UNIVERSITY OF THE DISTRICT OF COLUMBIA
COLLEGE OF AGRICULTURE, URBAN SUSTAINABILITY AND ENVIRONMENTAL SCIENCES

FINAL PERFORMANCE REPORT

2014-2015

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PROJECT 1

PROJECT SUMMARY

The Washington Youth Garden (WYG) Specialty Crop Gardening Program is designed to: a) increase child and adult nutrition knowledge and consumption of specialty crops, b) increase the development of organic and sustainable production practices, and c) improve food access in underserved communities by directly serving WYG participants that learn and work in WYG's one-acre organic specialty crop garden. With this project, WYG will be able to increase the educational impact of our one-acre demonstration garden that is used for multiple purposes – nutrition education, enhanced hands-on science instruction, and physical activity – and connects DC youth and families to their food source and educates them about healthy eating and organic gardening. The garden provides direct gardening experiences for: underserved families in our summer gardening program, underserved youth in our school-based and education outreach programs, urban teens in our paid summer program, as well as teacher and educators who are trained in organic practices and raising specialty crops.

PROJECT APPROACH

The project was funded with a $45,000 grant for a period of up to two years to support the Specialty Crop Gardening Program of the Washington Youth Garden (WYG), particularly the aspects of these programs that take place at the 1-acre demonstration garden on the grounds of the US National Arboretum:

- Green Ambassadors Program (formerly Seed to Supper) is a summer internship program for local high school students in urban gardening and the green economy with continued opportunities following the summer to work with WYG.
- Family Garden Days (formerly Growing Food…Growing Together) is a free summer gardening and nutrition program for underserved DC families to increase healthy eating habits and access to fresh, organic produce.
- SPROUT (Science Program Reaching OUT)—WYG instructors deliver this low-cost 90-minute garden science program to youth, ages 3-18, in the WYG garden, and occasionally off-site. We offer 4 lesson modules customized for age.
- Garden Science—a comprehensive school garden development program (13 weeks of classroom curriculum and seeding projects, schoolyard gardens, school-wide events, spring field trips to WYG) for students and teachers at our 5 partner schools in Wards 5 and 8.

GOALS AND OUTCOMES ACHIEVED

To date, WYG's progress on activities from the Work Plan of the approved project proposal:

Measurable Outcome 1:

WYG will maintain a model one-acre organic demonstration and educational garden on the public grounds of the US National Arboretum, planting at least 50 specialty crops and utilizing specialty crops in 10 new ways in WYG's educational programs over the project year.

To date, WYG has planted well over 50 specialty crops in our one-acre demonstration garden during the grant period (See Appendix B), and used specialty crops in 23 new ways in our education programs over the past two years: grilled baba ghanoush, pesto potato salad, cucumber-tomato salad, honeyed popcorn, double potato (sweet and Yukon gold) salad, sweet potato soup, sweet potato greens salad, shredded beet and apple slaw, home fries with herbs, garden pita pockets, green bean and potato salad, quinoa and lentil herb salad, lemony leafy green salad, garlic bread medallions, summer ratatouille, strawberries and salad greens, summer pasta salad, roasted beet salad with orange balsamic vinaigrette, zucchini brownies, herbal vinaigrettes, herbal sodas, herbal salves, and herb hangings (art).

Measurable Outcome 2:
Increase by 24% (to 1,875) the number of children and adults drawn from DC's underserved communities who will expand their knowledge of basic nutrition, their consumption of specialty crops, and their access to healthy foods as a result of their participation in WYG's Garden Science, SPROUT, GFGT or Seed-to-Supper programs and their utilization of WYG's demonstration and education garden featuring specialty crops.

In 2013, WYG increased the number of underserved children and adults served to 2,066 (37% increase from 1,512) as a result of their participation in our four education outreach programs. In 2014, WYG further increased the number of underserved children and adults served to 3,230 (increase of 56%) from 2013.

PERFORMANCE MEASURE (outlined in original proposal)	**WORK COMPLETED DURING GRANT PERIOD**	**STRETCH TARGET** (9/30/14) (**final**)
200-300 SPROUT participants in 4th grade and older sent home with pots, soil discs, and specialty crop seeds to grow at home.	341	250
200 SPROUT participants prepare food from seasonal specialty crops harvested.	973	850
1,500 SPROUT participants receive direct instruction about organic practice in specialty food production in their WYG field trip (soil health, poly culture, Integrated Pest Management, crop rotation).	2,402	1,500
225 Garden Science students and teachers prepare food from seasonal specialty crops harvested in the garden.	223	244
225 Garden Science students participate in a garden practicum rotation including activities that reinforce organic and sustainable production practices like weeding, mulching,	289	225

planting, thinning, and spreading compost.		
10-20 GFGT families sent home with sprouted specialty crop seedlings and container garden training information.	21 families **Note: WYG refined the GFGT program in 2013 to better serve families. See below.*	12
10-20 GFGT families harvest seasonal specialty crops, participate in interactive cooking demo with harvested crops, and take home the recipe and enough produce to make that meal twice with a family of 4.	52 families **Note: WYG refined GFGT in 2013. See below.*	60
12 Seed to Supper (S2S) youth learn organic and sustainable production practices (weeding, mulching, planting, thinning, spreading compost, trellising, use of organic controls, other activities) for a 5 week period, 3 days a week, 6 hours a day. (Work crew is 4 days a week, 8 hours a day.)	10 (3 in 2013 and 7 in 2014) ** Note: WYG refined S2S in 2013. See below.*	9
12 Seed to Supper (S2S) youth participate in two interactive cooking demonstrations, taking home approximately 5 pounds of seasonal specialty produce weekly, and delivering surplus produce (~20-40 pounds biweekly) to hunger relief organizations.	10 (3 in 2013 and 7 in 2014) **Note: WYG refined S2S in 2013. See below.*	9

BENEFICIARIES

Programs Total

2013-2014: 5,254 youth and adults (3,230 underserved youth and adults)

These individuals are beneficiaries of the hands-on learning experiences provided through our three on-site programs: Green Ambassadors Program, Family Garden Day and SPROUT.

Green Ambassadors Program: 10 DC area high school students

With diversity as the central criteria for team selection, these beneficiaries come from varying socioeconomic backgrounds. In 2013, the pilot program was delivered to three area teenagers (African-American) from three DC high schools. In 2014, seven area teenagers (3 African-American, 3 Hispanic, 1 Caucasian), were selected from primarily

low-income DC Public Schools and DC Public Charter Schools, and one private high school.

Family Garden Day: 168 individuals from 52 families

This series of day-long programming for D.C families garners a mix of one-time and repeat beneficiaries. With a particular focus on showing families how to plant, harvest, and prepare nutritious recipes affordably, the program operates at a nominal fee with potential for fee-reduction or waiver.

SPROUT: 5,086 youth, teachers and adult chaperones

Youth, teachers and adult chaperones, are invited from District of Columbia Public Schools, District of Columbia Public Charter Schools, parent resource centers, housing shelters, and community centers. Because of our demonstration garden's location in Northeast DC, many of our groups come by neighboring DC schools in Wards 5 and 6. Of the SPROUT groups that reported their Free and Reduced Price (FRP) eligibility, 72% (32 groups in 2013; 42 groups in 2014) were composed of a majority of students eligible for FRP.

See Performance Measure chart for detailed analytics.

LESSONS LEARNED
Program Changes:

Seed to Supper (Renamed: Green Ambassadors Program)—In winter 2012, WYG staff assessed our summer teen job program. While our partnership with Student Conservation Association delivered a successful 2012 program, their cost-share expenses were prohibitive long-term, and their focus was not strongly aligned with WYG's mission. In spring 2013, we used that experience to pilot a **summer high school internship program** with 3 students that better suited our needs and focused on developing young people's interests and skills in urban gardening. Interns were also trained to help deliver our SPROUT field trip program to young children and performed community service at WYG school gardens and local hunger relief organizations. The program made a tremendous impact on the lives of these young people— enhancing their knowledge and consumption of specialty crops, improving their academic and interpersonal skills, increasing their knowledge of environmental stewardship, and supporting them to push themselves beyond their comfort zone to into proud young adults. In 2014, we increased the capacity of the program to host 7 high school students. Please see attached evaluation report (Appendix A) for the excellent outcomes of this year's program.

Growing Food…Growing Together—After researching other delivery models for in winter 2012, we piloted a **new format** for our summer family gardening and nutrition program and re-named the program **Family Garden Days** to better describe and market the program to local families. We designed fun and affordable mornings spent in

our garden (June 8, July 13, August 10) where families worked together weeding, harvesting, and learning about organic gardening techniques, our bees, and more. They participated in cooking demonstrations, shared a healthy meal, and took home fresh produce and nutritious recipes. A family of four paid just $35 to participate in 3+ hours of quality programming and families from the surrounding neighborhood and those with financial need paid discounted fees or had them waived entirely. In 2014, we doubled the number of these sessions and provided 6 opportunities (May 31st, June 28th, July 26th, August 9th, August 23rd, September 13th) for families to participate.

Grant Administrative Delays and Challenges:

In terms of administering this grant, we have encountered ongoing difficulty in securing a signed contract from our State Point of Contact (as of this date, FONA still does not have a signed contract for this grant). Additionally, our efforts to efficiently communicate and invoice grant expenses through our State Point of Contact for timely payment have also been repeatedly delayed. These efforts have taken up a large portion of staff time and unfortunately required them to pull their attention away from participants and direct program implementation.

Logistical Issues with Nutrition Field Trips:

Though we have experienced no food safety incidents to our knowledge in the last 4 decades, an ARS audit in September 2013 of our demonstration garden area revealed the need to secure hot water (or work through a different approved food-safety protocol) at the garden site if we will be doing food preparation on-site. For this reason, we reduced our cooking activities (and did much simpler tasting activities) for the final few weeks of the grant period. We are collaborating with USNA and ARS leadership to rectify this issue for the upcoming programming season.

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PROJECT TWO

This final report represents a project submitted by the College of Agriculture, Urban Sustainability, and Environmental Sciences.

Project Title: Educating for Specialty Crop Enhancement through Hydroponics

PROJECT SUMMARY:

The project was designed to support a business oriented hydroponic education program that will introduce participants to soilless growing techniques. introduction to the use of the hydroponic process to the residents of the District of Columbia. The University of the District of Columbia, College of Agriculture, Urban Sustainability, and Environmental Science provided a simple recirculating model for the growth of select medicinal and herb crops. Through the funding period, the Experiment Station monitored the amount of each crop grown and determine the economic value of the total production.

Our program taught the participants the related science, the rudimentary construction and organization steps needed for production, and the maintenance of hydroponic growing. Many of the grown herbs and specialty crops can be substituted for more detrimental cooking supplements such as salt and animal fats.

The project provided specialty crop seeds and seedlings and the concomitant resources to micro-entrepreneur groups while projecting a microenterprise model of business.

PROJECT APPROACH

Through a comprehensive entrepreneurial approach to hydroponics, CAUSES provided hands on hydroponics training in 4-H programs and business focused workshops at built hydroponics systems at our Muirkirk research farm in Beltsville MD. The associated vegetables grown in the hydroponics systems included lettuce, collards, kale, basil, and jute, which were distributed to the public through the UDC Farmer's Market.

During January-June of 2014, we developed a comprehensive curriculum for the hydroponics workshop. Recruiting and outreach to local farmers and UDC students took place during the summer for workshop implementation in the fall.

In September and October 2014, we conducted two hydroponics workshops, led by Peter James, for local small business owners, UDC employees, and interested members of the public. Fifteen people were trained in hydroponic system forms and construction, business practices, scientific principles, and large/small scale projects.

Finally, we also accomplished a research based program of hydroponics growth based on different nutrient techniques.

Goals and Outcomes Achieved:

Goal 1: Enhance the system of hydroponic growing in two Wards within the District of

Columbia.

Planned performance Measure: Improve technical and academic response to basic operational information between pre and post program testing.

Benchmark: Assessed level of understanding measured at project start

Target: We expect to improve the measured understanding of hydroponics by 20%.

Actual outcome:

Fifteen people were trained in hydroponic system forms and construction, business practices, scientific principles, and large/small scale projects in 2013-2014. We conducted pre and post surveys of participants to demonstrate increase in knowledge about hydroponic systems. All of the 13 participants who completed both the pre- and post-workshop surveys reported an increase in knowledge. The total average increase across all participants and topics was 48% with a standard deviation of 13%. The minimum increase was 18%, and the maximum 65% (See attached surveys at the end of this report). This is a greater increase in knowledge of hydroponics than our goal of 20% increase in knowledge as stated in our measurable outcomes.

Goal 2: Improve the participation of teachers in using hydroponics and specialty crops as an aid in teaching business, science, and nutrition education.

Performance Measure: The installation of hydroponic exhibits at school sites.

Benchmark: Response to a school hydroponic survey.

Target: Two additional exhibits.

Actual Outcome:

As a part of the outreach to schools and teachers, we ran five 4-H workshops for campers to learn about the basics of hydroponics. Four different primary and high schools participated, with 85 4-H students attending. One school, Ballou High School, is located in Ward 8, a low income, high poverty area with few grocery stores. Riverside Center, a second participating school, is located in Ward 6 and is classified as a Title 1 school, providing assistance to low income families in the area.

These workshops focused on showing young students the importance and basic workings of the hydroponics systems setup at the farm, and to show them how to start-up systems like this at their own homes and classrooms. The teachers were given educational handouts to aid them in learning about and constructing hydroponics systems in their classrooms.

Additional accomplished goal: Hydroponics research:

In order to run these programs more efficiently, we did an analysis of plant growth within the NFT system with varying nutrient patterns. We found that plant development decreases with increased electrical conductivity (EC) and decreased nutrients in the water. EC was originally proposed as a quick way to analyze nutrient content in situ, as accurate nutrient analyses had to be brought to the UDC lab for analysis. From our analysis, plant development much more clearly follows nutrient levels, not EC.

Unmet and altered goals:

The hydroponics systems for schools was built in the summer of 2014, with a comprehensive plan to install them at two participating schools. Unfortunately, Peter James, our previous hydroponic teacher, terminated his involvement with UDC in early 2015. This also severed the school connections for planned installment of hydroponics systems, so the original goal was not fully accomplished.

The built hydroponics systems intended for schools were instead repurposed in a different academic program at UDC. Business students at the UDC School of Business and Professional Science Master's students in CAUSES Water Resources program were provided seed money from UDC's Agricultural Experiment Station to start an entrepreneurial hydroponics project at the Muirkirk farm, based on the built hydroponics systems funded in this project. Their program built a three tier NFT (Nutrient Flow Transport) system in a separate greenhouse. This system has been producing specialty herbs, high quality lettuce (Bibb and Romaine), and ethnic crops consistently since April, 2015. This setup has produced almost $800,000 in profits from produce marketed at UDC's Farmer's Market and has expanded the business opportunities of college students and provided job skills. The profit is being reinvested into academic programs related to hydroponic research and business training at UDC.

Beneficiaries:

The fifteen participants in our workshops were the main beneficiaries, gaining knowledge on how to build, maintain, and build businesses around hydroponics systems.

Beyond the planned workshops, the built hydroponics systems at the Muirkirk Research Farm have been used in a broad range of educational activities. In October 2014, UDC hosted an Agroecology day at the farm for high-school students. Three highschools in DC participated and 38 students (aged 14-18) came to the Muirkirk Farm and participated in four different workshops across the farm. One of these was a half-hour long session touring the hydroponics and aquaponics set-ups and teaching them about the scientific principles behind biointensive food systems. The post-test given to students indicated that the hydroponics tour was educational for the students. On average, students strongly agreed with the statement "I know what hydroponics and aquaponics systems are and the basics of how they are constructed, as well as the environmental benefits of growing in bio-intensive systems". They also answered 3/5 questions correctly on a quiz about hydroponic systems, indicating retention of knowledge.

Additionally, over the summer and early fall of 2015, an urban agricultural program was provided to 8 different schools, many from low-income, underserved wards of DC (7 and 8). There were over 100 student participants across 7 workshops, where Jr. High and High School students learned about soils, aquaponics/hydroponics, and farming techniques. Surveys provided at the end indicated that students increased their knowledge about how hydroponic systems worked, using the demonstration areas at the Muirkirk farm.

In September, 2014, UDC hosted a public educational Harvest Day at the farm, inviting people from the public, alumni, and collaborators to come and see the newly revamped Muirkirk farm. Close to fifty people came and took a tour of the farm and were educated about the hydroponics systems. Many of these were teachers who expressed interest in setting up a hydroponics system in their schools. Another federally funded program, Ethnic Crops, held an educational workshop in November, 2014 promoting ethnic crop production for five local DC and Maryland farmers. These farmers then took a tour of the farm and learned about the hydroponics systems. Two of these farmers mentioned a desire to set up a greenhouse similar to our setup at their own place.

Besides the planned educational events, there have been close to 3,000 people who have visited the farm in the past two years, most of whom took a tour of the farm, which included an overview of the hydroponics systems. Many of these visitors were teachers, farmers, and embassy visitors and dignitaries, interested in the specialty crops being grown in our hydroponics systems.

LESSONS LEARNED:

While activities were completed on the grant this year (the aforementioned repurposing of the hydroponics systems and educational activities), there was no expenditure of funds. The funds remaining from 2014 were for $663.96 of supplies to maintain the hydroponics system and $600.00 of travel money for programmatic work at partner schools. Due to the issues with our hired contractor and partner schools, we reprogrammed this money fully into supplies. Unfortunately, while the money was spent on a variety of maintenance supplies for hydroponics, we failed to properly credit the funds spent to the proper account, and spent the money out of our general cost funds. In the future, the PI, Lorraine Clarke, will be more diligent in following up on spent costs to make sure they are properly credited to the proper accounts.

Our major failing in this project was not meeting the high school involvement goal of our hydroponics program. The contractor hired to complete the hydroponics build at participating goals and maintain the program at UDC severed his relationship with UDC in February, 2015. The dispute that led to this was due to the contractor expending funds not authorized through UDC, leading to him not being able to be reimbursed for the supplies. To avoid situations like this in the future, UDC has implemented a purchase order system based on contractual obligations for all contracted SCBG collaborators. This system streamlines requested orders from contractors and reduces the need for long processing times. Additionally, the only allowable

funds are those written within the contract, preventing confusion and disputes about allowable funds for spending.

Secondly, the contractor terminating with us left the program with no one to maintain or plant the hydroponics system. In the summer of 2015, we relied on volunteers, which prevented year round production in 2015 due to irregular maintenance. A new project coordinator for farm activities was hired in September of 2015. His new duties include coordination of volunteers and management of farm activities, including hydroponic systems. Before his hiring, UDC only had two full time staff, due to one of the full time farm staff being off for disability leave. Finally, we recognize the value of including students and academic programs in maintenance of technical systems. We have expanded the student interns and water resources students involved in different parts of the program to prevent further delays and lack of maintenance.

One of the "problems and delays" mentioned in 2014 was a lack of continuous monitoring for the hydroponics (and associated aquaponics) systems at the Muirkirk Farm. As shown by our research, merely measuring the electrical conductivity of the systems does not clearly show nutrient density in water systems. In 2015, UDC CAUSES has formed a collaboration with the Computer Science department at UDC. Future plans and projects include a continuous monitoring programs using wi-fi enabled nutrient probes with alerts for low nutrient density and pH changes. Technological advancement is planned to also include dispensers for nutrients or pH altering solutions that can be administered without physically visiting the site or waiting for testing results from our water resources lab.

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PROJECT THREE

This final report represents a project submitted by the College of Agriculture, Urban Sustainability, and Environmental Sciences.

Project Title: "Specialty Crop Enhancement through Soil Productivity Research and Extension Education".

The project is designed to increase specialty crop consumption through education and increased productivity among gardeners within the District of Columbia through research, and extension service marketing and training.

PROJECT SUMMARY:

The soils within the District of Columbia should exhibit a variety of properties based, in part, upon construction, environmental hazards, pollution, and climatic shifting. Unlike the expected homogeneity of farming communities, urban agriculture is limited by space, transient impact, and ever changing land use. Thus, it is important to determine chemical and biological variables, best growing practices, and the best crops to grow on specific properties. This project conducted research on a 1-2 acre plot, at the College of Agriculture, Urban Sustainability, and Environmental Science Agricultural Experiment Station. Overall, the project tested variability that residents and gardeners may encounter as they attempt to increase their yield of specialty crops, while incorporating educational activities to encourage those activities. By evaluating the relationship between soil characteristics and the application of different growing variables, AES is providing opportunities to DC residents to increase the consumption of specialty crops through the increase of garden productivity.

PROJECT APPROACH:

Originally, our project plan included a three year testing and experimental schedule of fertilizers, plant testing, and soil nutrient analysis in conjunction with regular workshops occurring with the public. Due to delays in building and maintaining the fields established through this grant, our plan was amended in early 2015 to include one year of comprehensive soil testing and comparison between soil and plant nutrient content, as well as a large, comprehensive educational workshop.

GOALS AND OUTCOMES ACHIEVED:

Due to staff turnover, goals were amended in 2014, along with an amended timeline for completion in 2014 and 2015. The amended timeline is shown here.

Plan of Work (for 2015 goals):

Activity	Timeline	Staff
Plan curriculum for educational workshop (Based on existing SARE and biointensive classes held at	Jan-Feb 2015	Lorraine Weller Clarke, Mary Farrah, Yao Afantchao, Che Axum

Muirkirk farm) STATUS: COMPLETED		
Purchase and develop curriculum and handouts for event; recruit speakers STATUS: COMPLETED	Feb-Mar 2015	LWC, YA, CA
Collect soils at farm for analysis by International Ag Labs STATUS: COMPLETED IN JUNE AND AUGUST OF 2015	Feb 2015	LWC, CA
Advertise event and recruit participants STATUS: COMPLETED	Feb-Mar 2015	Leslie Malone (PR), Arielle Gernstein, MF, YA, CA, LWC
Conduct workshop at farm for 50-70 participants STATUS: COMPLETED FOR 45 PARTICIPANTS	Mar 2015	LWC, YA, CA, other invited guests
Amend soils based on International Ag Lab recommendations STATUS: COMPLETED IN SEPTEMBER, 2015	May 2015	CA and other farm managers
Analyze results of day-of pre/post surveys STATUS: COMPLETED	May 2015	Center for Sustainable Development, LWC, CA
Test crop nutrient levels STATUS: COMPLETED IN AUGUST	June-Aug 2015	LWC, CA, other farm managers
Send out post-harvest survey to participants (goal: 20% participation): STATUS: SENT OUT, VERY FEW PARTICIPANTS, NO ANALYSIS	Aug 2015	LWC, YA, CA

POSSIBLE		
Analysis of post-harvest survey, written report for future participation STATUS: COMPLETED FOR SOILS PROJECT	Sep 2015	LWC, YA, CA

Our original goals were partly achieved in 2013-2014 and then amended in early 2015. Only the unamended original goals are included here, with the addition of the goals proposed and accomplished in 2015.

1) **Goal:** To demonstrate the production of specialty crops under a variety of soil and growing conditions
    a. **Performance measure:** *Original:* Compare outputs of 96 randomized plots *Updated:* Compare current outputs of farm to outputs after soil test fertilization recommendations have been implemented
    b. **Benchmark:** *Original:* None. *Updated:* Soil tests in 2011 and 2012
    c. **Target:** *Original:* A 10% increase in annual yield *Updated:* A 10% increase in annual yield and a 10% increase in plant nutrient concentrations.

Activities completed for Goal 1:
In 2013, we planted many more crops than succeeded, and our harvestable area was only around 2200 sq. feet, though we planted 56,628 sq. ft. (1.3 acres). Also, this was a late fall planting and harvesting, meaning we were only able to plant fall species. We planted a total of 18 different specialty crops of many varieties, but mainly greens (Kale, Pac Choi, Broccoli, etc). Only 13 of these crops actually had a harvest and we harvested over 3,000 pounds of produce.

In 2014, we were able to expand our planted area to 118,918 sq. feet (2.7 acres), an increase of 100%. This increase included the building of four hoophouses, planting three separate 1/4 acre plots developed through USDA, and maintaining our original land set up in the fenced area and in the back of the farm through this grant. Our yields were similarly expanded: We planted 36 different specialty crops (with more than twice that many varieties) and harvested 12,769 pounds of produce, an increase of over 400%. On a per acre basis, we harvested 2,307 lbs/acre in 2013 and 4,729 lbs/acre in 2014, a 100% increase in production. We attribute this to the better soil preparation and biointensive management during 2014. In addition, due to our longer growing season availability, we were able to get 2-3 harvests in 2014, instead of just one.

Finally, in 2015, we maintained the original 2.7 acres and maintained similar specialty crop production. Due to the low staffing at the Muirkirk farm between April and August of 2015, the actual production report is still in progress and will be released to the public in early January through the CAUSES Impact and Reach document. The produce maintained in the hoophouses and developed projects were partly distributed to the public through our CSA program. Ten participants paid $25 per week to get a distribution of specialty crops produced at the Muirkirk

farm, most of which were produced in the established hoophouses and fields with this grant. Funds were not used for the buying of seeds or harvest costs, so we do not report those here. Over 24 weeks, participants to the CSA received, on average, 20 lbs of food each (higher or lower depending on the crop used). That harvest alone was near 5,000 lbs, with the majority coming from the established hoophouses.

Soil and plant nutrient test outcomes:
Due to delays in planting and lack of staffing to collect data, two total soil collections were completed in June (before major planting was completed) and in August (end of season). We followed this second analysis with plant nutrient analysis. We intended to directly compare the plant nutrients to overall soil data and examine patterns for more nutrient dense crop planning.

Soil Samples			
Soil Info	# of fields	# of samples	# of times sampled
Total sampled	11	32	2
Info about samples	Included all fields growing specialty crops at Muirkirk research farm and the UDC Green Roof	Multiple samples under specific sets of crops in August, one conglomerate sample in June	All sampled twice except hoophouses and green roof (only sampled in August)

Plant Samples			
Plant info	# of fields	# of samples	# of species
Total sampled	11	53	33
Info about samples	Included all fields growing specialty crops at Muirkirk research farm and the UDC Green Roof	One sample of plant for each field where soil was sampled AND where specialty crops were grown	One conglomerate sample of each species planted in each sampled field. Included: Tomatoes, Green peppers, Beans, Okra, Chard, Beets, and a variety of ethnic crops.

Soil samples were sent to International Ag Labs for nutrient testing with recommendations about soil amendments and plant samples were sent to Penn State nutrient testing lab.

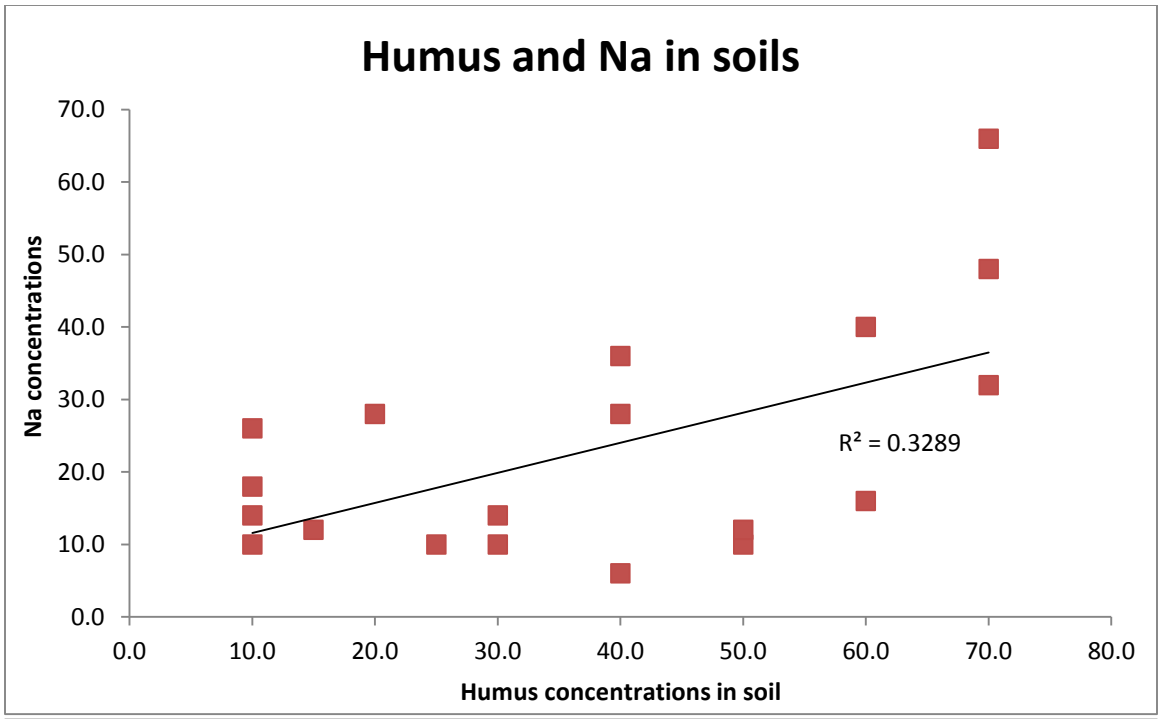
Results:

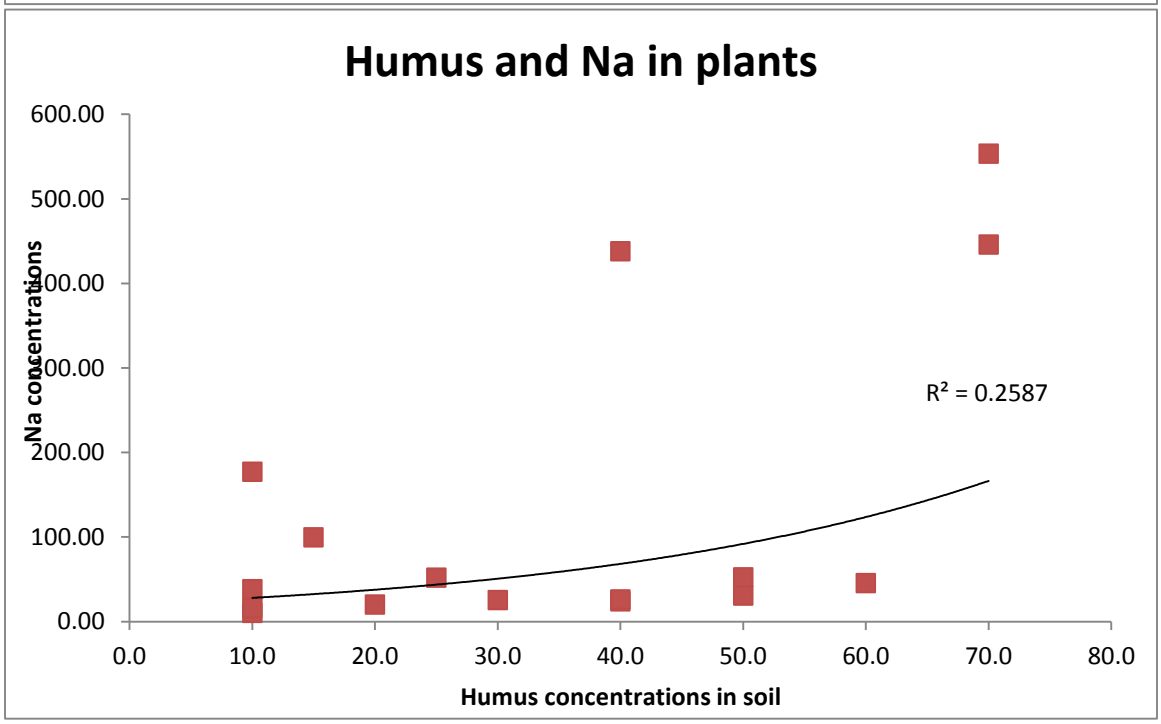
With two different soil sampling times, 32 soil samples, 53 plant samples, and 33 different species, the analysis of the data has been complex. The plant data was not received till mid-November, so there has been insufficient time to analyze the data thoroughly. Next year, Dr. Clarke will work with a Water Resources Master's student to analyze the data and present the results at a conference, as well as publishing a paper containing the results.

That being said, some interesting results did stand out. Firstly, the concentration of salt (Na) was VERY high in some of the plant tissue analyses, especially tomatoes and chard. Looking at the

data, these high concentrations of tissue Na were linked to very high soil Na, in both the hoophouses at the Muirkirk Farm and the UDC Green Roof. The presence of Na in both soils and plants was linked to higher overall potassium and humus. We hypothesize that these increased levels of Na is due to the high salt concentrations of added compost and humus, especially in the hoophouses. Some of the Humus% were VERY high, up to 70 ppm, especially in the hoophouses. This indicates over fertilization with compost. On the green roof, the soil is manufactured. Some of the boxes where we grew vegetables did not drain properly, leading to a buildup of salts in the soil and in the plant tissues.

In terms of plant nutrients, we had no deficiencies. All crops were high in major and minor nutrients (N, P, K, Ca, Fe). More common instead was excesses. The major cations in soils (K, Ca, Na, etc) all increased together in crops. This may be caused by luxury consumption of excess K nutrients in the soil (likely from over fertilization) and accidental takeup of other, less necessary nutrients. Crops most likely to take advantage of the “luxury” consumption were ethnic crops, tomatoes, and chard. This finding does support the recommendations by International Ag labs, which pushes for addition of Ca and carbon rich nutrients to be added to soils in order to encourage luxury uptake and improved taste. We will continue to investigate the relationship between soils and plant nutrient density through this analysis.





2) **Goal:** To improve the resident gardeners and emerging grower/producer understanding of soil value within the growing process and its relationship to produce yield
   a. **Performance Measure:** *Original:* Provide six community workshops per season and train fifteen community trainers per season. *Updated:* Provide a community workshop focused on sustainable agricultural practices and train 70 people during this event.

b. **Benchmark:** *Original*: Pre-program knowledge of soil and agriculture chemistry. Updated: Pre-program knowledge of soil management and biointensive agricultural practices.
c. **Target:** A 75% increase in knowledge demonstrated through post-test (*Same as original*)

Activities completed for Goal 2:
In March, 2015, we had a successful Soil Management workshop with 4 speakers and multiple presentations about soil management and maintenance. Though we invited over 70 participants (and had a wait list), bad weather the day of prevented many participants from coming. Overall, we had 45 participants. Pre and post tests were administered before and after the workshops to determine knowledge retention and gain. As seen in appendix 1 (attached with report), the 20 participants who did both pre and post tests did all report a 75% increase in knowledge, particularly of how to manage nutrient content in soils and plants. There were some limitations to the format that the pre-post tests were given in, so understanding how to quantify that knowledge is difficult and something we are working to understand better in future surveys.

3) **Goal:** Increase the variety and yield of specialty crops grown by the residents of the District of Columbia
   a. **Performance Measure:** *Original:* The participants will plant a larger range of crops. *Updated:* The participants will plant a larger range of crops and increase the harvest and sale of specialty crops.
   b. **Benchmark:** *Original:* The range of crops currently grown by selected project participants. *Updated:* The range and yield of crops currently grown by selected project participants.
   c. **Target:** *Original:* A 50% increase in the types of specialty crops grown by project participants. *Updated:* As determined through post-season testing of participants, a 50% increase in the types of specialty crops grown by project participants and a 10% increase in yield.

<u>Actual Outcome:</u>
Additionally in our pre/post tests, we asked participants of the soil survey whether they had a garden and whether they would be implementing the lessons learned in this workshop. Over 80% had a garden or community garden plot of their own and over 90% indicated a strong desire to implement changes in their current management style to accommodate the things they learned.

Unfortunately, we were unable to fully implement the second part of the investigation into how people garden. After the event, it was much harder to get a hold of the participants through phone and email. Only 5 of them responded with an evaluation survey of the effectiveness of the program sent out after the workshop was finished and none responded to attempts to survey them on current at home techniques and changes in specialty crop planting and production. Please see “lessons learned” for a discussion on how we will attempt to do things differently in the future.

BENEFICIARIES:

Specialty crops produced in 2013-2015 in the specialty crop block grant programs was primarily distributed to low-income families through Bread for the City and Capital Area Food Bank. An additional 5,000 lbs was used in our CSA program at UDC, and benefitted 10 families directly near UDC.

Additionally, the 45 participants at the Soil Management Workshop learned about sustainable farming techniques, crop nutrients, composting, soil pathogens, and biointensive planting techniques. This educational program will be continued in 2016 and years after to promote improved soil management and Specialty crop nutrient density in the DC regions.

Finally, the future publishing of the comparative plant nutrient density and soil nutrient content will be published for the academic community. Our goal is for the information collected in this past year to advise new techniques for creating nutrient dense food in cities, as well as promoting specialty crop growth by local farmers.

LESSONS LEARNED

The major issue we ran into for the collection of data related to growing of specialty crops by private gardeners was one of contact and follow up interest. In the future, the soils workshop will be 4-5 smaller workshops throughout the growing season, with hands on activities to teach participants about how to work through issues they are currently encountering in their gardens. Site visits will be incorporated into the curriculum to monitor participant progress without extra work on their part. Additionally, multiple in person discussions with local gardeners will provide excellent qualitative data on their receptiveness to provided information.

Secondly, our project funded the building of hoophouses, field prep, supplies, and curriculum costs, but did not cover necessary staffing time to maintain these projects. Because of this, Lorraine Clarke completed the majority of the sampling and workshop planning alone, leaving little time to do analyses or manage multiple sampling sessions and implementation of soil amendments. In future proposals, staff time and student interns will be prioritized for programming and data collection to ensure timely completion of the program.

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UNIVERSITY OF THE DISTRICT OF COLUMBIA
COLLEGE OF AGRICULTURE, URBAN SUSTAINABILITY AND ENVIRONMENTAL SCIENCES

Soil Workshop, Spring 2015:

Assessment Report

Data Management and Assessment Unit, Operations

September 2015

Executive Summary

This report contains a thorough analysis of a soil workshop held on March 20, 2015. This workshop, held at the Muirkirk Research Farm in Beltsville, MD, was free of charge and open to the general public as part of the outreach activities of the Center for Urban Agriculture.

Pre and post-surveys were created and distributed to participants at the end of the workshop. The assessment measured change in knowledge and condition[1] using a likert scale and three open-ended questions. A total of 19 participants completed these surveys. Afterwards, the data was coded and subsequently analyzed. Quantitative tests include the means of pre-test scores compared to the means of post-test scores as well as t-tests. The influence of sex and gardening on increase in knowledge was also evaluated using mean comparisons. Qualitative tests included open and axial coding to search for invariant/common themes.

Key Findings:

- Participants reported an increase on the seven knowledge pieces evaluated.
- On average, participants reported the largest increase of knowledge gain in managing soils for nutrient density and the smallest increase of knowledge gain in composting techniques.
- On average, participants reported a 75% increase in terms of general knowledge in soil management.
- On average, participants reported a 9 out of 10 likelihood in terms of what they learned in their backyard or neighborhood.

Recommendations:

1.) Examine length of workshop and target audience, i.e. gardening skills to effectively evaluate increase in knowledge based on gardening background.
2.) Change the scale to a 1 to 5 likert scale where each value is attached to a qualitative description.
3.) Create survey around target goals, i.e., larger range of crops.
4.) Restructure composting techniques lesson to increase knowledge gain.

[1] Only one question focused on change in condition.

Introduction

This report contains a thorough analysis of a soil workshop held on March 20, 2015. This workshop, held at the Muirkirk Research Farm in Beltsville, MD was free of charge and open to the general public as part of the outreach activities of the Center for Urban Agriculture.

This report contains several subsections as listed below:

a. Identified Outcomes
b. Instrument Development
c. Data Collection
d. Data Analysis
e. Quantitative Findings
f. Qualitative Findings
g. Discussion/Recommendations
h. Appendices

a. Identified Outcomes

This program does not have a logic model; however, Dr. Lorraine Weller-Clarke did create planned goals and outcomes. These include:

1) **Goal:** To improve the resident gardeners and emerging grower/producer understanding of soil value within the growing process and its relationship to produce yield.

   a) **Performance Measure:** *Original:* Provide six community workshops per season and train fifteen community trainers per season. *Updated:* Provide a community workshop focused on sustainable agricultural practices and train 70 people during this event.
   b) **Benchmark:** *Original*: Pre-program knowledge of soil and agriculture chemistry. Updated: Pre-program knowledge of soil management and biointensive agricultural practices.
   c) **Target:** A 75% increase in knowledge demonstrated through post-test (*Same as original*)

2) **Goal:** Increase the variety and yield of specialty crops grown by the residents of the District of Columbia.

   a) **Performance Measure:** *Original:* The participants will plant a larger range of crops. *Updated:* The participants will plant a larger range of crops and increase the harvest and sale of specialty crops.
   b) **Benchmark:** *Original:* The range of crops currently grown by selected project participants. *Updated:* The range and yield of crops currently grown by selected project participants.
   c) **Target:** *Original:* A 50% increase in the types of specialty crops grown by project participants. *Updated:* As determined through post-season testing of participants, a 50% increase in the types of specialty crops grown by project participants and a 10% increase in yield.

b. Instrument Development[2]

The instrument utilized was an outcomes-based survey created by Dr. Lorraine Weller-Clarke. Demographic information[3] was collected during the online registration process before the workshop. The survey contained eight outcome[4] variables and three follow-up questions that ranged from asking why or why not participants would consider implementing the knowledge they learned, if they current garden and garden size and their thoughts about improving the workshop. The first six outcome variables were scored on an eleven-point likert scale ranging from not at all (0) to expert (10). The remaining outcomes variables were scored on an eleven-point likert scale ranging from not at all (0) to very much (10).

c. Data Collection

The instrument was distributed at the end of the workshop and data was collected from the participants. Upon survey collection, Dr. Clarke passed the raw data to the Assessment Program unit within the Operations Division for coding, analysis, findings, and recommendations. Mr. Hess passed the data to Ms. Gerstein who coded and analyzed the raw qualitative and quantitative data using SPSS and Excel.

d. Data Analysis

Quantitative Analysis

The raw data was assigned numerical values and subsequently coded into SPSS. Variable coding was as follows:

Demographic variables[5]:

Sex: (1) Male, (2) Female, (3) Self-Defined

Race: (1) White, (2) Black, (3) Asian, (4) American Indian/ Alaskan Native, (5) Native Hawaiian/ Pacific Islander, (7) Middle Eastern, (8) Hispanic, (9) Other

Ward: (1) Ward 1, (2) Ward 2, (3) Ward 3, (4) Ward 4, (5) Ward 5, (6) Ward 6, (7) Ward 7, (8) Ward 8, (9) DMV area

Garden: (0) No, (1) Yes

Outcome variables:

The survey instrument had a 0 to 10 likert scale with the values indicating:

[2] See Dr. Clarke for copy of the survey
[3] Demographic information was not mandatory so some values are missing.
[4] Seven of these questions were evaluating knowledge increase and the eighth evaluated behavior change.
[5] Age was collected but cannot be used for analysis because the results vary between single number and age range.

0 = none, 10 = expert for Q1 to Q6 and

0 = not at all, 10 = very much for Q7 to Q8

After coding data in SPSS, several statistical tests were conducted. These tests included frequency distributions[6], descriptive statistics to measure frequency, central tendency (mean/average value), dispersion (Minimum and Maximum values), and variance (standard deviation) and cross tabs. See charts below for visual representations of descriptive statistics:

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Sustainablefarmingpre	19	0	7.0	3.658	1.8860
Sustainablefarmingpost	19	1	10	5.32	1.765
Cropnutrientspre	19	0	6	2.58	1.710
Cropnutrientspost	19	1	9	5.63	2.385
Biointensivepre	19	0	8	2.37	2.060
Biointensivepost	19	2	9	5.00	1.826
Compostingpre	19	1	8	4.95	2.013
Compostingpost	18	3	9	6.33	1.749
Soilpathogenpre	19	0	6	2.53	1.926
Soilpathogenpost	17	0	9	4.59	2.181
Seedlingpre	19	0	7	3.47	2.389
Seedlingpost	17	0	9	5.35	2.523
KnowledgeInc	17	2	10	7.18	2.270
LikelyImplement	17	4	10	8.65	1.693
Valid N (listwise)	15				

To interpret descriptive statistics table, values of mean scores that were closer to “10” indicate more favorable scores, whereas scores that are closer to “0” indicate less favorable scores. As for standard deviation, the smaller the number, the more likely the data points are close to the mean. The inverse is true for higher standard deviation scores.

Six statements on the survey instrument were presented as pre and post test statements. For this type of data is it more meaningful to compare the means of each statement, pre and post test. After the means were calculated, a paired sample t test was also used to evaluate the significance of the increase in knowledge. Refer to Appendix B for the Pair Samples Test.

[6] See Appendix A for demographic and evaluation variable frequency distributions table

In addition, percent change of pre and post test means[7] were calculated based on gender and gardening.

Qualitative Analysis[8]

Qualitative responses were transcribed to be analyzed. After transcription, open coding was applied to search for invariant/common themes. In addition, axial coding was applied to the raw data set after open coding to verify established categories. Categories were established based on the observed invariants.

d. Quantitative Findings

Difference in Means

Looking at the means of the pre and post-survey answers, all six questions showed an increase in knowledge. The smallest increase in knowledge was composting techniques (28%) and the largest increase in knowledge was managing crops for soil nutrient density (132%).

An additional question was asked to evaluate general soil management knowledge increase from the workshop. The mean score for this was 7.2 based on a 0 (Not at all) to 10 (Very much). An outcomes-based question asked if the participant would consider implementing what they learned in their neighborhood or backyard. On the same scale from 0 (Not at all) to 10 (Very much), the mean was an 8.7, indicating a strong inclination to apply the knowledge learned. It is important to keep in mind that these participants are already very interested in gardening as 14/18 are already DC Master Gardeners or in the current year's program.

T-Test

A paired t-test confirms that the change on all six concepts were "significant[9] at a $p<.10$ level.

Percent Change in Means Based on Demographic Variable

Next the means were calculated for each likert-scale pre and post test based on a crosstab with sex, race, ward, and garden (yes/no). A percentage change was calculated for each pre and post survey question. Then each percent change was compared to see which one was the largest based on the demographic variables. Ward was not used for this comparison because the small size of the workshop would not produce usable findings. In addition, Race is not a usable variable because 26% respondents did not answer this question and looking at the race distribution in the table below, with such low frequencies in the Black, Hispanic and Other category, these responses skew the percent change too heavily to accurately evaluate a mean comparison.

[7] Due to size of the cross tab table section, please see Appendix B for visual representation.
[8] Please see Appendix C for coded data.
[9] This means that we are 90% sure that the result we is not due to chance.

Race

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Missing	5	26.3	26.3	26.3
	White	10	52.6	52.6	78.9
	Black	1	5.3	5.3	84.2
	Hispanic	1	5.3	5.3	89.5
	Other	2	10.5	10.5	100.0
	Total	19	100.0	100.0	

Findings of the percent change of the means are as follows:

- Female respondents reported a higher understanding of managing crops for nutrient density, biointensive management compared to their male counterparts.
- Male respondents reported a higher understanding of composting techniques, soil pathogen mitigation and seedling management and crop variety selection compared to their female counterparts.
- Male respondents reported that they are more likely to implement what they learned in their backyard or neighborhood compared to their female counterparts.
- Male respondents reported a higher understanding of soil management overall compared to their female counterparts.
- Respondents who garden reported a higher understanding of sustainable farming principles and biointensive management compared to respondents who do not garden.
- Respondents who do not garden reported a higher understanding of crops for nutrient density, composting techniques, soil pathogen mitigation and seedling management and crop variety selection compared to respondents who garden.

e. Qualitative Findings

Question 1: Why or why not would you consider implementing what you learned in your neighborhood or backyard?

- 11% (2/19) of respondents mentioned that they want to improve the nutrition quality of food.

- 11% (2/19) of respondents mentioned that they want to improve their yields.

- 37% (7/19) of respondents mentioned that the concepts they learned will help them improve their gardening.

Question 2: Do you have any suggestions to improve the soils management workshop?

- 11% (2/19) of respondents mentioned that they would like more time in the workshop.
- 16% (3/19) of respondents mentioned that they would like more hands-on activities.

f. Discussion/Recommendations

After completing the analysis, several salient trends were evident. One trend is that all of the increase in knowledge statements evaluated by the participants had a percent increase, which is expected, but considering the scale was 0 to 10, all of the means remained at 6 or below for the post-test scores. If 0 is considered knowing nothing about the subject and 10 being an expert, the means indicate that the participants are at the beginner to intermediate level after the workshop. It is important to keep in mind who the target audience of the workshop is. This indicates that they did not have substantial knowledge increases. In addition, the 0 to 10 likert scale allows for extreme percent increases. For example, a pre-test score of 1 and post-test score of 5 is a 400% increase in knowledge. These increases skew the average percent changes quite drastically.

In addition, in order to measure how pre-existing gardening skills or knowledge affect knowledge increase in the soil workshop, a diverse group of participants need to take part in the workshop. In this case, this potential correlation could not be evaluated because only 2 participants do not currently garden.

In order to obtain more meaningful findings, there are several relevant recommendations. First, the survey instrument should be revised to a five-point likert scale. This way percent increases can be more accurately measured. Second, a group of participants with varying skill levels in gardening should participate in order to evaluate the effect of gardening skill on knowledge increase. Third, the workshop coordinator asked for information about how participant income level affected change in knowledge. This cannot be evaluated because income was not collected. So next time, gender, race, ward and income level should be collected.

Only one outcome question is asked about future gardening. Other questions that line up with the target goals of the program could be added to assess further outcomes. The three central outcomes: change in knowledge, change in behavior, and change in condition had varying levels of success. No change in condition questions were asked of participants. Also, if not all participants are attending every workshop knowledge session, they should note on the survey instrument which ones they have attended for proper evaluation.

In terms of content, the focus should be on improving the following sessions: sustainable farming principles, composting techniques, and seedling management. Participants did not grasp these concepts as well as the other ones taught. Instructors should explore ways to make these sessions more relatable using hands-on, interactive demonstrations.

Appendix A

Demographic Variables (Including Gardening)

Race

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Missing	5	26.3	26.3	26.3
	White	10	52.6	52.6	78.9
	Black	1	5.3	5.3	84.2
	Hispanic	1	5.3	5.3	89.5
	Other	2	10.5	10.5	100.0
	Total	19	100.0	100.0	

Ward

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Missing	2	10.5	11.1	11.1
	1.00	1	5.3	5.6	16.7
	3.00	2	10.5	11.1	27.8
	4.00	6	31.6	33.3	61.1
	6.00	2	10.5	11.1	72.2
	7.00	1	5.3	5.6	77.8
	8.00	2	10.5	11.1	88.9
	9.00	2	10.5	11.1	100.0
	Total	18	94.7	100.0	
Missing	System	1	5.3		
Total		19	100.0		

Sex

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Missing	2	10.5	11.1	11.1
	Male	5	26.3	27.8	38.9
	Female	11	57.9	61.1	100.0
	Total	18	94.7	100.0	
Missing	System	1	5.3		
Total		19	100.0		

Garden

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	2	10.5	11.8	11.8
	Yes	15	78.9	88.2	100.0
	Total	17	89.5	100.0	
Missing	System	2	10.5		
Total		19	100.0		

Evaluation Variables

Sustainablefarmingpre

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.0	1	5.3	5.3	5.3
	1.0	3	15.8	15.8	21.1
	3.0	3	15.8	15.8	36.8
	3.5	1	5.3	5.3	42.1
	4.0	5	26.3	26.3	68.4
	5.0	3	15.8	15.8	84.2
	6.0	2	10.5	10.5	94.7
	7.0	1	5.3	5.3	100.0
	Total	19	100.0	100.0	

Sustainablefarmingpost

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	5.3	5.3	5.3
	4	4	21.1	21.1	26.3
	5	6	31.6	31.6	57.9
	6	5	26.3	26.3	84.2
	7	2	10.5	10.5	94.7
	10	1	5.3	5.3	100.0
	Total	19	100.0	100.0	

Cropnutrientspre

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	1	5.3	5.3	5.3
	1	5	26.3	26.3	31.6
	2	5	26.3	26.3	57.9
	3	3	15.8	15.8	73.7
	4	1	5.3	5.3	78.9
	5	3	15.8	15.8	94.7
	6	1	5.3	5.3	100.0
	Total	19	100.0	100.0	

Cropnutrientspost

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	5.3	5.3	5.3
	2	2	10.5	10.5	15.8
	3	1	5.3	5.3	21.1
	4	1	5.3	5.3	26.3
	5	3	15.8	15.8	42.1
	6	3	15.8	15.8	57.9
	7	5	26.3	26.3	84.2
	9	3	15.8	15.8	100.0
	Total	19	100.0	100.0	

Biointensivepre

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	4	21.1	21.1	21.1
	1	3	15.8	15.8	36.8
	2	4	21.1	21.1	57.9
	3	3	15.8	15.8	73.7
	4	3	15.8	15.8	89.5
	5	1	5.3	5.3	94.7
	8	1	5.3	5.3	100.0
	Total	19	100.0	100.0	

Biointensivepost

		Frequency	Percent	Valid Percent	Cumulative Percent
	2	2	10.5	10.5	10.5
	3	2	10.5	10.5	21.1
	4	2	10.5	10.5	31.6
	5	7	36.8	36.8	68.4
Valid	6	3	15.8	15.8	84.2
	7	1	5.3	5.3	89.5
	8	1	5.3	5.3	94.7
	9	1	5.3	5.3	100.0
	Total	19	100.0	100.0	

Compostingpre

		Frequency	Percent	Valid Percent	Cumulative Percent
	1	1	5.3	5.3	5.3
	2	2	10.5	10.5	15.8
	3	1	5.3	5.3	21.1
	4	3	15.8	15.8	36.8
Valid	5	5	26.3	26.3	63.2
	6	2	10.5	10.5	73.7
	7	3	15.8	15.8	89.5
	8	2	10.5	10.5	100.0
	Total	19	100.0	100.0	

Compostingpost

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	2	10.5	11.1	11.1
	4	1	5.3	5.6	16.7
	5	1	5.3	5.6	22.2
	6	5	26.3	27.8	50.0
	7	5	26.3	27.8	77.8
	8	2	10.5	11.1	88.9
	9	2	10.5	11.1	100.0
	Total	18	94.7	100.0	
Missing	System	1	5.3		
Total		19	100.0		

Soilpathogenpre

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	3	15.8	15.8	15.8
	1	4	21.1	21.1	36.8
	2	2	10.5	10.5	47.4
	3	6	31.6	31.6	78.9
	5	2	10.5	10.5	89.5
	6	2	10.5	10.5	100.0
	Total	19	100.0	100.0	

Soilpathogenpost

		Frequency	Percent	Valid Percent	Cumulative Percent
	0	1	5.3	5.9	5.9
	1	1	5.3	5.9	11.8
	3	3	15.8	17.6	29.4
	4	2	10.5	11.8	41.2
Valid	5	4	21.1	23.5	64.7
	6	4	21.1	23.5	88.2
	7	1	5.3	5.9	94.1
	9	1	5.3	5.9	100.0
	Total	17	89.5	100.0	
Missing	System	2	10.5		
Total		19	100.0		

Seedlingpre

		Frequency	Percent	Valid Percent	Cumulative Percent
	0	2	10.5	10.5	10.5
	1	2	10.5	10.5	21.1
	2	5	26.3	26.3	47.4
	3	1	5.3	5.3	52.6
Valid	4	2	10.5	10.5	63.2
	5	2	10.5	10.5	73.7
	6	2	10.5	10.5	84.2
	7	3	15.8	15.8	100.0
	Total	19	100.0	100.0	

Seedlingpost

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	1	5.3	5.9	5.9
	1	1	5.3	5.9	11.8
	2	1	5.3	5.9	17.6
	3	1	5.3	5.9	23.5
	4	1	5.3	5.9	29.4
	6	7	36.8	41.2	70.6
	7	2	10.5	11.8	82.4
	8	2	10.5	11.8	94.1
	9	1	5.3	5.9	100.0
	Total	17	89.5	100.0	
Missing	System	2	10.5		
Total		19	100.0		

KnowledgeInc

		Frequency	Percent	Valid Percent	Cumulative Percent
	2	1	5.3	5.9	5.9
	3	1	5.3	5.9	11.8
	5	1	5.3	5.9	17.6
	6	2	10.5	11.8	29.4
Valid	7	4	21.1	23.5	52.9
	8	2	10.5	11.8	64.7
	9	4	21.1	23.5	88.2
	10	2	10.5	11.8	100.0
	Total	17	89.5	100.0	
Missing	System	2	10.5		
Total		19	100.0		

LikelyImplement

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4	1	5.3	5.9	5.9
	7	3	15.8	17.6	23.5
	8	3	15.8	17.6	41.2
	9	2	10.5	11.8	52.9
	10	8	42.1	47.1	100.0
	Total	17	89.5	100.0	
Missing	System	2	10.5		
Total		19	100.0		

Appendix B

Means

Race		Sustainable farmingpre	Sustainablefarmingpost	Cropnutrientspre	Cropnutrientspost	Biointensivepre	Biointensivepost	Compostingpre	Compostingpost	Soilpathogenpre	Soilpathogenpost	Seedlingpre	Seedlingpost	KnowledgeInc	LikelyImplement
.00	Mean	4.800	6.20	3.40	6.40	3.20	5.60	5.80	6.60	2.80	5.40	4.40	6.20	7.00	8.20
	N	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Std. Deviation	1.4832	2.490	1.817	2.608	1.924	2.074	1.095	1.817	1.789	2.510	2.302	2.168	2.915	2.683
White	Mean	3.600	4.90	2.30	4.70	2.20	4.30	5.10	5.89	2.40	3.63	3.30	4.63	6.75	8.75
	N	10	10	10	10	10	10	10	9	10	8	10	8	8	8
	Std. Deviation	1.7127	1.663	1.636	2.359	2.300	1.829	2.234	2.028	1.955	2.134	2.312	2.774	2.252	1.282
Black	Mean	1.000	5.00	1.00	7.00	1.00	7.00	2.00	7.00	2.00	7.00	2.00	7.00	7.00	8.00
	N	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Std. Deviation	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Hispanic	Mean	.000	5.00	1.00	9.00	.00	5.00	2.00	8.00	.00	5.00	2.00	8.00	10.00	10.00
	N	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Std. Deviation	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Other	Mean	4.250	5.50	3.50	6.00	3.00	6.00	5.00	6.50	4.00	5.00	3.50	4.00	8.00	9.00
	N	2	2	2	2	2	2	2	2	2	2	2	2	2	2

	Std. Deviation	1.0607	.707	2.121	.000	1.414	.000	1.414	.707	2.828	1.414	4.950	2.828	1.414	1.414
Total	Mean	3.658	5.32	2.58	5.63	2.37	5.00	4.95	6.33	2.53	4.59	3.47	5.35	7.18	8.65
	N	19	19	19	19	19	19	19	18	19	17	19	17	17	17
	Std. Deviation	1.8860	1.765	1.710	2.385	2.060	1.826	2.013	1.749	1.926	2.181	2.389	2.523	2.270	1.693

Ward		Sustainablefarmingpre	Sustainablefarmingpost	Cropnutrientspre	Cropnutrientspost	Biointensivepre	Biointensivepost	Compostingpre	Compostingpost	Soilpathogenpre	Soilpathogenpost	Seedlingpre	Seedlingpost	KnowledgeInc	LikelyImplement
0	Mean	3.500	4.00	3.50	4.50	4.00	4.00	6.00	6.50	3.00	3.00	4.00	4.50	4.50	5.50
	N	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Std. Deviation	.7071	.000	2.121	3.536	.000	.000	1.414	.707	.000	.000	2.828	2.121	3.536	2.121
1	Mean	.000	5.00	1.00	9.00	.00	5.00	2.00	8.00	.00	5.00	2.00	8.00	10.00	10.00
	N	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Std. Deviation	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3	Mean	5.000	6.50	4.50	6.50	1.50	4.00	6.00	6.50	4.50	5.00	5.00	6.00	5.50	8.50
	N	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Std. Deviation	1.4142	.707	2.121	3.536	2.121	1.414	2.828	2.121	2.121	1.414	2.828	2.828	3.536	2.121
4	Mean	4.333	5.50	1.67	4.50	3.00	5.50	5.33	6.33	1.67	3.80	2.83	4.60	7.40	9.20
	N	6	6	6	6	6	6	6	6	6	5	6	5	5	5
	Std. Deviation	2.1602	3.017	1.366	3.082	2.966	2.739	2.422	2.503	1.966	3.701	2.927	3.912	1.817	1.304

6	Mean	2.000	4.50	1.50	5.50	1.50	3.50	3.50	4.50	1.00	5.00	3.00	6.00	10.00	10.00
	N	2	2	2	2	2	2	2	2	2	1	2	1	1	1
	Std. Deviation	1.4142	.707	.707	.707	.707	2.121	.707	2.121	.000	.	1.414	.	.	.
7	Mean	1.000	5.00	1.00	7.00	1.00	7.00	2.00	7.00	2.00	7.00	2.00	7.00	7.00	8.00
	N	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Std. Deviation	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8	Mean	4.250	5.50	3.50	6.00	3.00	6.00	5.00	6.50	4.00	5.00	3.50	4.00	8.00	9.00
	N	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Std. Deviation	1.0607	.707	2.121	.000	1.414	.000	1.414	.707	2.828	1.414	4.950	2.828	1.414	1.414
9	Mean	4.000	5.50	3.00	6.00	1.50	5.00	6.00	6.00	4.00	5.00	4.50	6.00	6.50	8.50
	N	2	2	2	2	2	2	2	1	2	2	2	2	2	2
	Std. Deviation	.0000	.707	.000	1.414	2.121	.000	1.414	.	1.414	.000	.707	.000	.707	.707
Total	Mean	3.583	5.28	2.44	5.56	2.33	5.00	4.94	6.29	2.50	4.50	3.39	5.31	7.06	8.56
	N	18	18	18	18	18	18	18	17	18	16	18	16	16	16
	Std. Deviation	1.9117	1.809	1.653	2.431	2.114	1.879	2.071	1.795	1.978	2.221	2.429	2.600	2.294	1.711

Sex		Sustainablefarmingpre	Sustainablefarmingpost	Cropnutrientspre	Cropnutrientspost	Biointensivepre	Biointensivepost	Compostingpre	Compostingpost	Soilpathogenpre	Soilpathogenpost	Seedlingpre	Seedlingpost	KnowledgeInc	LikelyImplement
.00	Mean	3.500	4.00	3.50	4.50	4.00	4.00	6.00	6.50	3.00	3.00	4.00	4.50	4.50	5.50
	N	2	2	2	2	2	2	2	2	2	2	2	2	2	2

	Std. Deviation	.7071	.000	2.121	3.536	.000	.000	1.414	.707	.000	.000	2.828	2.121	3.536	2.121
Male	Mean	4.200	6.40	2.60	6.00	3.60	5.80	6.00	8.00	2.40	5.00	3.40	6.25	8.25	10.00
	N	5	5	5	5	5	5	5	5	5	4	5	4	4	4
	Std. Deviation	2.6833	2.302	2.408	4.123	3.050	2.775	2.550	1.225	2.881	3.742	3.362	4.193	1.708	.000
Female	Mean	3.318	5.00	2.18	5.55	1.45	4.82	4.27	5.40	2.45	4.60	3.27	5.10	7.10	8.60
	N	11	11	11	11	11	11	11	10	11	10	11	10	10	10
	Std. Deviation	1.7360	1.549	1.250	1.293	1.293	1.537	1.794	1.578	1.809	1.713	2.149	2.079	2.079	1.174
Total	Mean	3.583	5.28	2.44	5.56	2.33	5.00	4.94	6.29	2.50	4.50	3.39	5.31	7.06	8.56
	N	18	18	18	18	18	18	18	17	18	16	18	16	16	16
	Std. Deviation	1.9117	1.809	1.653	2.431	2.114	1.879	2.071	1.795	1.978	2.221	2.429	2.600	2.294	1.711

Appendix C
Open/Axial Coding

Question 8: Why or why not would you consider implementing what you learned in your neighborhood or backyard?

- Absolutely. Because nutrition is important as plant performance to me.
- Learned some interesting approach to try composting in the garden.
- Very good info – quite a bit for this novice gardener. Looking forward to returning next year.
- Yes. I learned methods to improve soil and nutrients of food in what I grow
- Things I learned will help me be better
- Without good soil, can produce good herbs for medical purposes.
- Seems easy and helpful for yields
- Good reminders and new information about responding to soil and plant needs
- Yes, want to improve garden skills
- Will improve my outputs of produce
- Feel more prepared to address problems
- This workshop helped me gain practical knowledge on how to prepare my soil for my gardening, amend the soil and increase my soil health.
- Because by utilizing all that I learned with "teaching moments" for educating my neighbors.

I want to implement what I learned in my neighborhood or backyard because:

- I want to improve the nutrition quality of my food (2)
- I want to improve my yields (2)
- I learned new information (7)

Question 10: Do you have any suggestions to improve the soils management workshop?

- I think you guys did a great job. There was a great turnout.
- Didn't have enough time to learn about nutrient density farming. Not sure how to implement techniques.
- Include more DC residents from Wards 8 & 7
- More classroom space

- Anything hands-on would make it even more valuable. Seedling management would easily lend itself to hands-on, but would require various levels of seedling development in advance
- Yes, make it available online. Stream it.
- Jon Frank – too long – too long to sit. More interactive sessions
- It was a great but maybe more hands-on activities
- Allow more time
- A talk on DC area-specific growing problems and appropriate plant choices in the face of climate change
- I thought it was awesome!! The informality of the venue made the subject matter less intimidating

Changes:

- Allow more time for workshops (2)
- More hands-on activities (3)