

RECYCLING TECHNICAL ASSISTANCE

Project #574

FINAL REPORT

WEST CHESTER BOROUGH, CHESTER COUNTY FOOD WASTE COLLECTION PROGRAM EVALUATION



April 2015

**Sponsored by the Pennsylvania Department of Environmental Protection through the
Pennsylvania State Association of Township Supervisors**

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**WEST CHESTER BOROUGH, CHESTER COUNTY
FOOD WASTE COLLECTION PROGRAM EVALUATION**

Project Completed By:



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1.0 STATEMENT OF PROBLEM

This study was conducted for West Chester Borough (Borough) under the Recycling Technical Assistance program that is sponsored by the Pennsylvania Department of Environmental Protection (PADEP) through the Pennsylvania State Association of Township Supervisors (PSATS). The Borough requested a solid waste expert to assist in determining the feasibility of implementing a permanent food waste collection and composting program for commercial food waste generators, and possibly residential units, located within the Borough. The Borough is unsure how to charge fees to businesses for this service.

2.0 SUMMARY OF WORK

2.1 Pilot Food Waste Project

West Chester University submitted a grant to the U.S. Environmental Protection Agency (EPA) on behalf of the Borough to conduct a food waste composting pilot project (pilot project). The pilot project aimed to address two of three benefits identified by EPA Region 3 to divert food waste to composting: 1) diversion from landfills for environmental and economic benefits, and 2) land preservation and restoration through waste reduction and recycling.



During the pilot study, food waste was collected by Borough staff using a stake body truck (photo above). Pilot participants are shown in **Table 1**. Twenty-one (21)-gallon totes filled with food waste by restaurant employees were manually loaded onto the stake body trucks and delivered to Longwood Gardens in Kennett Square, Pennsylvania for composting. Longwood Gardens did not charge the Borough a tip fee for food waste deliveries to its compost site. After Borough staff collected and delivered food waste totes, they were taken back to the Public Works Department building, washed out, and returned to the restaurants on the same day. On a typical collection day, it took approximately two hours to collect food waste from 2 or 3 businesses plus one hour to deliver food waste and return to the Public Works Department. During the pilot study, participating restaurants were not charged a fee by the Borough for collection, transportation, or disposal services. These costs were paid through the EPA grant.

Table 1. Food Waste Pilot Diversion Summary

Participant	Collection Frequency	# of Totes (21-gallon)	Tons Per Week	Total Tons Over 6 months
Landmark Americana	2x per week	10	.98	24.51
Roots Café	2x per week	5	.65	15.09
Three Little Pigs	1x per week	1	.20	4.71
Total Food Waste Diversion (Tons)				44.31

As provided to Gannett Fleming by West Chester University in its Final Report to EPA (**Appendix A**), the diversion of 44.31 tons of food waste to composting saved 78.06 MTCO₂ (metric tons CO₂ emissions) per year. This is the equivalent of taking 202 cars off the

road. This calculation uses a conversion of 0.88 tons CO₂ saved per ton of material composted. Therefore, 44.31 tons of food scrap x 0.88 = 39.03 MTCO₂ equivalent and doubled to equal a full year's emissions = 78.06. Gannett Fleming notes that this calculation does not consider additional transportation and other emissions generated by the pilot program.

2.2 Curbside Solid Waste Program

According to the 2010 U.S. Census, West Chester Borough has 6,335 owner-occupied residential units. The Borough provides curbside trash collection and single-stream recycling services once per week to approximately 3,000 households. The Borough does not require residents to use Borough collection services, so roughly half of the residential properties contract with private haulers. Residential establishments are allowed two (2) 35-gallon waste cans per week. In addition to these cans, each property may place out no more than four (4) Borough trash bags as part of the Borough's pay-as-you-throw (PAYT) trash program. The annual cost for the trash and recycling collection programs is estimated at \$644,000 or about \$215 per household. The Borough's curbside collection program is very relevant to the proposed food waste collection program. Developing a sustainable food waste program in the Borough will require integrating food waste diversion in a manner that compliments and enhances the entire solid waste system performance.

2.3 Food Waste Evaluation Findings

The following subsections describe operational and financial findings from background investigations, site visits, and meetings with the Borough. The food waste pilot successfully gathered preliminary information and revealed lessons learned that benefit the Borough as it continues to evaluate food waste management in greater detail.

2.3.1 Findings

- Due to the limited scale of the pilot project, there was not sufficient data recovered to determine the feasibility of food waste diversion from a larger portion of Borough restaurants.
- The pilot study provided insights regarding the key premises for the pilot project, including: food waste diversion for environmental and economic benefits, land preservation and restoration, and minimizing food hauling. The pilot demonstrated:
 - Food waste can be diverted from Borough restaurants away from landfill disposal. Borough restaurant food waste was beneficially converted to compost as an alternative to landfilling. Landfill diversion of 44 tons of organics reduced methane production, which is a potent greenhouse gas.
 - At the small pilot scale, there was no significant or measured impact related to land preservation and restoration. However, Longwood Gardens uses the composted food waste to maintain its properties and gardens. Conceptually, a small amount of land (landfill) area was preserved through composting.
 - Food waste hauling was reduced for the 1.83 tons of food waste collected and transported to Longwood Gardens (8.5 miles away) versus hauling to the Lanchester Landfill (22 miles away). However, the total transportation and associated impacts increased, but were not calculated during the pilot. Transportation increased because of the additional collection route and because municipal solid waste continued to be collected from restaurants by private haulers without any reduction

- in collection frequency. Due to added transportation and associated impacts, the pilot project revealed that preferred alternatives for a larger scale food waste diversion program will need to address collection efficiency.
- It is not feasible to simply expand the pilot project to a larger portion of the Borough's 60 restaurants. The pilot is not scalable for the following reasons:
 - Food waste collection service was provided to restaurants as an additional collection service. By adding a new service without integrating it with other collection services (perhaps leaf waste collection), the collection efficiency is not optimized. As demonstrated by State College Borough's 3-year food waste composting pilot (which is currently the only sustainable curbside food waste collection program in Pennsylvania), operating separate collection routes for different organic waste streams is cost prohibitive. Seventy (70) to 80 percent of waste management costs are associated with collection and transportation. Consequently, inefficient routing translates to added costs that are passed to participating customers. This assumes that a larger food waste program in West Chester Borough may not be continuously subsidized by grants. Most restaurants are resistant to paying added waste management fees for food waste collection and disposal. Therefore, collection optimization that delivers affordable customer rates is critical to promote restaurant participation and reach a stable operating scale. In a larger scale program, customers will have to pay waste management service fees for the cost of food waste collection and processing services.
 - Because dense food waste had to be loaded manually onto the stake body truck, 21-gallon containers were used to assure the containers could be safely handled by Borough staff. In an expanded food waste program the 21-gallon containers are not feasible due to their small capacity. Compared with larger containers, small food waste containers are generally inefficient to handle. For some restaurants, smaller containers will result in additional collections per week and added cost. Placing numerous small containers in the precious space inside or outside each restaurant is not favorable. In the pilot, larger containers were not feasible because mechanical loading equipment was not available to lift larger, heavy food waste containers.
 - Landmark Americana diverted 24 tons of food waste in six (6) months and is believed to be one of the largest food waste generators in the Borough. It is estimated that most restaurants in the Borough would have the potential to divert less than half the amount of Landmark Americana. Food waste is very dense (roughly 7.5 pounds per gallon). Because waste management companies typically bill customers based on container volume and collection frequency, the majority of Borough restaurants are not expected to generate sufficient quantities of food waste to materially impact solid waste quantities in a way that directly results in fewer collections and a reduced trash bill. As noted by one of the pilot participants, restaurants order food and serve food with a goal to produce minimal food waste or otherwise they will go out of business.
 - The anecdotal feedback from participating restaurants and several other restaurants during the pilot project was very supportive of food waste diversion. It appears many other Borough restaurants are willing to discuss and consider food waste diversion.
 - None of the 60 restaurants in the Borough are considered large food waste generators (e.g. grocery stores). Large generators can have a greater financial benefit from food waste diversion.

- The Borough does not currently bill residential establishment for curbside solid waste and recycling services. Solid waste customers pay through taxes or pay for extra trash bags if additional capacity is needed. Without a solid waste billing system in place, a billing mechanism would need to be established to charge restaurants for food waste collection services in a larger scale program. This will result in a separate trash bill and food waste bill.
- Because the Borough does not require residents to use Borough collection services, the Public Works Department does not provide solid waste collection service to all residential units within Borough limits. By servicing only about half of residential units, there are negative impacts to solid waste system performance:
 - Solid waste program efficiency. In the multi-hauler system, collection routes cannot be optimized. Borough trucks drive past some houses and collect from others. Service routes are duplicated by the Borough and several private haulers. The result, as compared with a single-hauler program where all households are collected on organized routes, is inefficiency, increased costs, and increased environmental and social (e.g. safety and community aesthetics) impacts.
 - Solid waste program accountability. In the multi-hauler system it is extremely difficult to track the activity and performance of all collection trucks and to verify solid waste data. Without accountability and reliable solid waste system performance metrics, it is not possible for the Borough to develop an accurate solid waste system baseline for measuring performance, including full cost accounting of the solid waste program (e.g. solid waste, container recycling, leaf waste, composting, etc.). Poor data recovery can decrease grant awards because the Act 101, Section 904 Performance Grants are based on the reported tons of eligible Act 101 recyclable materials.
 - Solid waste fee equity, taxes, and billing solid waste services. Owners of residential structures pay taxes that cover solid waste collection services provided by the Borough Public Works Department, while approximately half of Borough residential establishments use Borough solid waste collection services and the remaining pay a trash bill, the tax allocation is applied to all customers.
 - Program consistency. The top performing residential solid waste systems in Pennsylvania provide consistent and comprehensive services to all eligible customers. Although the Borough provides excellent curbside enforcement, the multi-hauler system is inherently challenging to streamline.
- The Borough's compost site is not permitted through PADEP to accept food waste. Based on preliminary review of the compost site, substantial capital improvements including earthwork, paving, stormwater management systems, etc. would be required for the site to be feasible for food waste composting. Additionally, the Borough does not have mixing and/or turning equipment or the manpower to accept and process



food waste with other organics. The Borough's compost site is not a feasible outlet for food waste composting.

- Longwood Gardens accepted food waste during the Borough's very small scale pilot project. It is not known if Longwood Gardens would be willing to accept Borough-generated food waste at a larger scale and greater duration. Longwood Gardens is the only known facility within 20 miles that can conditionally accept food waste. The limited number of local permitted food waste processors elevates the Borough's risk in delivering a sustainable food waste diversion program.
- The Borough's entire solid waste system needs to be considered in the decision making process for providing food waste service to Borough restaurants. Because some residents use Borough collection services and others use private haulers it is difficult to analyze and allocate costs.
- State College Borough operates the only sustained curbside food waste recovery program in Pennsylvania. This program has evolved over several years and includes collection from approximately 3,000 residential households and 20 commercial establishments. Based on a conference call with the Borough in January 2015, it was evident that the following factors contribute to program success:
 - Food waste collection is fully integrated with the Borough's entire solid waste collection program.
 - Food waste is collected in 65-gallon carts along with yard wastes at the curb from residential establishments. This optimizes routes and labor utilization by eliminating a separate route for food wastes. Other organics routes were also consolidated into the current program.
 - The Borough operates a compost facility under permit WMGP025 and accepts food waste along with other organic streams. The Borough has control over waste deliveries to the landfill, the compost site, and directly manages these disposal costs. This enables cost avoidance for landfill disposal and revenue generation for finished compost products.
 - The Borough diligently implements full-cost accounting of its solid waste program. It understands each program element cost and this is used to derive and issue customer trash bills.
 - The Borough is continually making program improvements that increase efficiency, service, and safety. For example, the Borough is transitioning from semi-automated collection to fully automated, side-loading collection vehicles and carts to decrease average stop time, reduce injuries, reduce litter, and to collect more material per stop.

3.0 SOLUTIONS

The following recommendations regarding West Chester Borough's proposed food waste program are based on research, experience with other food waste recovery and composting projects, phone interviews with industry experts, and review of the Borough's solid waste program and proposed food waste program.

3.1 Recommendations

It is not recommended the Borough implement an expanded food waste program for Borough restaurants at this time. The current solid waste collection program and market conditions

(e.g. organics processors) do not meet certain minimum criteria for implementing a sustainable food waste collection and processing program. However, provided certain criterion is met in the future, an expanded food waste program can benefit Borough restaurants and yield environmental and community benefits. It is recommended the Borough continue to investigate food waste diversion in a 1- to 2-year pilot study. A larger scale pilot will more accurately determine barriers, feasibility, and implementation alternatives and program details. It is suggested this pilot have three parts: Part 1) survey all Borough restaurants, Part 2) provide food waste collection services to 10 to 20 restaurants as part of a more detailed pilot study to support feasibility analysis, and Part 3) evaluate food waste diversion alternatives in the context of evaluating and improving the Borough's entire solid waste management program. Under Part 1 of the pilot study, it is recommended the Borough:

- Develop and issue a short survey (suggest 10 questions) to all Borough food waste establishments. The introduction to the survey should provide background about the benefits of food waste diversion along with some specifics about the Borough's study and vision for a future food waste program. Survey Monkey™ (www.surveymonkey.com) is recommended. Survey Monkey™ is an online survey tool that quickly aggregates survey data. Survey questions should be designed to solicit information from restaurants regarding barriers (real and perceived) about food waste program implementation and identify the restaurants that have the greatest interest in food waste diversion (pilot prospects). Example survey questions may include:
 - Would you consider participating and be open to being contacted by the Borough to learn more about the program?
 - If you are not willing to participate in the pilot food waste program, what are your top three concerns?
 - If you are willing to participate in the pilot, are you willing maintain and clean food waste containers for the pilot study?
 - How much do you currently pay per month for solid waste (trash) disposal? Request a copy of the trash bill.
 - Would you be willing to contact your current waste hauler to negotiate a reduced trash bill (related to diverting a portion of your waste to the food waste collection and composting program)?
 - Would you be willing to pay a monthly fee to partially or fully offset the cost of collecting food waste from your establishment so that it can be composted?
- Summarize food waste survey data into a short report for the Borough, including a list of recommendations or next steps related to the survey findings. Use the data to identify and follow up with the top restaurant prospects for the pilot. Apply information from the food waste survey and operational pilot to support the development of food waste alternatives that consider integration with the entire solid waste program (Part 3).

Under Part 2 of the pilot study, it is recommended the Borough implement an operational pilot that includes 10 to 20 Borough restaurants. This pilot should be designed to more accurately represent a future food waste diversion program in the Borough. For example, this pilot should:

- Place the obligation of maintaining and cleaning food waste containers on the restaurants.

- Use larger 65-gallon wheeled totes with lids (for odor) to reduce the number of containers provided to restaurants and to reduce the number of collections provided per week.
- Fit a Borough trash truck with an auto-lift system to improve collection efficiency and worker safety. By dumping all food waste into a truck, the Borough will not need to return to each restaurant with empty containers.
- Track collection and disposal costs in detail and develop a cost per month per restaurant for the service provided including estimated administrative costs (e.g. billing).
- Food waste service costs should be reviewed with participating restaurants and evaluated in conjunction with the trash bill from each restaurant. This information should be used to determine if a portion of restaurants can negotiate solid waste fees to fully or partially offset food waste service costs. Lowering the trash bill may require switching to a different hauler.

Under Part 3 of the pilot study, it is recommended the Borough evaluate the curbside solid waste system (i.e. curbside trash and recycling program) in detail to identify opportunities to improve overall solid waste system performance. Taking a step back to evaluate the Borough's system is recommended because there are notable deficiencies in the program structure and operations. Current program inefficiencies stem from multiple solid waste collectors operating in the same service area and the overlap from both tax-based solid waste fee recovery and trash bills. These conditions negatively impact the Borough's ability to manage solid wastes costs effectively and are expected to limit opportunities to implement food waste collection and other beneficial solid waste programs in the future. As part of a detailed solid waste system evaluation, it is recommended the Borough:

- Identify collection inefficiencies and consider restructuring the residential curbside solid waste program to improve overall solid waste system performance. In this context, performance refers to optimizing the collection program in a manner that reduces costs, reduces environmental impacts, reduces community impacts (e.g. noise, traffic, roadway damage, etc.), improves service consistency among customers, and improves service equity (e.g. appropriate and transparent allocation of service fees for solid waste management). It is recommended a single hauling entity (Borough or private hauler) service all eligible residential establishments to reduce program deficiencies, improve accountability, and to assure a program baseline or benchmark is established.
- Develop and analyze several alternatives for implementing a sustainable food waste program. Set a goal to select a preferred alternative as an outcome of the pilot study, even if implementation is several years out. Each alternative should be designed to capture over half the food waste generated by Borough restaurants. Alternatives should be well-integrated with other solid waste collection and disposal services. Examples of well-integrated and efficient food waste collection includes:
 - Food waste collection is provided in conjunction with other organics collection services to maximize equipment and labor efficiency. For example, food waste collection could be integrated with the mixed collection of leaf and yard wastes. This results in route consolidation and corresponding labor and operational cost reductions. Restaurants could be collected along a residential route.
 - The amount of organics collected per stop or collection event is maximized.

- Equipment is optimized through the redundant use of high-capacity collection vehicles (e.g. use the same collection equipment for residential solid waste (i.e. waste packer trucks) that are used for food waste collection.
- Containers are 65-gallon wheeled totes with lids to maximize the weight per tote for food waste collection, which can directly reduce the collection frequency (times per week) and associated costs. 65-gallon totes can be manually wheeled to collection vehicles, but should only be lifted using mechanical systems on the collection vehicles. Using larger totes saves floor space at the restaurant location since fewer containers are required.
- The food waste program recirculates the benefits of food waste composting to participants and the community. This can include supporting local business marketing efforts as sustainable organizations (e.g. awards) and returning a portion of the compost products to the community, including directly to food waste generators.
- State College Borough operates an integrated food waste collection and composting program and should be consulted during this process.
- Develop minimum criteria for a scalable food waste program, including:
 - Stable markets or organics processors for diverted food waste and other organics. Generally, a minimum of two (2) PADEP-approved organics processors or disposal facilities are recommended within 20 miles or a half hour travel time, one way. The stability of markets must be verified. Each facility has different requirements for feed stocks, delivery methods, schedules, contamination (rejected loads), etc. Organics processors influence the preferred food waste management alternative, including the collection methods and equipment utilized. For example, if Longwood Gardens will not accept truckloads of residential leaf waste mixed with commercial food waste, it may not be a stable market.
 - Agreements should be in place with all disposal or processing facilities that define operating terms, conditions, quality requirements, and financial obligations.
 - Customer cost. Customers have a threshold for how much they will pay for services and even how they pay for services. The Borough should investigate which restaurants are willing to pay for food waste service and how this translates to billing. Some businesses will not pay separate bills for trash and food waste collection. One option is for participating restaurants to “opt-in” to the residential curbside collection program, and receive one trash bill that includes food waste collection service.
 - Agreements are recommended to be in place between all customers (restaurants) and the Borough and compost facilities that define operating terms, conditions, and quality requirements (e.g. contamination by non-organics).
- Complete a solid waste system rates evaluation to accurately determine solid waste system cost allocation. A rates evaluation would determine the accuracy of the current tax allocation and could be used to determine the cost per household for solid waste services if it was provided to customers as a trash bill.

APPENDIX A
West Chester University Food Composting Pilot Initiative

West Chester University Food Composting Pilot Initiative

A. Contact Information

Project Name: **West Chester University Food Composting Pilot Initiative**

Project Location: **West Chester, PA**

Applicant's name and address: **Denise M. Polk, 218 W. Biddle St. West Chester, PA 19380**

Project Contact: **Denise M. Polk, dpolk@wcupa.edu, 540-383-0520**

(4a) As a result of this grant initiative, anticipated outcomes and outputs include:

- **Tons of food waste diverted from landfills** (Meghan Fogarty will work with restaurants to weigh, track, and record total gallons for each pick up). In addition to providing a total for the end of the funding period, we will track the gallons and/or pounds per pick-up, per restaurant. Therefore, we will be able to calculate total weekly and total monthly poundage. Moreover, we can develop a reasonable estimate for a projected number of pounds of food waste diverted should other WCB restaurants were to agree to participate in a joint Borough-wide food composting initiative.

An Excel Document is provided to show weekly and monthly pounds for each restaurant. Any missing data is indicated by a blank entry. Totals for the 6 month period as indicated on the spreadsheet are:

- **Roots = 30180 pounds or 15.09 tons**
 - **Landmark = 49010 pounds or 24.51 tons**
 - **Three Pigs = 9420 pounds or 4.71 tons**
 - **Totals: 88610 pounds or 44.31 tons**
- **Tons of greenhouse gases reduced** (BLUER will estimate this based on above data using the Waste Reduction Model (WARM), created by the EPA to help solid waste planners and organizations track and voluntarily report greenhouse gas emissions reductions and energy savings. The Web-based version of WARM was last updated February 2012 and requires inputting pre-food waste collection estimates as well as the amounts composted. This also will be used to demonstrate how the pilot contributed to BLUER's mission of reducing greenhouse gas emissions in WCB and to project how much impact a larger-scale effort would have. We require a month after pilot completion to make these calculations.

Using EPA's "WARM Model", the pilot project saved 78.06 MTCO₂ (metric tons CO₂ emissions) per year. This is the equivalent of taking 202 cars off the road. This calculator uses a conversion 0.88 tons CO₂ saved per ton of material composted - thus 44.31 tons of food scrap x 0.88 = 39.03 MTCO₂ equivalent and double to equal a full year's emissions = 78.06.

- **Dollars saved** (BID and Meghan Fogarty will work jointly to track money saved since economic outcomes likely will be more of a motivating factor for businesses to participate than the environmental benefits). They will be able to record the difference in restaurant waste costs by comparing restaurant's previous bills months with the grant period costs, controlling for other factors (time of year, etc.). These data can be used to create a chart so that restaurants of different sizes with different trash outputs can see an approximate monthly/yearly savings.

Unfortunately, this was more difficult to track, and we do not have an exact number. It is not possible for us to know in dollars or tonnage for Roots. After several requests to them asking for trash bill information, the chef informed me that their current trash service involves a monthly rental fee for the containers/hauling that does not fluctuate. Chef Charlie reported that the bills do not indicate the tonnage collected for each month since their services provides a flat fee service. Chef Charlie reported that they reduced their waste output by diverting the food waste by 60%. Other employees corroborated this figure, estimating anywhere between 50-60% reduction in their trash.

Three Little Pigs (which we added after the initial award by permission of the EPA) also cannot provide us with information that would help us calculate the economic benefit for their diverted waste either. This is because this restaurant is small enough that the Borough of West Chester collects their trash – they do not produce enough where the Borough requires them to contract with a private hauler.

With Landmark – the largest participant – representative trash bills from 2013 were for \$1255.53 and \$1080.18. Representative trash bills from 2014 were for \$564.59 and \$565.87, suggesting that the food waste diversion may have impacted their waste service; however, it is not possible to isolate this only to the food waste pilot study.

It would have been helpful to have anticipated some other way to measure the potential economic impact.

- **Total pounds of finished compost** provided to Thornbury Farm or other participating farm (Thornbury and/or participating farm will track this information). This must be calculated at the end of the funding period when drop-offs of food waste are done. (*NOTE: Jim Jones, a former council member, already did a feasibility study and found that real estate in this area is far more valuable than the profitability margin of finished compost).

- **Because this pilot did not include substantial contributions of carbon material, the following data provide the best estimate:**

Tons of organics available for compost: dry tons

- Wet tons x .2 = 44.31 wet tons x .2 = 8.862

Tons of Compost generated from waste/byproducts

- Dry tons x 2 = 17.72 tons

- **A pricing list and sample contracts for the local farm to use after the pilot is complete – the farm has to agree to** (Nancy Fromnick from CCSWA will work on helping the farm to make this a long-term sustainable part of their business)

Because Thornbury Farm was not our dropoff point, we did not accomplish this part of the grant. However, I am pleased to announce that I worked diligently with Randell Spackman at Thornbury Farm, and I helped serve as a liaison between him and several others who provided guidance and knowledge of the DEP application process. This included a meeting in June, 2014 as a pre-application meeting with the DEP. Randell has submitted his application. To my knowledge, the DEP sent it back twice, asking for more information. In addition, to my knowledge, Randell indicated that the attorney he uses for his farm business is now involved and assisting so that Randell can meet the DEP requirements to accept and review his application.

- **Survey and training of restaurant employees, increasing knowledge and belief in ease of composting** through the BID to all restaurants in the BID area asking them to

identify their attitudes about food waste composting and the degree to which they believe diverting food waste could be economically advantageous to them. Then, after we publicize the results of the pilot study and provide the actual savings, we could redistribute the survey (post-test) and compare attitude change. This would be a great way to generate buy-in from the restaurants as the next step toward a WCB-coordinated contract.

- **With only 32 restaurant employees, survey results did not show differences in knowledge level that were statistically significant due to the small sample size. Representatively, however, the results show that on all items of knowledge/fact, the number of incorrect responses decreased between the pre and the post test.**
- **For example, for the item :**
 - You can make compost from...
 - A lawn clippings, newspaper, egg shells, apple skins
 - B manure, dead leaves, cooked eggs, apple cores
 - C plastic water bottles, milk cartons, pop cans
 - D A and B only
 - E none of the above

Four respondents answered incorrectly before training and only one answered incorrectly after training.

In addition, we used 8 items to measure attitudes toward composting. Again, in performing a t-test using SPSS statistical software, the change in attitude was not statistically significant; however, we attribute this to the small sample size. However, the mean attitude score before the training was 23.4 (min 18, max 28). Comparing this with the mean attitude score after training 25.2 (min 19, max 32), we do see a positive shift in employee attitudes.

(4c) **Measures of success** include:

We estimated **172.8 tons** by the end of the pilot, and we actually generated 44.31 tons. We conclude the failure to reach this measure was not due to poor participation on the part of the restaurant participants but by an overestimation of food waste output on our part. Given that the three restaurants represent large, medium, and small restaurants in terms of plates served, we can extrapolate these actual numbers to estimate that if all 60 of the Borough's restaurants, this would translate to 886.2 tons annually. This also does not include other food generators such as nursing homes.

3. attitude change of restaurant owners on the benefits of food waste composting

(see p. 3 about survey results)

5. total projected reduction of greenhouse gas emissions if done on a larger WCB-wide scale =
Extrapolating for all 60 restaurants:

The waste equates to an average of 29.54 tons per restaurant per year (44.31 x2, divide by 3).

Take 29.54 x 60 restaurants = 1772.4 tons of potential waste generated

The CO2 savings equates to an average of 26.02 MTCO2 per restaurant (78.06 / 3)

Take 26.02×60 restaurants = 1561.2 MTCO₂ potentially saved if all the restaurants composted – or removing 4044 cars from the road. Using 1772.4 tons of waste $\times 0.88$ yields the same result (1561.2).

6. tons of greenhouse gas emissions reduction from two restaurants for grant-defined period in relation to reaching BLUER's goal for WCB (10% reduction of 2005 levels by 2015)
- &
7. total projected reduction of greenhouse gas emissions if done on a larger WCB-wide scale in relation to reaching BLUER's goal for WCB

In terms of the BLUER picture, our goal is 10% reduction over 2005 levels.

2005 total is 237,783 MTCO₂.

10% reduction is 23,778.3 MTCO₂

The pilot 78.06 MTCO₂ yearly total reduces emissions by 0.03%, but if all the restaurants compost, it reduces emissions by 0.7%. Not a huge contribution when comparing to the total emissions. HOWEVER, important to note that our inventory singles out 3000 MTCO₂ in the 'waste' sector – only a 1.4% contribution to the total inventory (remember our heavy hitters are energy related, electricity and fossil fuel use for heating, total approx. 80% of the inventory).

So when you compare the savings to that figure:

The pilot reduced WASTE emissions by 2.6%

If all 60 restaurants did it, potentially reduce waste emissions by 52%! That's a huge (potential) impact.

Overall, we felt the pilot was a success. All the restaurants reported that composting was easy for employees and that they would be interested in participating in other such programs in the future. We see the pilot restaurants as important parties to spread their positive experience to other restaurant owners/managers and to encourage future participation. Perhaps more significantly, we feel the results of the pilot provide important data for outlining a new pilot – one that will expand the number of participants while still using the municipal trucks/workers for hauling. The new pilot (once it is outlined and proposed) will begin laying the infrastructure of a model of food waste diversion that could serve as a model to other municipalities who are similar in size and geography to West Chester.

Our biggest lesson learned was simply in how to estimate the volume of waste more accurately and that we need to strategize to find a way to track monetary savings that works with restaurants regardless of their trash hauling contract. This is an important piece of data since economic savings may be more motivational for some restaurant owners than the environmental benefits.