this research. (Majumder, 2015). The method of research being used is qualitative research to collect information via Qualtrics surveys, and interviews with dining hall cooks about food waste in the cafeterias and about their practices. (Creswell, 2012). The surveys were sent to each Big TEN Universities, that is 14 campuses, about what they do with their food waste, and if they have any advice about handling food waste. It is understood that not every University will response, so a brief overview of each Universities dining hall food waste management plan. While looking into each University the number of students, and dining halls, plus what they have done in the past with their food waste will be recorded. The survey will be sent out February 15th, with a deadline of 30 days on March 15th. The interview with the dining hall cooks will be conducted from February 21st through March 7th.

To have no bias the same survey will be sent to one of our dining halls mangers, and interviews with ten cooks total, two from each dining hall, to gain their perspective on food waste where they work. The individuals interviewed will receive a free water bottle and a reusable bag thanks to the Sustainability office. Since, this work will not be published, it did not get submitted through the Institutional Review Board (IRB). No one’s name or personal information will be used. This research is exempt from the IRB process because all surveys and interviews are anonymous, and is merely used in the institutional setting.

The push for sustainable dining (pushing for more environmentally friendly tactics) can be costly. To divert the food waste from the landfill, it takes human labor. If UNL wanted an anaerobic digestor on campus it would cost around a million dollars. Even if UNL ever wanted to put compost bins at every dining hall it could cost UNL to collect, pickup, and drop off the food waste, unless they got a grant. Pushing to eliminate certain items like styrofoam or plastic trays would reduce cost, but other products might cost more. There are some schools that divert their food waste for livestock feed, which also cost money to transport. The riskiest is donated food because it can come with liability/ethical issues (Nebraska Food Waste Policy, 2018). Once that food is donated, how does UNL know the food is being held safely? This is not UNL’s
problem, and they can’t get in trouble for it, but UNL still worries about public health safety. There is no easy solution, just best practices.

At the end of this study all Big TEN Universities will be charted on the EPA’s Food Recovery Hierarchy, so we can see what practices are working. All the research, surveys and interview results will be combined to see what is working for UNL, and potentially a plan for the future. I understand food waste can be near the bottom on the importance list, and it is tough to see change when we have such a growing population on campus and in America. The food we throw out contributes to growing GHGs, so it would be wise to try find an efficient alternative to the landfill.

[Image: Food Recovery Hierarchy]

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**Big TEN Universities Research**

The goal of this research section is to find out what other Big TEN Universities do with their food waste. To collect the information, each Universities’ literature will be searched for the same items. What is noted is the number of students and dining halls, what methods they use to reuse food waste on campus, any recent practices. Any weights of food waste that gets reused or tossed in landfill, if any at all, will be recorded too. All of these will be compared to one another, to show how other big campuses reduce their dining hall food waste.

The first University, in no alphabetical order, The University of Illinois at Urbana-Champaign. This University has an annual undergraduate enrollment at around 38,000 students, and a total of around 44,000. Campus has seven all you can eat dining halls (Sustainability in Dining, 2015). This University has its own sustainable student farm which all get used in the dining halls. They are participants in the EPA food recovery challenge. According to the Recovery Challenge website, "Participants agree to reduce, donate, and/or compost wasted food, and to set annual waste diversion goals." (Sustainability in Dining, 2015) As part of their green dining initiatives they use trayless dining, one dining hall compost all of their pre-consumer food waste, all of their fryer oil is converted into biofuel for campus vehicles, they also repurpose coffee grounds for fertilizer via vermicomposting, as well as send rendered fat to farms for dust control (Sustainability in Dining, 2015). Dining services uses a program called LeanPath which
is food prevention technology in commercial kitchens, and tracks their food waste. They also, donate food with Zero Percent program, a non-profit, as well as to the food bank helping a tremendous amount. Dining Services is now diverting 7 tons of food waste from the landfill weekly with 4 anaerobic digestors on campus (Sustainability in Dining, 2015).

The next University is Indiana University Bloomington. This University has an undergraduate population of around 32,000 and a total of 43,000 students. They are equipped with over 30 dining location, and four dining halls (Indian University Dining, 2018). The University director of dining, has won the 2017 Campus Catalyst leadership Award for his effort toward a new zero waste initiative. They have made one eatery zero waste and they are working to make all dining location zero-waste (Indian University Dining, 2018). They understand food waste is an issue, so all of their dining halls compost, including cooking oil that is converted into biofuels. Indian University also, tries to follow a minimization goal of 40% diverted by 2020, that is an expected 20,000 pounds of food waste per month. What helps them is training their chefs to minimize food scraps by utilizing every part of an item, and placing recycling bins for food for guests to participate in their zero-waste initiate (Indian University Dining, 2018). This University also has their own campus farm that supplies the dining halls with organic material (Indian University Dining, 2018). A great composting program started in 2011 in coordination with IU and the Hilltop Garden and Nature Center to divert the dining halls food waste to be composted. As of 2015, they still collect 600 gallons or 2700 pounds each week (Hilltop Gardens, 2018). Some issues were not having big enough bins to collect the compost in, and aerating the compost piles. A food audit in their campus center revealed they produced 670 pounds over a five-day audit during lunch times (Brouk, 2018). They have created a great program called the Campus Kitchen, and they have volunteers repackage edible leftover food to be send to community pantries/organizations. In 2016, they got a grant of $50,000 for a commercial food waste pickup route, the cost covered the green bins for food and new dumpsters (Brouk, 2018). There are a dozen bins around campus, the food gets composted and reused, all in a closed cycle. Some places don’t have room for another dumpster, so they have 64-gallon buckets that get picked up twice a week (Brouk, 2018). There are some great ideas, and they can be hard to put it into practice.

Next, we will look into the University of Iowa. The student population is around 33,000, with three main dining halls to eat at. The University of Iowa’s 2020 vision is to divert 60% of their waste from landfills, they are currently at 41% (Sustainability, 2018). To help this vision they purchase locally grown food when possible, took away trays in dining halls, compost, and pulp their food waste. They compost over 450,000 pounds per year, as well as save 2.25 million gallons a water a year by using their pulper (Sustainability, 2018). They use the idea of taste, don’t waste in their dining halls to raise awareness and to reduce food waste. This campaign encourages students to take what they need and to not waste, this keeps dining halls cost down. In 2017, they conducted a food waste audit for three hours and collected around 250 pounds of edible food. This audit is part of the taste, don’t waste food reduction campaign, and showed students by images and posts how much they waste in hopes to have them take less (Spring 2017 Food Waste Audit, 2017). Iowa is very agriculture based, so it’s no surprise they compost heavily.

Next up, is the University of Minnesota- Twin Cities. The population of undergraduate students is around 32,000, but total enrollment is around 50,000 students (University of Minnesota-Twin Cities, 2018). This University has seven dining halls, and they are dedicated to reduce food waste. They donate their left overs via Urban Ventures and Loaves and Fishes,
around 7,845 pounds so far (Waste minimization, 2018). Compostable packaging has replaced 75% of their products like napkins, plates and silverware. They reuse their fryer oil via a company called Sanimax which makes the oil into animal feed, lubricants or biodiesel. Every year they recycle around 41,000 pounds of oil. They partake in an organic composting business, which takes their organics, about 1,080,000 pounds a semester, and is placed in an anaerobic composting system to create nutrient rich mulch to be sold (Waste minimization, 2018). On top of that, they also do trayless dining, and have a great energy efficient APEX dishwashing machine that saves water uses Phosphate free solution for cleaning (Waste minimization, 2018). It is nice to see Universities worried about water use in the kitchen. Because, water is in all the food being wasted, so being equipped with a pulper is very effective. Minnesota has a great public forum that encourages regional effort toward food security and impact of food waste to the environment. The main goal of this forum is gaining the attention of major stakeholders and to discover new opportunities for collaboration dealing with food waste (Minnesota Food Waste Forum, 2018). So, food waste is definitely on their minds with further plans in the works.

Next, is the University of Michigan. The University of Michigan has around 30,000 undergraduate students enroll, with a total of around 44,000 students (Facts and figures, 2018). The campus has seven dining halls to choose from. The dining halls source 17% of their food from local sources, they have a goal of 20% (Michigan Dining, 2018). On top of going trayless and using a pulper to reduce volume of food. All the dining halls compost pre and post-consumer food waste. The food waste is sent to Ann Harbor Compost Center where WeCare Organics make it into soil (Michigan Dining, 2018). They also operate compost bins in retail locations on campus. Michigan Dining composted 862,912.15 pounds in 2016 (Michigan Dining, 2018). That is an incredible amount, glad they reuse it. This campus has pushed toward getting Green Restaurant Certified by the Green Restaurant Association. Meaning some of their cafes meet certain water, energy and waste efficiency standards (Michigan Dining, 2018). They run a program called Planet Blue, which encourages events to go zero-waste by supporting them with compostable materials (Michigan Dining, 2018). The University came out with a great awareness article toward biodigester, to create gas and reduce CO2 emissions. The study mentions how they need baseline data to see how much waste they can use. It is a good addition to improve sustainability, but also need back up data and examples for stakeholders to invest. (Converting Food Waste to Energy with a Biodigester, 2018). Every University is doing something unique to reduce their food waste.

Up next, is Michigan State University. The undergraduate population is around 40,000, with a total of 50,000 students (MSU Facts, 2018). The campus has nine dining halls, which they run food waste audit every fall. Staring in 2012, the audit helps the dining staff adjust and education to reduce food waste in their hall (Clean Plates at State, 2018). The residential and Hospitality Services conducted a zero-waste event and determines they waste 2,404.31 pounds in a 34.5-hour period. That’s an estimated 535,072 pounds for the fall (Preliminary Clean Plates Data Shows A Continuous Decrease in Food Waste, 2018). On campus there is a state-of-the-art anaerobic digester and composting initiative, which helps reuse food waste. Their anaerobic digester handles 20,000 pounds in 20 days (MSU Facts, 2018). Michigan state has been tracking their food waste for a while, it seems they are actively trying to collect and reuse food waste.

Next on the list, is the University of Maryland, College Park. The undergraduate enrollment is around 31,000 students, with the total of 40,000 students (About Maryland, 2018). The campus only has four dining halls, but plenty of cafes. The University of Maryland is making sustainability dining easy by composting all food waste in dining halls. They also push
for local products to reduce the CO2 emissions from food transportation, with a goal of 20% which they push past in 2014 (Food, 2018). Maryland send their food waste to Prince George’s County compost facility, and it will be sold to local grows, to complete a closed loop (Food, 2018). They run an awesome program called the University of Maryland Food Recovery Network. This program recovers food from sporting events and dining halls to donate to homeless shelters (Food, 2018). To add to all of that, they work to educate their student of taking less and reusing more. In 2011, they averaged 36 tons a month of food waste into compost. This university also has pulper to reduce weight, and they replaced Styrofoam with compostable plates and cups. Lastly, the cooking oil is converted to biodiesel fuel via the company Greenlight Biofuels (Waste, 2018).

The only private Big TEN institution is Northwestern University in Illinois. The undergraduate population is around 10,000 with a total enrollment around 20,000 students (Berkman, 2018). They have six dining halls on campus. Northwestern has also won a couple of awards for sustainability in 2018. They have created a strategic sustainability plan is a great initiative to reduce Green House Gases (GHG), they are pushing toward a zero-GHG emissions by 2050 (Morris, 2018). They have pushed for electric cars on campus, plus they diverted 38% of their waste by recycle, reuse and composting (Morris, 2018). This campus has a lot of education toward what can be recycled as well as going trayless. Northwestern has received a $1.6 million contract with the biomass Research and Development initiative. In three years, they will be testing different chemical mixtures to create biofuels (Beck, 2018). They are excited of the new possibility of making sustainable chemicals, so hopefully in the near future they adopt an anaerobic digester on campus. Northwestern also donates 40,000 meal every year around Thanksgiving. Founded in 2001, student volunteer work with 50 other schools to feed the hungry in the community (Wilson, 2015). Northwestern has a wide variety of options when it comes to reducing food waste. They also compost around 15% of their waste, but do not have bins around campus for food waste, because they don’t see enough (Brown, 2016). They hope to be a closed loop system in the future.

Next in line, Ohio State University. This campus has around 44,000 undergraduate students with a total of 66,000 students (Berkman, 2018). They only have three all you can eat dining halls, which is shocking seeing how big the student population is. Ohio State has two EnviroPure systems that converts food waste into water (OSU Dining Services, 2019). Food waste goes in and get shredded and then added to a tank to be converted into gray water that can go back to water treatment. This is a more advanced pulper system. On top of that they also do trayless dining. They are also equipped with pulpers, and a company called Quasar picks up their food waste and converts it to gas; this is done via anaerobic digestion (OSU Dining Services, 2019). To take care of their fryer oil they recycle it to be sold to be made into biofuel (OSU Dining Services, 2019). They also help local gardens donate around 5,000 lbs of food to the food bank (Harlow, 2018). This University is aware they have food waste and it seem they invested in bio digesters to reduce that amount.

Next, Penn State University. This University has around 46,000 undergraduate students with a total of 98,000 students (Berkman, 2018). This campus has plenty of places to eat with five dining halls. Penn state dining halls are not trayless. They estimate 10,000 students regularly eat in the dining halls (Harlow, 2018). They attempt to combat food waste by holding focus groups, food audits and digital signage called “Why Waste” (Harlow, 2018). Supposedly, they waste around 455,000 pounds of food a semester, that is enough to feed every person in four sold out Penn State games (Waste Diversion, 2018). To help reduce their waste they recycle cooking
oil with the company Mopac. The recycling and composting facility are with in five miles of the university, so they recycle all compostable material. They have compost bin in every dining hall, and the compost materials comes back to Penn States for landscaping. A program called Green2Go encouraged student to use a plastic container sold by university opposed to Styrofoam (Waste Diversion, 2018). They have constructed an anaerobic digester to be complete in Fall of 2019, but it is for animal manure use.

Next in line, Purdue University has around 30,000 undergraduate students, and a total of 41,000 students (Berkman, 2018). Purdue has five dining halls on campus, and they practice reducing food waste daily. They use just about every technique to reduce waste. They have gone trayless since 2013, they hold annual zero waste event diverting 1,000 plus pounds from the landfill (Purdue Dining Green, 2017). They create biodiesel product from fryer oil and grease products. The most impressive is their pulper system, they pulp all the food waste and truck it to near-by water treatment facility that has an anaerobic digester, and they use the gas to power their facility (Purdue Dining Green, 2017). They still create biodiesel products from fryer oil and grease products. Another great organization they run is to feed the homeless, one dining hall provided 109 pound of food resulting in 200 meals (Purdue Organization Partner to Serve Lafayette Homeless Community, 2017). The food pick-ups happen on Tuesday and Thursday nights every week. Transportation and storage need to be ensured for organizations safety needs. In 2017, they served more than 30,000 meals (Purdue Organization Partner to Serve Lafayette Homeless Community, 2017).

Up next, Rutgers University. Rutgers has around 51,000 undergraduate students with a total around 70,000 students (Berkman, 2018). This campus has four dining halls, and they have reengineered the food recovery hierarchy. They really focus on reusing the food on campus before sending it out to be recycled. Rutgers has six Waste2Go food waste digesters, that use micro-organism to break down food waste to go down the drain (Did you know, 2019). They use to employ a farmer to pick up their food waste, but they realized that pigs contribute to GHG just as much as methane from decomposing food waste. So, they proposed an anaerobic digester in 2013 (Patel et al., 2013). To build an anaerobic digester on campus it would cost around $1.4 million, and could process 50 tons a day. This digester would only take five to six years to pay off, and would go maintenance free for 25 years (Patel et al., 2013). Rutgers also has multiple food bank donation projects. They also help with Elijah’s promise which helps the community with food insecurity. New life pantry and Catholic charities are non-profits as well that also gain food from Rutgers as long as they comply with all requirement of the New Jersey Sanitary Code (Food Recovery, 2019). It seems that they have been testing anaerobic digesters to see what is the best fit for them.

Last, but not least, the University of Wisconsin-Madison. This university has 32,000 undergraduate students with a total of around 43,000 students. This campus has six dining halls, with great opportunities to use food waste. The University of Wisconsin has a great composting system, each dining hall and all residences have a composting bin that goes to an anaerobic digester operated by Gunderson Envision. Once all the food is pulped on campus it gets to the digester site where it is mixed with manure, to create electricity and fertilizer. Recently the University decided to use compostable to-go containers, cups, utensils and straws (Hamer, 2018). They have three food recovery partners, The campus Kitchen Project, the Food Recovery Network, and the open seat food pantry. All of which provide food to low-income communities. The biggest issues with their donation project are the logistics and driving the food around, most are student run, so it can be challenging (Hamer, 2018). On top of that they also recycle their oil
to heat water in dining halls, as well as special software that calculated amount need when they order food (Badgers Live Sustainably, 2019). Unlike most universities Wisconsin pushing toward a la carte meals so they can potential reduce food waste (Badgers Live Sustainably, 2019).

Big TEN Survey Results

Below is an example of the surveys sent out to the BigTEN Universities’ dining hall managers/sustainability coordinators. Following are 12 of the 14 Big TEN Universities’ responses. Table 1 shows what each University is doing regarding food waste in their dining halls.

1. Name- Anonymous
2. Position-
3. How long have you been in your current position?
4. How many dining halls do you manage in your university?
5. On average what percent of your food prepared is wasted? What do you do with the food waste?
6. Does your University have a policy for reducing dining hall food waste?
7. Have you used the EPA’s Food Recovery Hierarchy diagram to influence what practice you use to reduce or reuse food waste?

8. Considering dining hall food waste, what method(s)/practices do you use to handle food waste?
9. Do you have any concern when collecting are reusing food waste on campus?
Do you find reusing food waste to be worth the investment?

**Big TEN Responses**

**Penn State University**

2. “Penn State University Sustainability Coordinator of Auxiliary and Business Services

3. 6 weeks...it is a new position specifically geared towards handling food waste, food recovery, and plastic reduction

4. 5 residential dining units, plus 1 retail dining unit

5. I would estimate about 15-20% as of now. We are just starting to gain full awareness of the magnitude of our food waste.

6. We just started working with LeanPath at the same time that my position started (Jan. 7, 2019). LeanPath helps us track the source and loss reason for our food waste, as well as measuring post-consumer waste. Post-consumer waste figures enable us to create educational materials that target the students that may be taking more food than they'll eat. Determining waste sources and loss reasons allows us to tackle source reduction. Right now, we have a goal set to reduce back-of-house chicken waste (one of our largest offenders by weight and value) by 20% over the next 3 weeks.

7. Absolutely. I commonly refer to this figure when speaking to dining hall staff and have made sure everyone involved in our food waste fight becomes familiar with this hierarchy.

8. We currently compost nearly all food waste. Some pre-packaged items (certain sandwiches, pastries, etc.) are recovered/donated to the Central PA Food Bank. We are expanding our partnership with food banks across PA so all our branch campuses can also donate their leftover food to those in their communities that are food-insecure.

9. We process a majority of our own compost on campus. However, our composting facility is often at capacity so some of our compost must be landfilled. Because of this, source reduction and food recovery have become more urgent priorities.

10. Often yes. It is not much of an investment but more often a savings of prep time and money if the staff blast-chills chicken that never made it to the line on Tuesday night and then reuses it for Wednesday lunch, for example.”

**University of Maryland- College Park**

2. “Director of Dining Services

3. 12 years (working position)

4. 3 (dining halls)

5. I don't have a percentage I can share, but it is relatively low because we re-purpose food when possible (making corn chowder with yesterday's corn, as an example) and we partner with the Food Recovery Network to share those leftovers we can't use with those in need in the local area. We also have daily Chef's Feature's which allows our unit Chefs to re-invent leftovers!

6. There is no "policy", but there is an internal practice and commitment to managing food waste and limiting it whenever possible. As a department, we have a number of initiatives that help us achieve this goal - including, waste audits, donating food, small batch cooking, portion control, etc.

7. Yes, we are aware of this hierarchy and we practice it through our actions of minimizing food surplus as our first goal.

8. Food waste is composted. But, before it becomes waste or is given to others in need, we focus on small batch cooking, use of leftovers in Daily specials and soups, etc., menu management of
less popular items, portion control, smaller plates, and staff education to keep waste at a minimum.

9. No, we follow local health codes and are very careful with any food we re-use at a later time.
10. Yes, it keeps our plate costs down and allows us to use those saved dollars elsewhere. In addition, composting has been a win-win for us and we use compost material on our campus farm. Students also enjoy unique Chef created menu items with leftovers!"

University of Iowa
2. “Director of University Dining
3. 6 years (working position)
4. 3 AYCE market places, 14 retail operations
5. We don't know the percentage. All food waste, both pre and post-consumer, is composted through the county compost facility
6. Not specifically. The university has a goal of 60% waste diversion by 2020.
7. No.
8. More precise forecasting to need, made to order stations, education for students to decrease what they take, trayless dining, donations to local food pantry
9. labor
10. yes.”

University of Illinois at Urbana-Champaign
2. “Associate Director of Auxiliaries (fmr. Director of Dining)
3. 12+ years (working position)
4. 15 (dining halls)
5. Catering: 6% Residential Dining: 4% Retail: 2% The food waste is either recovered - wholesome overproduction is donated to local agencies. If not recovered and is the correct material, it is broken down in an aerobic (non-pineapple tops, corn husks) digester or vermin (non-meat & dairy) composted.
6. Yes, it is JIT (Just In Time Cooking) and regular campaigns encouraging customers to be part of the solution. Campus is also trayless in residential dining.
7. Yes, we are part of the network and have a designation from the EPA and USDA.
8. Waste is recorded via LeanPath and production records reflect the food production/waste amounts which impact the forecast. The food waste is either recovered - wholesome overproduction is donated to local agencies. If not recovered and is the correct material, it is broken down in an aerobic (non-pineapple tops, corn husks) digester or vermin (non-meat & dairy) composted.
9. Initially but the process is well documented and staff are trained. The reusing is for vermin-composting or to support local agencies. One example is wholesome food is packaged into single to 3 servings and is made available at the Wesley Foundation Food Pantry via a student volunteer program. The students are volunteers who package the food, they are trained by dining to handle it appropriately and the food pantry holds the food correctly. The Good Samaritan Law protects the University from liability; however, each entity that accepts donations signs a “Hold Harmless” statement and receives instructions on how to properly hold/re-heat the food. Donations are made in containers that can withstand re-heating.
10. Yes, it is the ethical and moral thing to do given the amount of food insecurity that exists.”
Rutgers University
2. “Executive Director, Rutgers Dining Services
3. 8 Years (working position)
4. 5 (dining halls)
5. We do not measure waste as a percentage of food prepared.
6. We do not have a policy but we have many systems to reduce waste.
7. No, we have been reducing our waste at Rutgers for the last 30 years
8. Reduce waste at the source Trayless Re-usable cups at take-out Re-usable bags at take-out
Aerobic Digesters VegaWatt Somat (pulp waste) Feed animals with pulped waste
9. No
10. Definitely”

University of Michigan
2. “Director of Student Engagement, Sustainability, Training and Development
3. 4 years (working position)
4. none- not in my position- there are 7 dining halls on our campus
5. An estimate is around 10%. We currently collect pre-consumer composting in the kitchen in all units. We also collect all post consumer composting in all units. In addition, we work with FRN (Food Recovery Network) to gather leftover food and distribute to the local food pantry. Since this student group started collecting around 5 years ago, they have saved approx 25,000 meals.
6. We went trayless, then we implemented small plate concept. We ask student to take what they want but eat what they take. We encourage students to try the food before taking an entire portion. No policy but the campus goal is 40% diversion away from landfill. We in dining are currently at 33% diversion. The chefs adjust recipes based on daily reports that allow them to reduce the recipe in order not to over produce.
7. Absolutely- we printed this poster to help educate
8. Composting FRN to food pantry Recycle grease small plates
9. no- we consulted with our campus health department to ensure food safety.
10. yes- our food cost is lower, waste reduction has improved”

University of Wisconsin
2. “Director of Dining and Culinary Services
3. 2 years (working position)
4. 6 (dining halls)
5. We do not have any substantial data on this. We are an ala carte dining facility so our post consumer food waste is lower then that of an AYCTE facility. All of our post consumer waste is composted.
6. We do not have an official policy, but it is a very important part of our business. Limiting waste ultimately results in limiting cost.
7. No
8. Compost or use a food digester.
9. No
10. What do you mean by reuse? To recycle the food waste to be reused somehow.”

Purdue University
2. “Director of Operations - Purdue University
3. 3 years (working position)
4. 5 Dining Courts
5. 5% of the cost of our food is considered wasted. We send the food to the West Lafayette Wastewater Treatment Plant - see question below.
6. We run programs within the dining courts to educate the students. This year’s campaign was called Erase the Waste working in conjunction with a student group called the Boiler Green Initiative.
7. Yes
8. Pulpers in the dishrooms for pre and post consumer waste which we call Yak. Daily Yak pick up by our university recycling team. Yak delivered to the West Lafayette Treatment Plant’s anaerobic digester where it produces heat and electricity for the plant. Product left over is sent to farmers for their fields. You can copy this link to see the video. https://youtu.be/pIQySje0cdQ
9. Our system is working very well for us
10. Yes, it diverts from the landfill thus saving the university those fees.”
(A couple extra notes)
   “Tray free Dining – All dining courts removed trays Fall 2013 and realized an 18% reduction in post-consumer food waste as students started taking smaller portions.”

“Biodiesel production from fryer oil and grease products – Purdue diverts over 8 tons of fryer oil and realizes revenue from the used oil”

“Swipe Out Starvation – Students can choose a “Swipe Out” card as one of their 4 items in On-the-Go! for a donation split between the local Back Pack Program and an international focus.”

“Food Donations – At closedown periods, food is donated to the local food bank. Apples from the Purdue Farm are dropped at the ACE Student Pantry on harvesting day. The university’s chapter of Timmy Global Health, along with Purdue Dining & Catering, have teamed with Lafayette Transitional Housing Center (LTHC) to help provide food for homeless families. We are currently working through some logistical issues, but we soon should be back to packaging and transporting to LTHC by Timmy volunteers twice a week.”

Ohio State University
2. “Senior Director
3. 8.5 Years (working position)
4. 30+ operations includes various facets of dining
5. Research is still underway. Initial data shows around 20% to 25% including peels and coffee grounds etc.
6. We have a goal to be zero waste by 2025.
7. One of the many opportunities we considered
8. Trayless, pulping, biodigesters, food bank donation and more.
9. There are often challenges but most are manageable.
10. Yes, but best way to reduce food waste is to not have waste.”

Michigan State University
2. “RHS Sustainability Officer
3. 7 yrs (working position)
4. Oversee sustainability Programming in in all 12 locations plus all retail
5. I don't have any idea of this percentage. The food waste that is collected in the kitchen is considered pre-consumer. All peels, rinds, trimmings, expired food etc. NOT POST CONSUMER
6. Yes, we have RHS polices
7. MSU has dictated our practices
8. Brody has a pulper, the rest of the halls collect in 96-gallon curb carts. picked up 3 days per week.
9. Safety, not to have a cart fall on anyone, when over filled. The carts are used heavily and do break. Making sure they are cleaned out to avoid pests.
10. Yes, as our pipe infrastructure cannot handle the food.”

Indian University
2. “Executive Director
3. 1 year 8 months (working position)
4. 34 locations (dining halls)
5. we are retail, so we work with our local food bank; hoosier hills to manage food waste.
6. no
7. yes. Our food waste doesn't make it to landfill
8. compost donate repurpose reduce
9. Food safety
10. yes”

University of Nebraska
2. “Assistant Director - University Dining Services
3. 22 years (working position)
4. Responsible for five dining centers
5. Unfortunately I cannot give you a good approximation of wasted food. The food that is wasted is disposed of through the university (pulper and directly in garbage) or use of garbage disposal system.
6. The University Dining Services' staff members work to have the least amount of food waste possible. We maintain records that are referenced when forecasting at future dates. Have also worked with student organizations to work with students to educate about food waste with the goal to reduce as much as possible.
7. We do use parts of the Food Recovery Hierarchy as follows: 1. Source Reduction - producing food based on past experience, etc. 2. Feed Hungry People - we use Food Net as a source for excess food that can be safely used when the dining center is not able to use. 3. Industrial Uses - waste oils are provided to a designated source. 4. Landfill - food waste collected by the university's facilities department.
8. Our goal is to have the least amount of food waste possible. Records are used for ordering/producing food to meet the needs of the customers but not over produce. Food safety is of utmost concern and we have policies/procedures in place for reusing food according to time/temperature controls. We also donate excess safe food to Food Net in cases where the food cannot be used in the dining centers.
9. This is a multi-departmental process and therefore the planning, coordination, implementation and evaluation have to be developed by multi-departments.
10. Overall yes, but need to know specifically costs, feasibility, resources, etc. in developing a response to that question.”

**Table 1** Shows what each Big Ten University does with their dining hall food waste.
Categorized by the food recovery hierarchy

<table>
<thead>
<tr>
<th>Source reduction</th>
<th>Feed hungry people</th>
<th>Feed Animals</th>
<th>Industrial</th>
<th>Composting</th>
<th>Landfill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illinois</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Indiana</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Iowa</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Minnesota</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Michigan</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Michigan State</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Maryland</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Nebraska</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Northwestern</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Ohio</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Penn State</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Purdue</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Rutgers</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Wisconsin</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
Table 2- Shows The number of dining halls compared to the student population at each University

<table>
<thead>
<tr>
<th></th>
<th>Number of students</th>
<th>Number of dining halls</th>
<th>Dining hall to student ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penn State</td>
<td>98,000</td>
<td>5</td>
<td>1: 19,600</td>
</tr>
<tr>
<td>Rutgers</td>
<td>70,000</td>
<td>5</td>
<td>1: 14,000</td>
</tr>
<tr>
<td>Ohio State</td>
<td>66,000</td>
<td>3</td>
<td>1: 22,000</td>
</tr>
<tr>
<td>Minnesota</td>
<td>50,000</td>
<td>7</td>
<td>1: 7,143</td>
</tr>
<tr>
<td>Michigan State</td>
<td>50,000</td>
<td>9</td>
<td>1: 5,555</td>
</tr>
<tr>
<td>Illinois</td>
<td>44,000</td>
<td>7</td>
<td>1: 6,285</td>
</tr>
<tr>
<td>Michigan</td>
<td>44,000</td>
<td>7</td>
<td>1: 6,285</td>
</tr>
<tr>
<td>Indiana</td>
<td>43,000</td>
<td>4</td>
<td>1: 10,750</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>43,000</td>
<td>6</td>
<td>1: 7,167</td>
</tr>
<tr>
<td>Purdue</td>
<td>41,000</td>
<td>5</td>
<td>1: 8,200</td>
</tr>
<tr>
<td>Maryland</td>
<td>40,000</td>
<td>3</td>
<td>1: 13,333</td>
</tr>
<tr>
<td>Iowa</td>
<td>33,000</td>
<td>3</td>
<td>1: 11,000</td>
</tr>
<tr>
<td>Nebraska</td>
<td>26,000</td>
<td>5</td>
<td>1: 5,200</td>
</tr>
<tr>
<td>Northwestern</td>
<td>20,000</td>
<td>6</td>
<td>1: 3,333</td>
</tr>
</tbody>
</table>

UNL Dining Hall Research-

The University of Nebraska has around 20,000 undergraduates with a total of 26,000 students enrolled, and has two campuses with five dining halls (Berkman, 2018). A great program UNL has is the Huskers Helping Huskers Pantry, which provides free food and resources to help the unfortunate on campus. Since 2016, the University has partner with Big Red Worm to accepts 10 tons per month of our food waste, which is turned into nutrient rich soil (Grande, 2017). The University does a great job at reducing food waste from the source. They encourage reducing what you eat by utilizing MyPlate and appropriate serving utensils, which helps students take the correct portion of an item. The University has stopped using trays and Styrofoam as well. As far as food donations, UNL’s dining halls are involved with a group called FoodNet. FoodNet is a local non-profit food collection business that gets donation from 100 plus businesses, institutions and care facilities in the Lincoln area. They provide mostly perishable foods such as fruits, vegetables, dairy products, bread, etc. Distribution of food through Foodnet is made possible by the Bill Emerson Good Samaritan Food Donation Act: an act of Congress that encourages the donation of food and grocery products to non-profit organizations for distribution to needy individuals, backed by the full force and effect of law. FoodNet works with the food donation connection to get food to the hungry in our community (FoodNet, 2019). UNL regularly donates to the FoodNet at the end of every semester.

As well as working to reducing food waste going to the landfill, UNL is currently conducting GHG emission inventory. They look at emissions from electric, livestock, and even food waste emissions (Current Initiative, 2019). The office of sustainability has created a new organization called EcoHuskers for staff and student to express their sustainability concerns. Composting on a small scale has been happening for years on campus, but now we have partner
with PepsiCo Recycling Zero Waste Fund to start a small, temporary composting program. Uribe will come every Friday and transport it to Prairieland Dairy to be mixed into soil. We have six sites around campus, and the staff and students are responsible for taking the waste outside to be picked up by Uribe (Snyder, 2019). This is a great start for UNL’s composting program, and hopefully it is very successful and we invest in a large-scale operation.

**UNL Dining Hall Interviews**

Below is an example of the interviews given to ten UNL dining halls cooks, two from each dining hall. The objective of these interviews is to gain the cooks insight of what the issue is with excess food waste in their dining hall, and to hear from them what they do with food waste. This is very important because they work with and see food waste on a daily basis, so they might have some creative ideas for reducing the amount. Also, below is table 2, which summarizes the interviews responses.

1. What dining hall do you work in?
2. How long have you worked in food service?
3. How long have you been at UNL?
4. How often is food being wasted in your dining hall? What is the problem?
5. In your opinion, what should your dining hall do to lower food waste?
6. What can UNL do to reduce their food waste?
7. Looking at the practices from the EPA’s Food Recovery Hierarchy, which way of reusing food waste seem best for UNL?

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**Food Recovery Hierarchy**

![Diagram of Food Recovery Hierarchy](image)

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Abel Dining Hall staff #1

“I work in Abel. Three years in July at Abel and in food service. There is always a little bit of waste each day. Think it is from kids taking more than they want to eat. Education program to
make kids understand they can always come back for more, don’t have to take it all at once. Find a way to divert the food we can’t use at the end of the day to the homeless shelter. Mix between feed hungry people and feed animals. I know East campus use to take their plant waste as compost, I know we have chicken on East campus, we could feed them.”

Abel Dining Hall staff #2
“I work in Abel. Nine years. In food service for 15 to 16 years. Unavoidable, some gets tossed out, but try to recycle as much as possible. We work our numbers to try to avoid wasting. Everyone tends to take too much food and toss it. Employees do it too. A forecast system to determine what we order, so it would be nice to get those number close to reduce waste. We give food to the homeless shelter during a long shut down, toward FoodNet. I think we are pretty good on our food waste. We do give some away, but not on a daily basis. Produce goes bad quick so animals or compost is a great idea. Giving it to animals or compost is a good idea. We do feed hungry people and animals some times. The other option is industrial, but I don’t know how much you can throw in there. We are the only dining hall with no oil, but the other dining halls recycle their oil. Oil generators isn’t that great either.”

East Union Dining staff #1
“I work in the East Union Dining hall. I worked in Harper dining for eight years. In food service for about 15 years, includes culinary school. Been at UNL for almost nine years. It is not that bad here compared to city campus, culture is a bit different. Grew up in a household where they don’t waste food. The problem with food waste here is like every dining hall taking more than we can eat and throwing the rest away. Don’t over produce stuff that we can’t reuse. Run a campaign to raise awareness. Train the students to not waste. We do give over production to the FoodNet, first goal is to make sure the food is safe. Composting does really help reduce waste. It would be great if the university could implement most of these to prevent food going into the landfill.”

East Union Dining staff #2
“I only work in this dining hall. 45 years in food service. Work all over the place, notably New Orleans convention center. Huge kitchens. Working at UNL for 10 years. It is not as bad as it used to be. Three factors, number one whatever was being served, if it wasn’t moving they would still keep it out, well we aren’t making any money off it. Number two, their mouths, serving size, students take too much. We go with small portion sizes. You want to give them options too so student take a lot. Serving sizes, serving portions. MyPlate doesn’t make a difference. Find out what people like, can’t control it like a la carte, watch how much you cook, make sure the utensils are right size for portion. Control how much you produce. Well, we do the donation program. I don’t’ want to serve it to them because it is not held in a safe environment, so I would rather compost or whatever, not for human consumption. Here on East campus since we are an agriculture campus we composting, we just have to stop because of construction. Summer time is a good time for composting. Donating for FoodNet, we need to have good quality. Food Waste is going to happen. Feed the hungry and compost. Very serious here about composting.”

Cather Dining Hall staff #1
“Yes, only in Cather Dining Hall. Started in Kearney in 1989, been in food service since 16. At UNL for a year and half, almost two years. We see food waste daily. Students, we write down what we produce and how much we have left, so we can tighten that down, but we cannot control how much a student puts on their plate and comes back to the kitchen. As producers we cut back as much as we can. We try the best as we can to control the end product, but educating the students more about come back for more instead of stacking up a mountain on their plate. We all know students don’t eat a full portion of each item. Students should understand the spoon out there are in the correct portion size/amount. The top line is the big one, we need to start there, I don’t know what the University policy is for donating to the city mission. I know our excess at the end of the semester goes to a Food Bank. At Pinnacle Bank Arena, we did a lot of stuff for the city mission and recycles all oil, and had four bins for all recycling. Compostable went to a farmer pick up the food waste to feed his hogs. The gentlemen with the worm compost come and pick some up. I am surprised we don’t compost more. I know in the summer the ground crew asks if we have any coffee grounds, and they add it to the gardens on campus.

Cather Dining Hall staff #2
“Only in this dining hall, worked in food service for nine years, since I was 15 years old. At UNL for 5 years. See food waste every day, of course we create some was in the kitchen, but the main problem comes from the student taking too much. Education, and take more of our food and donate more. We donate pizza to FoodNet, it would be nice if more areas did that. We have flash freezer to safely cool items to donate. UNL could have not have all the dining halls open on the weekend, because it is much slower, especially with weather issues, it saves labor and food. We adjust and make less food on slow days. Source reduction and reusing could be improved, feed the hungry or giving the food to animals. Innovation campus does all of them, it is a pain to have four different colored trash cans.”

Harper Dining Hall staff #1
“Yes, only in this dining hall. Probably ten years now in food service, first at Bisonwiches downtown. In the dining hall now for one year. As far as the kitchen and cooks goes we try to repurpose everything, quite a bit of food waste comes back on dirty plates that is where most of it comes from; half sandwiches, whole pizzas slice they take one bite and don’t like it or put too much on their plates. Definitely, over portion on the student behalf. Good questions, as far as staff/kitchen we repurpose whatever is not served or we sent it to FoodNet who takes just about everything. Maybe, educate students on how much is actually wasted it might change their perception. They can always come back. Back to educating student on how much food waste comes through a day. We fill probably 5 or 6 50-gallon bins of food waste every night and afternoon. Showing them how much food actually comes back on all of their plates would help us out a lot. We already do the top two for sure, but I would say composting or animals feed, but I don’t know how much of that need to be sorted out, does the banana peels and pizza scrapes does it need to be sorted out for the animals, compared to composting you can throw everything in.”

Harper Dining Hall staff #2
“So, to let you know English is my second language. So, if you don’t understand me. Yes, only in this dining hall. Ten years, I started as a server here. Ten years at UNL. Yes, see food waste every day. So, we have to weigh the food every day, so we are at the same level and don’t waste
food so we have to measure and know like a forecasting. Depends on the forecasting. If you do too much forecast it comes too much waste, then you have to manage the second time to lower forecasting. The campus could work on forecasting system and educating. Yeah, we do FoodNet. Oil. Feed the hungry people.”

Selleck Dining Hall staff #
“Only in this dining hall. Started when I was 14. So, 40 years. At Selleck for 30 years. See food waste every day. We don’t have crystal balls, so we have to guess what they will eat. So, a lot of it is guessing. We do have a pulper. I am strong believer of batch cooking. Cooking as you go. Somethings can’t be batch cooked. Say I forecast 400 chicken wings, so I cook 100 at a time, and cook the rest later if needed. The same menu varies so it is tough. Educating student to only take a little bit. 90% of the food waste comes from the students. Cooks try their best to no waste. We call it over produced items which we can reheat for the next day. The top three for sure, Composting would be really good! Right now, we do the top two, we sent what we can to FoodNet and reuse at much as we can. We have our old fryer oil picked up and is recycled. Composting would be smart for sustainability, renewability and fertilizers.”

Selleck Dining Hall staff #2
“Yes, only in this dining hall, nine year in total in food service, only two years at Selleck. See food waste every day. Students are the main problem, taking too much. Obviously, we can reuse that, but be pulp it. We just throw away all pulper food. We try to forecast best we can. Weather plays a part we can be slow. What we can reheat we reuse by reheating. We try to cook in smaller portions, and have extra ready to be cooked. We have a blast chiller to quickly and safely cool food for reuse. I think composting is a really good idea. It would be simple with the pulpers. Train all the employee to be better on batch cooking, so we don’t waste so much in the kitchen. Kind of like a la cart. Composting would be a really good idea. Unfamiliar with industrial uses, we do recycle out oil, landfill would be nice to stay away from as much as possible.”

Table 3- Gives a summarized version of the interviews with each dining hall

<table>
<thead>
<tr>
<th>Dining Hall</th>
<th>Summarized Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abel</td>
<td>Food waste is unavoidable, tough to track what students eat. Forecasting system helps reduce waste. Educating students on how much is wasted would help. UNL should do a mix between feeding the hungry and feeding animals. Composting or feed chickens on east campus. Massive FoodNet donation at the end of semesters. No oil dining hall.</td>
</tr>
<tr>
<td>East Union</td>
<td>The culture on East campus is a bit different than downtown, they don’t see as much waste. Main issue is the student take too much. Educate students to not waste. Don’t over produce items that can’t be reused. Expressed concern about food not being held at proper temperature when donated, so would rather compost it.</td>
</tr>
</tbody>
</table>
Students are creating the majority of the waste. The kitchen tries to cut back as much as possible, but educating students on correct portions would help. A flash freezer helps cool items to be donated. It would nice if more stations donated food at the end of the day. To reduce overall food waste UNL could close some dining halls or certain food stations on the weekend or when weather is bad. Source reduction could be improved. Composting and feeding the hungry is a good idea.

Over portioning on the students end. Educate students on how much waste they produce. Kitchen works hard to reuse food. We fill five 50-gallon trash can every day. We donate to FoodNet often, and they take most items. Composting or feeding animals is a good idea, but it might need to be sorted for animal feed.

90% of the food waste comes from students. We like to batch cook, so we don’t over produce. Educate student to take appropriate amount. We can reheat over produced items. A la cart options could reduce food waste. We already donate food and reuse some food waste. It would be nice to start composting.

Table 4- Shows the responses to the main three questions addressed in the interviews with each dining hall

<table>
<thead>
<tr>
<th></th>
<th>Q1- Food waste visible?</th>
<th>Q2- What is causing food waste?</th>
<th>Q3- Ways to reduce food waste?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abel</td>
<td>Yes, unavoidable</td>
<td>Students over portioning</td>
<td>Feed animals, donate or compost</td>
</tr>
<tr>
<td>East Union</td>
<td>Not a lot, but yes</td>
<td>Students or over production</td>
<td>Compost</td>
</tr>
<tr>
<td>Cather</td>
<td>Yes</td>
<td>Students over portioning</td>
<td>Source reduction, donate or compost</td>
</tr>
<tr>
<td>Harper</td>
<td>Yes</td>
<td>Students or over production</td>
<td>Feed animals and compost</td>
</tr>
<tr>
<td>Selleck</td>
<td>Yes</td>
<td>Students over portioning</td>
<td>Donate and compost</td>
</tr>
</tbody>
</table>
Discussion

The research question was to find out how Big TEN Universities are handling their dining hall food waste, as well as, in our dining halls at the University of Lincoln Nebraska. Initial thoughts were that schools with the most people would have an efficient food waste recovery system because of the amount of money a big university generates. One might think that agriculture states would be doing more with their food waste, because of the simplicity of repurposing it. It turns out that every Big TEN University is doing something remarkable with their food waste. Maybe this is because of the large student population on these campuses, so it is worth their time to divert the food waste and reuse it. What was over looked is how easy it is for Universities to donate their excess food which would otherwise be thrown out. It was shocking to discover the majority of the Universities have access to an anaerobic digester to convert food waste. Penn State and Rutgers are the biggest Universities population wise but they still don’t utilize all food recovery options; this is because they specialize and become very efficient at composting or anaerobic digesting. It also just shows you no University is doing a perfect job, and some universities have different options than others. UNL is on the small side compared to other, and they have accomplished just as much as other big Universities.

Nebraska is among the few that don’t truck food waste to an anaerobic digester. The waste water treatment facility close to innovation campus and Uribe are options, but could cost UNL extra money because they still would pay for landfill services. UNL does recycle their cooking oil if the dining halls use oil. To have an anaerobic digester it can cost millions, plus generated lots of labor and trucking to get the job done. In the big picture, we already paid for the food to be grown and transported to us to be consumed, so it seems like enough GHG and money has gone into this food waste, so we should try to keep a closed loop. Essentially, we don’t want to spend too much money recovering and handling food waste because it defeats the purpose. When it comes to UNL dining halls, the cooks brought up great points. Student are generating 90% of the food waste, so it starts with educating students on portion size and how much they waste. Adopting an ala cart menu would help reduce food waste, but could become an inconvenience for students. It is also recommended that during slow days or on slow week, that we could close a dining hall or even close a couple station in the dining hall to reduce how much the kitchen produces. UNL uses source reduction heavily, feeding hungry people, composting and the landfill to take care of their excess food waste. UNL is doing the right things especially for the size of school we have.

Conclusion

Big TEN Universities use a wide variety of techniques to reduce the high volume of dining hall food waste. This study was conducted to find out what the best option is for reducing dining hall food waste on Big TEN campuses, specifically UNL. The study included a literature review of how each University handles dining hall food waste, surveys to Big TEN Universities dining hall management and interview with UNL dining hall cooks.

As shown in Table 1, the most prominent options are source reduction (making smaller portion/ educating/ reusing), and donating to non-profits. These two options are really the best practices, but it is impossible to divert all the food waste via those two ways. Industrial uses create a clean energy from the high methane gases when food decomposes, but this method cost a substantial amount, but we would see the return benefit in the future. The clean gas produced from our food waste would most likely power the trucks that pick up our food waste, so we
would technically see the benefits. There is a small number of animals on East Campus for students, and those animals may be on a strict diet, but food waste could be turned in to animal feed for our animals on East Campus. From the interview results it’s clear that composting is the most popular option for UNL and is widely accepted by the dining hall staff. UNL has recently started a small-scale operation for composting that should take off. UNL will need to create infrastructure for this in the future, we will need more bins for organics and a couple vehicles that will transport it to Prairieland Dairy, Big Red Worms or a composting site on East Campus.

If this study could be done again, it should focus on one process to reduce food waste. Another thing that could be done different is to use quantitative research to collect weights of food waste and convert that weight in to a dollar amount. Then, you could estimate how much GHG/Methane comes from food waste on a college campus. Hopefully, from those numbers we could find the best practices, and that would convince administration that food waste should be repurposed on a large scale. The next step for UNL is to work towards collecting food waste efficiently and gain infrastructure for a compost system.

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References


