Food Waste at Rutgers University

Turning food waste into a renewable energy source at Rutgers University

Tag Words: Rutgers University, New Brunswick, food waste, anaerobic digester, dining halls, bioenergy

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Summary:
Rutgers University produces up to 50 tons of food waste per day by its dining halls A pig farmer by the name of Steve Pinter comes and picks up all the waste every other day and takes it back to his farm and feeds it to his pigs. It is rumored that Rutgers University knows that Steve Pinter is breaking a state food and agriculture law. The only positive thing that comes out of the pig farmer taking the food waste away from Rutgers is that it doesn't end up in a landfill. However, we believe that a smarter option is available in which Rutgers could take the food waste that the dining halls produce and recycle it with other waste that the University produces to make bioenergy by the means of an anaerobic digester.

Video Link: http://youtu.be/kaHB_FWZFXc

The Issue: Food Waste and its Environmental Effects (AP)

Food waste is a major issue that affects the world we all live in. In today's day and age we are becoming more environmentally cautious and due to the environmental concerns around food waste it's driving people to push for reform on how to treat the issue of food waste. By nature people initially think that food has the ability to break down overtime when placed into large landfills, and this is true however the means of breaking down itself is what is hazardous to the environment. When food begins to rot it releases a greenhouse gas called methane, which the U.S. Environmental Protection Agency (EPA) states that it traps 23 times as much heat in the atmosphere than CO2 does and of which 34% of methane emissions can be found in landfills. .As a result this increases global warming twenty one times more than carbon dioxide. In fact according to the USDA about 25.9 million tons of food waste gets thrown into garbage cans each year which costs the United States around $1 billion every year just to dispose its food waste. However if methane is collected properly it can be used as an energy source. Furthermore an anaerobic digester also produces a beneficial byproduct, organic fertilizer. The organic fertilizer can help improve soil quality and health and can also reduce the amount of pesticides. Whereas, on the other hand food waste that is thrown into landfills increases the chances of new diseases to emerge.

Food Waste at Rutgers University and Ethical Considerations for the current method (AP)

Although food waste is more of a worldwide issue our main focus is food waste here at Rutgers University in New Brunswick and how they handle it. The New Brunswick campus itself has 4 dining halls and approximately 50 tons of food waste is accumulated by the dining halls on campus every day. Basically food wasted at the dining halls goes through a process in which it is first taken off each tray and then converted into a paste, like oatmeal. The paste is then put into empty barrels and refrigerated until a pig farmer by the name of Steve Pinter comes and picks it up. Steve Pinter is a local pig farmer who owns Pinter Beef and Pork Farm in Hillsborough, New Jersey. Rutgers University pays Steve Pinter around $120,000 a year to pick up the food waste accumulated at the dining halls. Furthermore, he has quite an old relationship with Rutgers because he has been doing this for several years and so have generations before him.

However, Steve Pinter is not doing his job entirely right and the interesting thing is that Rutgers being his employer knows of his wrongdoings. Apparently Rutgers is aware, or at least thinks that Pinter is not heating and processing the food waste taken from Rutgers dining halls, however Rutgers has blind sighted the issue and has allowed it to continue. Instead of ignoring the issue Rutgers must examine the situation more closely and send out someone in private to observe what he really does and once caught confront Steve Pinter and bring forth to the surface his wrongdoings. As mandated by the 1980 Swine Health Protection Act set up by the USDA (United States Department of Agriculture) food waste fed to pigs must be heat treated. This is done to reduce the risk of foreign animal diseases in swine and to eliminate other harmful pathogens that could cause severe diseases which in turn can spread to other animals or humans if swine consume the contaminated meat in improperly treated food waste. The diseases that follow the consumption of unheated food waste include hog cholera, foot and mouth disease, African swine fever and swine vestibular disease. In other words Pinter is breaking the Swine Health Protection Act and Rutgers being his employer will be completely liable for his actions since Rutgers has allowed it to continue. However, all of this can be solved through anaerobic digestion of the University's food waste.

The Proper Process of Heating Food Waste As Stated by The 1980 Swine Health Protection Act (AP)

There's also a specific procedure involved in heating food waste that consists of meat before feeding it to swine. Food waste must be heated throughout and boiled (212°F or 100°C at sea level) for 30 (thirty) minutes. There are two methods generally used to heat food waste, which are direct fire and steam injection. The direct fire method heats the food waste with flames which come into direct contact with a cooking vat that is stirred regularly. The other method is done by using a steam injection and is usually used for larger operations. This process involves injecting steam into the bottom of a pile of food waste(University of Florida).Steve Pinter is probably not even following these guidelines and as a result is feeding the swine contaminated food, which as result causes the pigs to acquire diseases which then leads to people getting sick when consuming the swine meat. Basically it's a series of effects that result simply due to not heating the food waste up before feeding it to the pigs. Furthermore, the price Rutgers pays

Pinter is extremely expensive for just getting rid of waste which in reality is something they can make use of. The only benefit that the pig farmer's method has is that it prevents food waste from ending up into landfills, however the price is ridiculously high and the method itself is not the most brilliant method either.

Carbon Footprint of Food Waste (AP)

Rutgers University produces a total of approximately 50 tons of food waste and pays Steve Pinter $120,000 in order for him to pick up all this food waste and feed it to his pigs, in other words per day his pigs eat 50 tons of food waste. Realistically it's hard to believe that Pinter has so many pigs on his farm that can eat 50 tons of food per day. On an average a 100lb pig can eat up to 5lbs of food per day and 50 tons of waste equals about 110,231lbs.Therefore Steve Pinter would need to have 22,046 pigs to successfully finish 50 tons of food waste per day. In terms of the environmental effects of food waste, carbon footprint is a very interesting factor to consider. A carbon footprint is defined as the total amount of greenhouse gases produced to directly and indirectly support human activities, usually expressed in equivalent tons of carbon dioxide (CO2).The carbon footprint of food waste in landfills is 7.9tons of carbon dioxide per one ton of food waste hence if all the food of Rutgers was piled into landfills it would produce 395 tons of CO2 per day. The estimated overall average carbon footprint for 4lbs of boneless pig produces 8.8 lbs. of carbon footprint. With the average weight of a pig being around 200lbs, each pig will produce 440lbs of carbon footprint and therefore 22,046 pigs would produce 4850 tons of carbon footprints. In other words, the current method which consist of the pig farmer feeding his pigs the food waste is not environmentally friendly because it produces a lot of greenhouse gases hence this method should be permanently removed and other alternatives should be given thought to.

Immediate action to be taken to break ties with the pig farmer and identify another vendor (TG)

Steve Ricks, Director of Dining Hall services, stated that every few years Rutgers University puts out a bid to basically find a better option in terms of getting rid of food waste. At the moment Steve Pinter has the contract, but the bid will go to someone who is a cheaper option as well as someone whose method of taking care of the food waste sounds more environmentally beneficial.

Already Implemented Alternatives at Rutgers University (TG)

Rutgers University has already attempted to use an on-site aerobic digester to reduce the cost of food waste. September 2011 an Organic Refuse Conversion Alternative (ORCA) was installed in the Livingston dining hall. The model is an ORCA 2400 which can process 2400 pounds of food per day in a continuous feed procedure. The ORCA taken the food waste and mixes it with water and organisms that will break down the food aerobically and give a final product of greywater. This greywater is similar to the level of contamination as the water used to wash hands or take baths or showers in, so it can be placed directly into the sewer system to be treated. Since the biological waste is being broken down and mixed with water it can be removed by these alternative methods. With the ability to connect the ORCA to the sewer system and have running water provided to it money can be saved by not needing the pig farmer

anymore. The main issue here is that the biological waste has energy stored inside of it which can be harnessed and used to make electricity or processed into usable fertilizer and this is not being utilized with the ORCA. Another concern is that it has a capacity of a single system is only 2400 pounds and with Rutgers producing 50 tons or 100,000 pounds we would need 45 ORCA 2400s to not have extra waste at any one facility. The cost of one system is $49,000 per ORCA 2400 along with installation and freight costs. This combined with the monthly cost to resupply the system to keep the aerobic process working efficiently adds $220,500 a year for all of the systems. The ORCA 2400 has a 5 year lifetime so needs to be replaced soon after recovering from the initial costs. The largest impact the ORCA 2400 has it is uses around 400 gallons of water a day per unit which when all are combined together utilizes 6,570,000 gallons of water yearly. Since water is commonly seen as one of the most important resources that we have wasting 6,570,000 gallons a year to reduce some costs of getting the biological waste removed does not seem justifiable from an environmental perspective.

Short term solutions: Option A

Waste Management has been working with Rutgers since the year 2000 and is responsible for removing food waste at the University's student centers as well as other parts of New Brunswick campus. Ever since joining forces with Waste Management, Rutgers has achieved a 67% recycling material diversion rate and are working towards a 87% rate by the year 2015,they've installed about nine of our solar powered trash compactor sets in order to reduce collector costs as well as implemented single stream recycling hence recycles can be mixed together without any mixing. In other words Rutgers and Waste Management have developed an amazing relationship with one another ever since the year 2000. Hence, awarding Waste Management with the contract to handle Rutgers dining hall waste seems like a good viable alternative – at least in the short term.
Waste Management has a process they follow when they receive unmixed biological waste such as lawn trimmings or food waste. Since the waste is separate from that of regular municipal waste it can be used in many different process that have a lesser impact on the environment compared to being placed into a landfill. The Wilmington Organic Recycling Center or WORC is a facility that is part of the Peninsula Compost Group where Waste Management brings the waste to be processed.

The WORC is located in Wilmington Delaware and is one of the largest state of the art facilities in the area. The center uses the biological waste that enters to be made into a useable manufactured topsoil mixture and a virtual tour of the facility is available online in their website. Upon arriving the trucks are weighed to get a measurement of how much waste is entered into the system. The trucks then proceed to unload the contents of the truck into a tip building where it will be inspected by Quality Control and Compliance Specialists. From there metal from the waste is removed by magnets and plastic by hand on a conveyor belt before the waste is taken outside and placed into 500 ton stacks. These stacks are put through a 3 phase system to speed the natural biodegradation from 1-2 years down to 8 weeks. In phase 1 the stacks are covered with a Gore™ Cover System which prevents the outside elements from entering the system which is measured and changed by the installed computer controlled environment. After 4 weeks the stacks are uncovered and moved to phase 2 where they are recovered and left for 2 weeks. During the time they are moved it mixes the stack to help the process continue evenly

throughout the stack. Phase 3 is 2 weeks of having the stacks uncovered and exposed to the outside environment before it is put through a screen and mixed with soil for the final product. Anything that was not suitable for the final product is the recalculated into a stack being prepared for Phase 1.

The WORC is comprised of large impervious surfaces so they have sloped areas that let rainwater runoff into retention ponds located at either end of the facility. All the plastic and metal removed during the process is sent to another facility to be recycled. During the biodegradation process any leachate produced is filtered out into the sanitary sewer system to be treated. The center has a bio filter for the air in the tip building where the workers are and the waste is dropped off that has microorganisms remove any odor causing agents before being released into the atmosphere. They try to reduce the impact that they have on the environment every step of the process to make the facility as green as possible.

The facility itself is able to counteract many of the negative environmental impacts that otherwise would have been formed if Waste Management had decided to place the biological waste into a landfill. The issue is between the time the waste is produced to the time it ends up becoming manufactured topsoil the environmental impacts that the WORC reduce are being produced during transportation. "The truck that comes through your neighborhood can hold anywhere from 12 to 14 tons of waste." So for the 50 tons of waste Rutgers produces daily this will require 4-5 trucks to travel the 90 miles from the New Brunswick campuses to WORC. A single truck "gets less than 3 miles per gallon" if they still utilize diesel fuel and only improve to around 10 miles per gallon if they are brand new trucks utilizing a biofuel or alternative fuel. So for the waste at Rutgers to reach WORC between 70-100 gallons of fuel will be consumed. 10,180g/gallon of CO_2 for diesel trucks leaves us with 700,000-1,000,000 grams of CO_2 produced.

Waste Management is a reliable alternative to the current option for disposing of Rutgers food waste and should be carefully considered along with the other recommended courses of action in this paper. We know they are leaders in environmental innovation and have reduced the influence of Rutgers on the environment. They will continue to develop new processes and procedures to further reduce this impact for years down the road and talk of new implications for food waste are already being circulated. They do have the issue of the large transportation costs and environmental offsets which should be taken into consideration for the time being. As it stands this distance will cost money and create a larger effect on the production of greenhouse gases but in the future it may no longer be an issue if a facility is implemented closer to the campus. Waste Management is using WORC and does not own it so they may be inclined to remove the waste as they choose because once they collect the waste it is theirs to do with as they want to.

Short Term Solutions: Option B

Covanta is an alternative to the current removal of food waste that could be implemented in the short term while we wait for the development of a long term solution to be established. Covanta is a company that has locations in multiple states across the United States. The closest location is in Newark New Jersey just over 30 miles from the New Brunswick campus. The

main objective of the company is to take municipal waste and convert it into energy to be used elsewhere. The company follows the Energy-from-Waste (EfW) mission and wishes to be the leading force in the production of energy from what has been determined to be waste.

The process of collecting EfW through the Covanta facilities as displayed on their main webpage involves the implementation of a large incinerator that then creates steam to power a generator. The municipal waste is collected by manned trucks and then brought to the facility. From there it is dumped near an opening to the incinerator and pushed into the incinerator with a bulldozer. Once inside the garbage is placed near the heat source by a large claw which helps to aerate the waste for easier combustion. The heat generated from the combustion is absorbed by a tank holding water that is nearby which when heated enough begins to produce steam. The steam is then utilized by a generator to start the process of making electricity. This electricity is then used in the facility and placed into the local grid. The garbage that you leave outside of your house can be what drives the reaction to give you power in your own home.

Environmental impacts are hard to eliminate but they are minimized greatly by Covanta. They have high quality air pollution control systems to eliminate the particulate matter and gaseous emissions that the incinerator releases. They also keep the building where the process is completed under negative pressure which means that if the building is opened to interact with the outside air it will enter the building rather than mix evenly. This prevents the odor created from the large quantities of municipal waste from being released into the surrounding environment.

One of the largest problems with utilizing Covanta is that we already have a contract with Waste Management for our municipal waste and Covanta does nothing different when they receive biological waste or municipal. We already have a system in place that separates large amounts of food waste and this would be nullified if we send it to be incinerated when it otherwise could be utilized elsewhere by facilities with the proper system in place. Biological waste can be a very valuable commodity for those with a system that can utilize it so letting the already separated food waste get mixed is counterproductive and unreasonable from an environmental standpoint.

Long-term Solutions

Primary Long Term Solution: Establish an anaerobic digester on site at Rutgers University

An anaerobic digester for waste removal is being proposed. One way or another an anaerobic digester should be implemented in the waste removal effort. As discussed early on in this paper, an anaerobic digester is a vessel in which millions upon millions of microbes break down organic matter in an effort to produce carbon dioxide and methane byproducts. Then, the gaseous byproducts are compressed and converted into fuel. This harnessed fuel can be used to heat a building, power the lights in a classroom or even run a bus engine. There are many viable options for incorporating anaerobic digesters to remove the biomass brought on by dining hall food waste. It can be used to make fertilizers and composting for farms. Therefore, it is truly astounding how biomass which was once a burden everyone tried to make disappear is being used to fuel our everyday necessities. This approach is cost effective in the long run and it is the cleaner, more practical approach.

Obtaining an anaerobic digester on campus is still the primary goal that this proposal aims to seek. Anaerobic digestion is a long-term waste resolution system. Other countries have prospered from using this method. Many countries in Europe have been widely using anaerobic digestion for many years. Germany, United Kingdom, Italy and Spain just to name a few are actively involved in the process. Each year from 2001-2006 these European companies have been increasing their biogas production by implementing more anaerobic digester sites. With the increased use of anaerobic digestion in Europe, this was coupled with a decrease in greenhouse gas emission. This could be partially due to the fact that they are driving long distances less because they are blessed with the convenience of driving to a nearby location where an anaerobic digester is present. As the years go by, the levels of renewable energy increase and this is due to the fact that the process and mechanism of digestion improves more each year. As stated above, this is a dynamic process. One may learn more about the situation and improvements as time passes by.

The Cost of Building an Anaerobic Digester at Rutgers University:

All numbers and figures were estimates from the international company UTS who is responsible for many anaerobic digesters in Europe and obtained from personal interactions with Julie Fagan
Digester specifications include:

- A vessel to support ~50 tons/day
- Electrical feedback potential= 300 Kilowatt hour (kWh)
- Biogas production = 74.3 scfm
- Height= 17 ft, Diameter 46 ft

Costs of implementing an anaerobic digester that can support about 50 tons per day including its conversion of methane to Natural Gas:
The capital cost totals to about 1.4 million dollars. This includes the

- Combined heat power generator ($500,000)
- Filter screw press separator ($50,000)
- Gas scrubber (700,000-800,000)
- Operation expense is $25,000

Costs of Implementing an anaerobic digester that can support about 50 tons per day including its conversion of methane to Electricity:
The capital cost totals to about 594,000 dollars. This includes the

- Combined heat power generator ($500,000)
- Filter screw press separator ($50,000)
- Operating expense is $44,000

Annual Expenses vs. Annual Income:

Once the digester is installed, the system should not falter or be replaced until after 25 years
The Annual Operating Expenses Include:

- The operator plus the food waste hauling costs about 65,000
- The miscellaneous expenses are about 10,000

Annual Income From Anaerobic Digestion:

- 2.37 Mkwhr at $0.13 per kwhr= $308,000
- Cost savings due to the pig farmer= $120,000

Two options to convert the methane produced by anaerobic digestion to bioenergy are listed. The first is methane production converted to electricity to power classrooms. The second option is turning the methane into natural gas to power busses. The 1.6 million capital cost includes both natural gas and electricity generation. In brief the positives for switching to anaerobic digestion are that it is energy made on site, waste is no longer a liability and a burden. Lastly, the waste is now the new energy resource. The con includes the expensive capital cost to establish a digester.

In conclusion, the placement of an anaerobic digester is indeed a costly expense. However, the capital cost can be regained in a reasonable time frame. Currently, Rutgers pays $120,000 a year for the pig farmer to rid Rutgers of the biomass. One may recall that the capital cost for implementing an anaerobic digester is about 1.4 million dollars. According to these calculations the capital cost should be regained in about 5-6 years. After the capital cost is in full paid, Rutgers would be saving $73,000 per year.

Secondary Long Term Solution: Have Waste Management Process it for Bioenergy

Have Waste Management Process it for Bioenergy in 18 months, Waste Management hopes to have built their new facility in Elizabeth, NJ which will accept food waste and other biomass. This facility will create bio slurry that will be sold to waste water treatment facilities that will be able to utilize the bio slurry to produce energy that will potentially be utilized for their plants. Money will be saved in terms of transporting the waste to Elizabeth instead of all the way to Delaware. Most importantly, it will impact the environment much less since not as much diesel is being burned in terms of travel distance.
At the same time, Waste Management will be able to produce a product from our biomass that could generate energy as well as compost (Personal conversation with Dr. Julie M. Fagan and officials of Waste Management).

Third Long Term Solution: Send our waste to Organic Diversions

If purchasing an anaerobic digester on campus is not a feasible option for the next few years, there is an alternative. There is an option to switch waste collection firms. The bio waste should be transported to a firm with an anaerobic digester on site. Rutgers should seek a firm that incorporates anaerobic digestion and even though Rutgers would not gain from the energy produced (or maybe they could negotiate a lower cost to remove the waste), they could say with confidence that the waste is being dealt with in a responsible manner.

One such company may be Organic Diversions, a state of the art facility that can accommodate 400 tons of organic waste per day. It is in the process of being built. Organic Diversions also will pick up waste materials from various locations and prepare it for composting and or anaerobic digestion. Organic Diversions will then sell the compost to nearby individual

homeowners, country club golf courses or to farmers. They expect to use the methane produced by anaerobic digestion to heat their greenhouses and to power the offices.

Delaware

The facility approved and funded by the state of New Jersey, will be located in Southern New Jersey. This facility is currently underway and it is scheduled to be fully operational by the end of the year (2013) or by the beginning of next year (2014) according to the conversation we had with the CEO of Organic Diversions Rocco D'Antonio. He indicated that it would be used for commercial purposes. Even though the facility is not built yet, this is something that should be monitored through the years because this approach would dispose of Rutgers biomass in a responsible manner.

Even if Organic Diversions is not chosen as the new waste collection agency, there are more companies with the same philosophies. The main point is that we must shift with what Rutgers is doing now. We must call for action and gain some assurance that the responsible avenue is being taken. That means straying away from simply throwing away our waste in a landfill out of state. Our university produces tons of food waste per day. If we continue to follow this trend there will be no place to dump the biomass because the landfills will be completely full. It is our duty to find a better approach and to leave as little of a burden on our community as possible. Recycling food waste to be made into fuel is a far better alternative. Even if it is not a tremendous amount of fuel produced, it is a step forward. The process may be improved on through the years. However, it is worth the hard work and effort because these efforts go a long way. These are all options that Rutgers can be open to in the future.

In Conclusion:

It is the responsibility of humans to nurture and take care of the environment and community that they live in. Responsible waste management is a crucial part of that principle. It is evident that our community in Rutgers is facing a problem of waste removal. Its students and faculty members produce about 50 tons of food waste per day. This figure is absolutely staggering and it is the primary reason that drove our group to create this proposal. As the university grows in number, smarter steps continuously need to taken and set forth to improve a system as dynamic as waste management. We intend to present our proposal to the Director of Dining Hall services and the President of Rutgers University.

Service Project

President Robert L. Barchi
Rutgers, The State University of New Jersey
83 Somerset Street
New Brunswick, NJ 08901-1281

April 24, 2013

Dear President Barchi,

As students enrolled in the Ethics in Science Colloquium taught by Dr. Julie Fagan on the SEBS campus, we wanted to inform you of an issue of concern. The 4 dining facilities at the Rutgers New Brunswick campuses generate an amazing 50 tons of food waste daily. Knowing that food waste causes harmful greenhouse gases when left to break down in landfills with municipal waste, the university made the smart decision of creating an infrastructure to separate food waste at the dining halls to be disposed of separately. The food waste goes through the process of being ground up and placed into large 55 gallon drums which, when filled, are relocated into a large walk in refrigerator where it will be stored. Every other night a man by the name of Steve Pinter of Pinter Beef and Pork Farm located in Hillsborough New Jersey collects the drums and takes them to his farm to be used as food for his pigs.

The university has also tested the idea of using the Organic Refuse Conversion Alternative 2400 (ORCA 2400) which was installed on the Livingston campus September of 2011, it was later move to Busch and will evidently be back in operations shortly. This ORCA 2400 aerobically breaks down the food waste using organisms and mixing it with water allowing it to meet the regulations of being classified as greywater, which can be sent directly into the sewer system for removal.

Although the university has been proactive in dealing with all the food waste we generate there are perhaps better options both financially and environmentally. Currently we pay Steve Pinter approximately $120,000 annually to remove the food waste. This is then added to the costs of running the grinder and maintenance of the grinder and the cost to run the walk-in refrigerator. We also use Steve Pinter to help reduce our impact on greenhouse gases, but the pigs themselves produce large amounts of methane The carbon foot print for food waste in a landfill is estimated to be ~7.9 tons of carbon dioxide per ton of food waste. If all of Rutgers food waste were piled on landfills, it would produce 316 tons of carbon dioxide per day. Pigs have a much larger carbon footprint. Estimating that the average pig weighs 230 lbs and if the pig farmer is feeding all of the 100,000 lbs (50 tons) of food waste per day to his pigs and pigs eat approximately 4% of their body weight per day (~10 lbs of food per day), that would feed roughly 10,000 pigs. 10,000 pigs compute to a carbon footprint of 1084 tons – more so than being land-filled (Patel et al, 2011). We question if the farm has 10,000 pigs so the actual impact of the food waste is uncertain.

The ORCA 2400 is a cheaper alternative to dumping into a landfill but what it saves in money is not enough to compensate for the impact it has on important natural resources. The ORCA has a capacity of 2400 pounds per day and uses around 400 gallons of water per day. Fresh water is one of the resources that we have found is vital to reserve and use wisely as seen when there are governmental restrictions put on the usage of water during droughts. Multiple ORCA 2400 will be needed to handle all the waste and since each unit costs $49,000 plus installation getting the 43-45 ORCA 2400 systems installed will cost upward $220,500. The system also has a monthly fee to cover the supplies for the process which in total becomes a $37,800 a year expense. The

ORCA 2400 has a 5 year lifespan and has a warranty for 2-3 years so in a short time the system will need to be replaced. All of the ORCA 2400 systems being used would use 6,570,000 gallons a year which is approximately the amount 750 tanker trucks hold. This seems like a better alternative for smaller scale scenarios but not for the amount of food waste produced here at Rutgers.

Alternatively the company Waste Management, whom we already have contracted to remove much of our waste, is capable of taking food waste as well and sending it to the Wilmington Organic Recycling Center (WORC) where it will be broken down and made into fertilizer. The facility takes all the steps that they need to make sure the released greenhouse gases are captured and contained then treated before being released back into the atmosphere. The final product is compost sold as commercial topsoil. The environmental impact for using Waste Management is derived from transportation of the food waste to the WORC . The truck that comes through your neighborhood can hold anywhere from 12 to 14 tons of waste. So for the 50 tons of waste Rutgers produces daily this will require 4-5 trucks to travel the 90 miles from the New Brunswick campuses to WORC. A single truck gets less than 3 miles per gallon if they still utilize diesel fuel and only improve to around 10 miles per gallon if they are brand new trucks utilizing a biofuel or other alternative. So for the waste at Rutgers to reach WORC between 70-100 gallons of fuel will be consumed. Using 10,180g/gallon of CO2 for diesel trucks leaves us with 700,000-1,000,000 grams of CO2 produced. In the near future, Waste Management expects to have a new facility in Elizabeth that will be able to process food waste into bio slurry to be sold to waste water treatment plants to create produce bioenergy.
What we think is the best alternative, is to have our own anaerobic digester on campus. The initial cost would be significant ~$1.5-2 million but the anaerobic digester would be able to take the food waste and produce electricity for the campus, calculating a 5 year pay back. With an average 25 year lifetime on the digester this would leave 20 years of producing electricity and saving money or selling it to make a profit. The food waste has a high amount of energy stored in it and with the help of the digester it can be utilized by us.

Rutgers has many options available for them when dealing with the disposal of food waste, but the current methods are not the best economically or environmentally. In the near future we should think of finding a process that will allow us to use our food waste so it is treated as a resource rather than a detriment that must be removed.

Thank you for your time and if you have any other further questions you may refer to the full text at (link to the paper in the database) or contact me via email at tgroben@eden.rutgers.edu

From,

Theodore Groben, Aamir Patel, Stephanie Suyhogo

Letters to the Editor:

(AP)

Julian Chokkatu
Daily Targum
26 Mine St., New Brunswick NJ 08901

Dear Sir,

Through the columns of your esteemed newspaper I would like to bring to the notice of all Rutgers Students, the issue of food waste here at Rutgers University. I take great pride in being a student here at Rutgers University and when asked in my Ethics in Science class something that interested me, food waste at Rutgers immediately came to my mind. I live on campus here at Rutgers and hence I eat at the dining halls all the time. Seeing the amount of food wasted by students truly always got me angry and got me to think about what Rutgers dining halls would do with its food waste. Therefore, I immediately knew that my topic of interest in class would definitely be Food waste that is produced by Rutgers Dining halls. I and two other individuals decided to work together and after researching we came to know about what Rutgers actually does with its waste. This method surprised me and forced me and my partners to immediately want to stop the current method and implement another. This letter discusses the current method that Rutgers uses to get rid of its food waste and the new method that we think the University should implement.

Rutgers University produces up to 50 tons of food waste per day by its dining halls and spends at least $120,000 a year to get rid of the waste each day. Rutgers pays a pig farmer by the name of Steve Pinter to come and pick up the waste every day and feed it to his pigs. However, this method of waste removal is completely useless and must be stopped because it's extremely costly and produces pollution. There is another method that Rutgers can implement in order to get rid of the food waste they produce, which would be to implement an anaerobic digester that can be used to break down the food waste .This process is capable of handling all the food waste that Rutgers produces and it also produces byproducts like fertilizer and methane. Furthermore the methane produced can be used to heat buildings and generate electricity, in other words it can be a new form of renewable energy that the university can use. In terms of the financial aspect of things, realistically an anaerobic digester that has the potential to handle all of the food waste produced as well as the necessary equipment that will be needed to convert methane to electricity would cost the University about 2 million dollars. However the natural gas methane that the anaerobic digester will produce over 2.37MKWH of electricity over the course of a year, in other words the University will be saving approximately $308,000 a year in terms of electricity as well as $120,000 a year from not paying the pig farmer. Therefore, when combing both savings Rutgers will be able to pay off the initial cost of the anaerobic digester in only 5 years. Furthermore, after paying it off in 5 years any extra money can go towards University improvements around campus and also this method will be more beneficial to the environment than the initial pig farmer method.

It is evident that our community in Rutgers is facing a problem of waste removal. After researching and discovering better alternatives than the initial pig farmer method, we couldn't; help but want to bring change about Furthermore, the total amount of food waste produced per day is the primary reason that drove our group to create a business proposal that states the negatives of our present method and brings forth to the surface an alternative we think is the most beneficial, anaerobic digestion of the food waste. As the university grows in number,

smarter steps continuously need to be taken and set forth to improve a system as dynamic as waste management. Therefore we intend to present our proposal to the Director of Dining Hall services and the President of Rutgers University.

Thank You,

Aamir Patel

(SS)

To whom it may concern:

My name is Stephanie Suyhogo and I am currently a senior in Biological Sciences in SEBS, Rutgers University. I am currently enrolled in a class called Ethics in Science. In this course, students are called upon to take action in current issues in the world. My partners and I chose to take action against food waste at Rutgers University. The amount of food discarded is absolutely staggering. Each day, our dining halls accrue about 50 tons of food waste per day. Our current method of removal is inefficient and it might be a breach of food safety laws. A pig farmer by the name of Steve Pinter is responsible for picking up our biomass and he feeds it to his pigs. However, his practices are not stringently regulated and frankly, there is no proof of proper safety protocol. It is the university's responsibility to make sure that the hazards of our food waste are kept at bay. We would like to help steer our school to a more responsible option of waste management. Therefore, we would like to propose an anaerobic digester to be implemented at Rutgers University. Attached is a proposal for converting food waste into energy at Rutgers University. This is a smart, cost effective and it is the safest alternative to the method we use now.

Thank You

References

(1)"AgSTAR | US EPA." *EPA*. Environmental Protection Agency, 27 Sept. 2012. Web. 06 Mar. 2013.

(2)"American Biogas Council." *American Biogas Council*. N.p., n.d. Web. 06 Mar. 2013.

(3)"Anaerobic Digestion Basics." *Anaerobic Digestion Basics*. Ontario(Ministry of Agriculture and Food), 26 Sept. 2012. Web. 06 Mar. 2013.

(4)"Anaerobic Digestion." *Wikipedia*. Wikimedia Foundation, 03 Jan. 2013. Web. 06 Mar. 2013.

(5)"Organic Diversion - Our Programs." *Organic Diversion - Our Programs*. N.p., 2009. Web. 06 Mar. 2013.(6)Sethi, Prab. "Anaerobic Digestion." - *Waste to Energy & Biomass in California* N.p., n.d. Web. 06 Mar. 201

(6) http://www.totallygreen.com/wp-content/uploads/2011/10/TG-flyer-9.15.11.pdf

(7) http://peninsula-compost.com/facilities/WORC.html

(8) http://www.covantaenergy.com/facilities/Virtual-Tour-Residential.aspx