2017 University of the District of Columbia Combined Research and Extension Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

1. **Executive Summary**

As the only public institution of higher learning in our nation's capital, and the only exclusively urban land-grant university in the United States, the University of the District of Columbia (UDC) and its College of Agriculture, Urban Sustainability and Environmental Sciences (CAUSES) continue the effort to position the University as a leader in urban-centered education, research, and community outreach (cooperative extension) at the local, regional, national and international level. UDC is a historically black, relevant and progressive urban land-grant institution in and for the District of Columbia that offers associate, baccalaureate, graduate and professional degree programs, as well as community education workshops, demonstrations and certificate programs to learners of all ages.

The College of Agriculture, Urban Sustainability and Environmental Sciences (CAUSES) embodies the land-grant tradition of UDC. In addition to offering innovative academic programs in architecture, urban sustainability, urban agriculture, water resources management, health education, nursing, and nutrition and dietetics, CAUSES also offers a wide range of applied research and community outreach programs through our five land-grant centers: (1) the Center for Urban Agriculture & Gardening Education; (2) the Center for Sustainable Development and Resilience, which includes the Water Resources Research Institute; (3) the Center for Nutrition, Diet & Health, which includes the Institute of Gerontology; (4) the Center for 4-H & Youth Development; and (5) the Center for Architectural Innovation and Building Science, which includes the Architectural Research Institute and the Building Science Institute.

The CAUSES mission is to "...offer research-based academic and community outreach programs that improve the quality of life and economic opportunity of people and communities in the District of Columbia, the nation and the world." In CAUSES, we recognize that, like ecosystems, we are connected to people and places right here in our own neighborhoods, and to those half way around the world. Pollution travels, resources are not always consumed where they are generated, and job markets are increasingly global and knowledge-based. Given these realities, we aspire to teach people to think in systems, work in diverse teams, and focus on connectivity and innovation. We apply these principals to all of our programs including our Master's and Bachelor's degree programs, professional development certificates, and community workshops and events. We are deeply committed to being relevant to the residents of the District of Columbia. Given our three-pronged approach of teaching, research and community outreach, we seek to make a measurable, positive difference in the lives of people right where they live and work. As a result, our programs focus on improving economic conditions, social and cultural circumstances, and the health of people and their living environments. Given our location in an exclusively urban environment, we use the terms 'community outreach' and 'cooperative extension' interchangeably. Only a few of our constituents were familiar with the term 'cooperative extension' but found the term community outreach rather descriptive. As a result, we have been using the latter to describe the scope of our community education work as 'community outreach' to offer a more familiar term to residents and organizations in the District of Columbia.

Our research and community outreach programs are more than local. They also serve as a model for relevant learning far beyond our region. Our tag line, "Healthy Cities - Healthy People," captures these commitments. Key to our success has been the integration of our academic and land-grant programs, and the integration of relevant applied research (Agricultural Experiment Station - AES) and community outreach and education (Cooperative Extension Service - CES) responsibilities into every one of our Land-grant Centers. Land-grant universities have always sought to be relevant to the needs of their communities by focusing on research that makes a difference in the lives of local people and organizations in the regions they serve; and by offering education both on their campuses and in local neighborhoods.

Consistent with the priorities of the USDA, and the needs of residents and public, private, and non-profit sector partners in the District of Columbia, our goals are derived from key NIFA objectives, such as improving (1) food security, (2) food safety, (3) mitigating climate change, (4) combating childhood obesity and other food related health problems, (5) improving water management and water safety, and (6) expanding alternative energy.

Finding solutions to real-life challenges requires collaboration across academic disciplines, hands-on work, and perseverance. For CAUSES, this means that we work together across many fields to find solutions to the aforementioned challenges. Yet given our location, our focus is exclusively urban. This exclusively urban focus sets us apart from all the other land-grant universities in the United States. We also create important alliances like urban agriculture and urban sustainability, and urban health and resiliency.

An important element of our ability to find solutions is the University's Agricultural Experiment Station, Firebird Farm, formerly, Muirkirk Farm. This is where innovative small scale food production methods, including the use of technology, are developed, tested, and improved before they are deployed into urban neighborhoods. Firebird Farm is quickly becoming a go-to place for urban farmers and gardeners and anyone who wants to learn how to make agriculture a viable profession in an urban setting.

Relatively few DC residents find us because they are motivated to become urban farmers. Most residents are initially motivated by the goal of improving their own health or that of their families, their quality of life, or their economic opportunities; some are motivated by the goal of making their neighborhoods safer; and some want to build capacity and expand the opportunities available to their neighbors and extended family. Yet research in the tradition of the Land-grant University is not enough when urban populations are the focus. We must work with coalitions across the city to link urban agriculture to health, urban sustainability, water management, and resiliency. We have accomplished this through our Urban Food Hubs concept that was pioneered by Dr. Sabine O'Hara, Dean of CAUSES and Land-grant Programs (O'Hara, S. 2015. Food Security: The Urban Food Hubs Solution. Solutions January-February, www.thesolutionsjournal.org; O'Hara, S. 2017. The Urban Food Hubs Solution: Building Capacity in Urban Communities. Metropolitan Universities Journal. Vol. 28 No. 1 (Winter), DOI: 10.18060/21477).

The Urban Food Hubs concept offers a comprehensive approach to urban food security that incorporates the whole value chain of food through four integrated components: (1) food production; (2) food preparation; (3) food distribution; and (4) closing the loop through waste and water recovery. To date we have implemented four Urban Food Hubs across the District of Columbia. Three of them are located in food desert neighborhoods in Wards 5, 7 and 8. Moreover, we are applying the urban food hubs concept and its four components to other projects that we are implementing in partnership with community based organizations across the District of Columbia.

In addition to providing non-credit bearing learning and capacity building programs in the tradition of the cooperative extension service, the CAUSES Urban Food Hubs also strengthen UDC's academic programs. Through programming offered by the five Land-grant Centers of CAUSES, the Urban Food Hub locations offer learning and leadership opportunities by providing students with hands-on, practical service

learning experiences, internships and research opportunities that (a) foster relevant experiential learning and (b) facilitate employability and skills development. Given our three-pronged approach of teaching, research and community outreach, we seek to make a measurable, positive difference in the lives of people right where they live and work. Our vision is to be a world leader in designing and implementing top quality, research-based academic and community outreach programs that measurably improve the quality of life and economic opportunity of people and communities in the District of Columbia, and urban communities across the nation, and the world.

Some of our College-wide stakeholder events in FY 17 were located at our Urban Food Hubs locations, others used partner locations including the following:

- 9/11 Day of Service

The University of the District of Columbia's College of Agriculture, Urban Sustainability, and Environmental Sciences (CAUSES) and The Mission Continues Washington DC Service Platoons joined forces in order to upgrade the East Capitol Urban Farm Food Hub (ECUF), located in Ward 7. The Mission Continues offers the opportunity for veterans and civilians to give back to their community, and become stronger citizens. It's a collective effort that empowers veterans to serve in new ways, solve tough challenges, and mobilize communities to serve alongside them. ECUF is a multi-functional, three acre Urban Food Hub that includes community gardens, an aquaponics system, a nature trail, community art, and a learn and play space for children. The farm is a result of a collaboration between CAUSES and the District of Columbia Housing Authority. Other partners engaged in the development of this Ward 7 Urban Food Hub are the Urban Waters Federal Partnership, several District of Columbia government agencies, community organizations, churches, and local businesses. The ECUF-Food Hub is one of several urban food hubs pioneered by the CAUSES to improve food security and sustainability in DC neighborhoods through food production, food preparation, food distribution, and waste and water management.

CAUSES is leading the urban agriculture initiatives in Washington DC and the nation. The partnership between CAUSES and Mission Continues was aimed at improving the farm's connection to the local community, while also improving the community's access to sustainable food production methods, more appealing food distribution options, and healthy foods. The initiative moved ECUF-Food Hub forward through an improved 'learn and play' area to host local children and schools, and teach them about the efficacy of urban sustainability, local community farming, and the benefits of eating more fresh unprocessed foods. As a result of this build day, the ECUF-Food Hub now has an expanded community garden, a new nature trail, new farm stands, a new STEM education space, and a shaded area where the community can gather.

- Aquaponics Ribbon Cutting

The University of the District of Columbia's (UDC) College of Agriculture, Urban Sustainability and Environmental Sciences (CAUSES) held the official ribbon cutting ceremony for its newest aquaponics system located at UDC-Van Ness campus. Stakeholders and community members participated in a tour of the greenhouse and demonstrations of the aquaponics system. Dr. Sabine O'Hara, Dean of CAUSES & Landgrant Programs, UDC President Ronald Mason, and Director of Department of Energy & Environment, Tommy Wells, offered remarks at the ribbon cutting event. Aquaponics refers to a combination of hydroponics (growing plants in nutrient rich water) and aquaculture (fish production). It is a growing field that presents not only potential career options but helps students and District residents learn about hydroponic production, nutrient management, and urban markets for hyper-local agricultural production. In an aquaponics system, fish and plants grow together in a symbiotic relationship. The systems convert waste produced by the fish into fertilizer for plants, which in turn filter out the nutrients, so that the water can recirculate back into the fish tanks. The new system is also an expression of the CAUSES' mission to create economic self-sufficiency by building green jobs and community access to

production facilities that can serve as business incubator and training facility to build local capacity.

In 2015, UDC CAUSES was awarded a grant to establish four aquaponic facilities in Wards 3, 5, 7 and 8. The facilities were envisioned as a key food production component of the UDC Urban Food Hubs. In May 2016, UDC held a ribbon-cutting for its first aquaponics facility at the East Capitol Urban Farm- Food Hub in Ward 7. UDC's continued growth in aquaponics will serve as a base for developing job-skills and offering entrepreneurship training for low-skilled District residents. Our test results and economic calculations show that each facility is able to generate upwards of $150,000 in annual revenue with different production models of specialized high revenue food production offering substantially higher profit potential than models that focus on a broad range of food plants for direct marketing in food desert neighborhoods. What is called for may be a socially responsible revenue model that addresses local food security and food access needs while capturing the higher profit potential of high revenue crops.

- Food, Family and Fun Fairs

The College of Agriculture, Urban Sustainability and Environmental Sciences (CAUSES), of the University of the District of Columbia (UDC), hosted a Food, Family and Fun Fair at the Bertie Backus Urban Food Hub on September 16, 2017, and at the P.R. Harris Urban Food Hub on September 23, 2017. Both events helped bring alive our motto, " Healthy Cities, - Healthy People." We engaged the Wards 5 and 8 communities by providing greenhouse tours, free produce giveaways, live food demonstrations, and information about CAUSES' academic and land-grant programs. Additionally, representatives from Sustainable DC and from the CAUSES Center for Sustainable Development and Resilience were on hand to explain the link between urban agriculture and improved storm water management and to explain the efficacy of rain gardens. Music, family-friendly activities, the invitation to sign up for a raised bed garden at the community garden location of the Urban Food Hubs sites, a picnic lunch, and feedback forms regarding the community outreach and education activities offered through CAUSES, made the two events a great opportunity for stakeholder outreach and feedback at both locations.

- Firebird Farm Open House

The College of Agriculture, Urban Sustainability and Environmental Sciences (CAUSES), held an open house at Firebird Farm on September 29th. Located in Beltsville, the 143-acre facility is a research farm with an agenda larger than producing fruits and vegetables. The farm strives to answer questions about state of the art urban agriculture practices with the goal of expanding the availability of locally grown food in Washington D.C. and its specific climate conditions. The open house provided the opportunity to share the farm's latest research developments and enjoy some of the freshly grown produce. Chef Herb Holden of the CAUSES Center for Nutrition, Diet and Health offered food tastings made with produce sourced from the farm. Also, tours were offered throughout the day by staff from the Center for Urban Agriculture and Gardening Education.

This annual report documents accomplishments and results for our Agricultural Experiment Station research and Cooperative Extension Service programs for Fiscal Year 2017. Due to our urban context and the unfamiliarity of urban populations with a terminology that grew out of rural land-grant programs, we refer to these programs as 'Relevant Applied Research' and 'Community Outreach and Education'. The focus of our programs is consistent with the NIFA objectives outlined in the 2014 Farm Bill, and includes: (1) Climate Change Mitigation; (2) Global Food Security and Hunger; (3) Health, Nutrition and Childhood Obesity; (4) Alternative Energy and Economic Capacity Building; (5) Water Safety and Water Management; and (6) Food Safety.

The activities of our Center for 4H and Youth Development cut across all of these six programmatic areas in terms of the content areas of our youth development programs. For this year's reporting purposes, 4H activities will be reported in a separate section of this report under number 7.

1. Climate Change Mitigation

1.1.1 Relevant Research

1.1.1.1 Establishing the Computational Infrastructure to Conduct Climate Change Research

An important focus of our Climate Change Mitigation activities has been the establishment of the computational infrastructure at UDC to conduct climate change research for the District of Columbia. To understand and adapt to climate change related issues, a number of federal, state and local government agencies have launched several evaluations of the vulnerability of their critical infrastructure to mitigate against the possible effects of climate change. Climate change has the potential to increase the variability in extreme weather events. Washington, DC is very important because the city houses a significant number of federal agencies, several national monuments, international embassies and serves as a major economic center for the Washington Metropolitan area. The increase in temperature can result in extreme precipitation events which can have significant impacts on the critical infrastructures of the District of Columbia, life and property of residents and on the overall economy of the Metropolitan DC area. There is a need to study the climatic parameter such as precipitation and its trend which would be useful for planners, engineers and water resource professionals in making informed decisions about climate change in planning, designing, operating, and maintaining the water resources systems.

In this particular research project, the key inputs, temperature and rainfall, are treated as key natural variables which have significant influence in climate change. Understanding these natural variables will benefit our decision-making in adaptability of climate change. The major goal of the project was to establish computational infrastructure at UDC to initiate climate change research for the District of Columbia, which was successfully accomplished through procurement of appropriate computational infrastructure, commission of infrastructure, rainfall data collection, development of the storm event analysis software tool, and incorporation of climate change modules in the courses.

In the final year of the project, two tasks were carried out which included (i) development and testing of storm event analysis software tool and (ii) development of web site design. The development of software tool took a significant portion of research efforts through training of a student in writing the computer code, debugging and testing for reliability. The web site design was planned and designed, however got delayed in implementing due to issues arising from design alignment with the university web site. We emphasized completion of analytical software tool over the development and implementation of web site because the student who worked on the project was trained and was in the final year of graduation. The accomplishment of software tool is more important for future research. The web site will be implemented after sorting out the remaining issues regarding the needed alignment with university web site design. The research project is completed. The following was accomplished under the major goals of the project:

- Identification, selection and procurement of computer server systems and its accessories - completed and implemented.
- The Database system design is completed for precipitation and stored procedure analytical tool to store the data is completed.
- Hourly long-term precipitation data were collected, processed and uploaded into the database server.
- The storm event analysis software tool was conceptualized, developed and tested for accuracy.
- The web site design has been completed and implementation has not been accomplished due to hosting and alignment issues with university website.

The preliminary results from the research, specifically from the storm event analysis software analytical tool, were presented at the 2017 World Environmental and Water Resources Congress, organized by Environmental Water Research Institute (EWRI) of American Society of Civil Engineers, May 21-25, 2017

Sacramento, CA. The title of the presentation was "Variability of Storm Event Characteristics in Different Climate Zones of Continental United States: Implications for Stormwater Management and Hydrologic Design" and presented by Pradeep Behera. Two students were hired for this project: one computer science graduate student and one architecture graduate student. The work provided a valuable learning opportunity for our students. The faculty members involved in this study trained the hired students and team members of the project. Following are significant products/outputs achieved during the project; we were able to implement the following steps:

- Commissioned computer server systems and set it up for the development of the software system.
- Downloaded the hourly precipitation data from NOAA web sites.
- Designed the database system and developed a stored procedure analytical tool to store the data for easy retrieval and use.
- Conceptualized and developed storm event analysis software tool and tested for accuracy.
- Disseminated our results through conference presentations at the regional and national level (DC Water Symposium and EWRI ASCE World and Environmental Congress).
- Faculty researchers have introduced climate change research in their course works.
- The team has researched and designed the preliminary layout for the web site development, which will serve all stakeholders including engineers, water resources professionals, agricultural professionals and health professionals.

The target audience for this research project included students and faculty, engineers, and water resources, agricultural and health professionals. Once the website component of the project has been implemented we expect a considerable increase in the utilization of the research results generated.

1.1.2 Community Outreach and Education (Cooperative Extension)

1.1.2.1 Climate Change Knowledge Formation

The concept of climate change is foreign to many communities of low socioeconomic status. Twelve workshops were offered that included education on climate change and its impacts. 85% of participants articulated an increase in knowledge in their understanding of climate change. 85% of participants also stated that they would change their behavior in response to the knowledge gained on the topic of climate change.

These are encouraging results. Additional projects to increase literacy about climate change and sustainable development are in preparation to build on the success of the community education programs offered in 2017.

1.2 Global Food Security and Hunger

1.2.1 Relevant Research

1.2.1.1 Determining Effects of Nitrogen Fixing Plants on Nutrient Density and Productivity in Agroforestry and Polyculture Systems

Like urban centers around the world, Washington DC is faced with challenges in providing fresh, healthy food to its residents, especially the underserved and low-income populations. Five percent of all households in the District have very low food security, while a total of thirteen percent have food insecurity. DC ranks second worst in the nation, exceeded only by Mississippi for the highest number of households with children that cannot afford enough food (20). Over 34,000 people live in areas classified as "food deserts," living more than a mile away from a supermarket (USDA ERS 2014). Most of these areas are in Wards 5, 7, and 8, where 95% of the population is African-American and more than one third of the households have yearly income below the federal poverty line of $22,000 for a family of four (19). In the

face of these statistics, the District of Columbia is looking for ways to improve access to fresh, nutrient dense food for all of its residents.

The District of Columbia is embedded in lush East Coast temperate forest. As issues of sustainability and food security are addressed, practical solutions to creating and increasing local productivity are being considered. The mayor of the District of Columbia has created a food policy council. Recently, the DC Urban Food Farm and Food Security Act of 2014 passed. Under this act, the mayor will identify urban plots to lease out to qualified applicants, offer tax credits for land owners who lease their land to growers, and work to promote buying locally grown food in order to support urban food production within the District (3). While this is a big step in helping to increase the availability of locally grown food, it is important that sustainable agricultural practices are a part of this change.

Sustainable and organic farmers throughout the nation are warming up to and embracing ideas such as permaculture, agroforestry, restoration agriculture, edible landscaping, rooftop gardening, and farming the woods. All of these models have the core concept of working with native plants and forestlands to produce sustenance crops that have marketable potential incorporated into a closed-loop system of agriculture. Urban runoff and agricultural waste are leading contributors of nutrient, bacterial, and toxic pollution to area waterways including the Anacostia Watershed and the Chesapeake Bay (11). Agroforestry and polyculture systems use nitrogen fixing trees and bushes along with cover crops to provide nitrogen. Polycultures and closed loop systems of food production have the potential of significantly lessening pollutants by decreasing agricultural inputs and limiting potentially toxic outputs. Agroforestry and polyculture systems rely on nitrogen fixing trees and bushes along with cover crops to provide nitrogen. Assessing the impact of nitrogen fixing plants on the resiliency and productivity of the system provides alternatives to standard nitrogen inputs. Determining nitrogen contributions from trees and bushes vs. cover crops will help provide information that growers can use to create efficient low-input and closed-loop nitrogen cycling.

Traditional large-scale growing practices have a significant environmental impact and also are not possible within urban settings. Agroforestry and/or polyculture, i.e. the cultivation of multiple crops in a closed loop system, is rising in popularity as growers and homeowners look for sustainable, low input methods of production for both sustenance and market crops. Such solutions can be applied to backyards or abandoned city lots. While there is a lot of potential for these types of systems to be successful at providing food and restoring ecosystems, it is still a new concept and requires some shifting from traditional practices. In order to demonstrate viable polyculture crops for the Mid-Atlantic region, we plan to design a ¼ acre plot that will consist of a variety of species including fruit and nut trees, fruit bushes and vines, and plants that are beneficial as ground cover, for nutrient building properties, or to attract beneficial insects. By using a wide range of plants, it will help to ensure that regardless of the season or environmental fluctuations, something will be flourishing and providing sustenance for the grower and creating a system where the plants complement rather than compete with each other.

Polyculture systems have other benefits for urban areas. Through design, the edges of the plot can be used as a noise barrier for those situated near high traffic roads or to block the view for those located near undesirable vantages. They also help to protect an area from sunlight and wind. Hedgerows are beneficial for the other plants in the guild by hosting pollinator and predatory species that help ensure a good harvest and protection from pest species. Other plants, such as daffodils, are beneficial both to plants around urban houses and in the polyculture plot for deterring rodents from entering the house or feasting on the bounty growing in the plot (16). All of these benefits will help to enhance the beauty of the city and the health of those living here.

UDC CAUSES and Bread for the City began City Orchard at the Firebird Farm in 2011. The project consists of 540 apple and 120 Asian pear trees along with blackberries, blueberries, raspberries, and strawberries. Apples, while chosen for their familiarity and acceptability among urbanites as the premiere

fruits, require much care and spraying because they are being grown in a temperate forested region. Though disease resistant strains were chosen for their potential to resist fire blight, other diseases such as cedar apple rust and apple scab make it almost impossible to produce aesthetically pleasing fruit without the use of chemical fungicides and other agents, which make apples one of the most toxic fruit on the market. This project makes clear that more work needs to be done in understanding and creating minimal input systems that are self-sustainable. Hence, this project will help identify potential perennial food crops that can help increase local food security while help reduce toxic agricultural and landscape runoff from chemical fertilizer use.

This project is contributing to the development of alternative food production methods that are practical for urban areas, such as Washington DC, to implement in backyards or on abandoned city lots. This will increase access to fresh, nutrient dense food that will help to improve the overall health of the citizens. Agroforestry and polyculture systems are designed to incorporate a variety of complementary plants to minimize the amount of inputs needed to maintain a healthy and productive plot. A polyculture plot at UDC Firebird Farm will be used for data collection on how different nitrogen fixing plants affect nutrient density and productivity, trialing various species to determine the best ones for the area, and also used as a model for education on how to establish successful polyculture plots in the city.

During the reporting period, analysis of the designated plot at the farm revealed some serious drainage issues that would have made it difficult for the plants to successfully establish themselves and be healthy. Drainage tile was installed to correct this issue. The plots have been prepped for planting in FY 18. We are actively looking for a student to work on the project for this coming season. Once the plants have been planted, data collection will begin. We plan to hold a workshop on site in the fall to begin sharing our learnings with the community.

1.2.1.2 The Urban Food Hubs Solution

CAUSES recognizes that improving Global Food Security and Hunger is one of the most important goals of urban agriculture and urban sustainability. Without securing a steady and dependable supply of highly nutritious food, urban communities cannot claim to attain sustainability. With more than half of the world's population, and over 80 percent of the U.S. population now living in urban communities, food travels over longer distances resulting in declining nutrient density, high energy demand and greenhouse gas emissions associated with a transport intensive food system, increasing vulnerability of urban food supplies, and growing health disparities due to unequal access to fresh food.

Using the pioneering work of Dr. Sabine O'Hara, CAUSES has begun implementing the concept of Urban Food Systems Hubs that operationalize her work on Sustaining Production (O'Hara 1996, 1998, 2004, 2012, 2013). Sustaining Production expands the traditional success measures of production such as profit maximization and productivity to simultaneously consider reducing emissions (negative externalities) and improving sink capacities. The Urban Food Systems Hubs consist of the following components:

1. Food production through highly efficient small-scale urban systems, including hydroponics and aquaponics;
2. Food preparation through commercial kitchens that serve as business incubators;
3. Food distribution through networked farmers markets, grocery stores and restaurants; and
4. Waste management and recycling through food waste processing, composting, energy generation, and water management.

All four components of the Urban Food Systems Hubs offer business development and job creation opportunities. To capitalize on these opportunities, the Hubs serve not only as sustainable production facilities, but also as training sites especially in the food desert areas of Wards 5, 7 and 8 where unemployment is high and food related public health problems including diabetes, hypertension and

obesity are prevalent.

Among the eight wards in the District of Columbia, Ward 8 is the most underserved and is located in the southeastern quadrant of Washington, DC, south of the Anacostia River. In 2012, the average household income in Ward 8 is $38,000 and unemployment was close to 24 percent. This compares to an average household income of $99,500 across all eight of the DC Wards and to an average $162,000 per household in Ward 3, which is home to the highest household incomes in the District of Columbia.

Twenty percent of the population in Ward 8 is under the age of 18; 91 percent are African American, 1.5 percent are Hispanic, slightly more than 4 percent are Caucasian, and less than 1 percent are Asian. The percentage of college graduates in Ward 8 is 7.6 percent compared to an average of 22.5 percent across all eight Wards.

Preliminary results of the productivity tests and revenue calculations for the Urban Food Hubs sites in Ward 5, 7 and 8 indicate that urban food production is commercially viable. However, the type of production that yield a wide range of vegetables for local production may not reach the same level of productivity as the production of high revenue crops for value added production or direct marketing to high revenue niche markets. Further research will be needed to identify socially responsible business models that meet the multiple objectives of the urban food hubs project. The models must at the same time improve food security objectives and high revenue objectives to create the maximum number of jobs possible.

1.2.1.3 Reducing Impacts of Solar Radiation on a Crop Producing Green Roof, and Modifying Roof Microclimates through an Adjacent Crop Producing Green Facade

The District of Columbia has millions of square feet of roof area. This roof area negatively impacts the urban environment and climate in several ways: the roof surface area absorbs a significant amount of heat, and is the greatest factor in residential energy consumption in certain climates (Kliman, 2001). Light colored roof coatings can ameliorate this problem by reducing the heat absorption; however, these coatings require regular maintenance, darken with dirt accumulation and age, and do nothing to address the increased runoff created when the previously vegetated site was replaced by an impermeable surface. These reflective roofs, coupled with the higher thermal mass of typical building materials like concrete and brick, are significant factors in the urban heat island in urban environments such as the District of Columbia.

Vegetated, or green, roofs can mitigate the effects of the urban heat island and water runoff in several ways. By improving the thermal performance of a building, a green roof can reduce the annual load for cooling the building (Garrison, 2012). A smaller mechanical system translates into reduced CO2 emissions. The plants also reduce the radiation reflected back into the atmosphere from the roof. Finally, water retention and evapotranspiration of rainfall helps reduce runoff. These green roofs can contribute to an urban environment in other positive ways. A well-designed green roof can have a park-like setting, and serve as a nice amenity for building users. A green roof can also be used to grow crop producing plants. In this configuration, the roof serves as an important component in helping to ensure food security in an urban environment.

One of the challenges with fully utilizing the roof for cultivation of plants is the fact that many roofs have a penthouse for the mechanical system. This penthouse has solid vertical walls that reflect the sunlight and heat back onto the roof. The reflected light and heat is deleterious to the growth of many plants - particularly crops. This study is conducted to determine the viability of using a three dimensional modular lattice system to support crop-producing vines that would cover the walls and reduce this reflected sunlight and heat. The research project is a parallel study that would utilize two existing green roofs - the one on the UDC campus, and one at a k-12 independent school located due west in McLean, Virginia. The UDC roof will test conditions and impacts in a dense urban environment, five floors above grade. The Virginia

site will test conditions and impacts in a heavily vegetated suburban environment, two floors above grade. The test areas will be divided into three sections. The lattice on one section will support dense vine crops. The lattice on the second section will support moderately dense vine crops. The third section will serve as the control, with no lattice or vines. The roof area adjacent to the walls will be planted with micro greens.

Measurements will be taken at regular intervals away from the wall to determine temperature, relative humidity, and solar radiation. It is anticipated that the dense vine crops will provide shading and reduce the reflected sunlight by as much as 20%. It is further anticipated that the air temperature adjacent to the vines will be reduced by 2- 8°C (Connelly, 2012). These two variables should provide a better environment for the plants located in the adjacent shallow beds, and result in a higher crop density. With thriving crop producing vines, and an increase in the usable roof area for planter beds, the overall potential for increased food production on the roof is significant. The ability to increase food security, while also mitigating the urban heat island and reducing the harmful runoff, simply by using existing roofs in the District has an enormous potential to positively impact the overall sustainability of the city. Furthermore, this condition of reflected heat is not limited to roofs with penthouses or partial floors on the same level.

The results of this study will have relevance to the creation of urban farms, and even the homeowner with the garden plot. Student participation will provide hands-on learning experiences for college level and k-12 students, and there are numerous outreach opportunities through the activities of the Center for Urban Agriculture and Gardening Education, Cooperative Extension Service of UDC. The primary goal of this study is to determine whether the installation of a green facade, constructed with a commercially available three-dimensional modular trellis system, can successfully reduce the reflected heat and light from building penthouses located at the same level as the green roof on the adjacent roof surfaces/planters. Solar insolation values and temperatures at the roof penthouse walls and regular intervals away from the wall will provide valuable data regarding the potential of the facade to impact the microclimate on the adjacent roof. By altering the density of the foliage on the green facade, the research will measure and observe whether the reduction reflected light and heat and modifications to the microclimate are sufficient to allow for the successful production of crops, such as micro greens, on the roof surface adjacent to the wall. The data will also provide information regarding the ideal density of the green facade. Further, the study will test the viability of crop producing vines in this type of installation.

A series of measurements will document the magnitude and extent of microclimate modification from the green facade. Crop densities will also be measured on the adjacent green roof. The magnitude and extent of the impact that will be determined by this study are important variables that can be used in the implementation of new green roofs, as more urban environments tackle solutions to food security. Further, by comparing the results of the two different microclimate conditions of the study sites, it may be possible to make inferences on a broader scale. The potential to ameliorate the deleterious impacts of radiant and solar gain from vertical building surfaces on adjacent horizontal garden plots is significant. Urban gardens and farms throughout urban areas - including the Urban Food Hubs being implemented across the District by UDC - will be able to benefit from the knowledge of strategies that will allow for greater flexibility in design, and maximum use of the available land. It is anticipated that the results gained from this study can be disseminated not only in research publications, but also in many of the extension activities of the CAUSES Center for Urban Agriculture and Gardening Education.

One of the challenges with fully utilizing a green roof for cultivation of plants is the fact that many roofs have a penthouse for the mechanical system. This penthouse has solid vertical walls that reflect the sunlight and heat back onto the roof. The reflected light and heat is deleterious to the growth of many plants - particularly crops. The primary goal of this study is to determine whether the installation of a green facade, constructed with a commercially available three-dimensional modular trellis system, can successfully reduce the reflected heat and light from building penthouses located at the same level as the green roof on the adjacent roof surfaces/planters. The results will provide valuable information for both the design and installation of crop producing green roofs, as well as the design and creation of the typical

household garden.

The ability to increase food security, while also mitigating the urban heat island and reducing the harmful runoff, simply by using existing roofs in the District has an enormous potential to positively impact the overall sustainability of the city. Furthermore, this condition of reflected heat is not limited to roofs with penthouses or partial floors on the same level. The results of this study will have relevance to the creation of urban farms, and even the homeowner with the garden plot. The following occurred during the reporting period:

1. Procured and oversaw installation of green facade system at both study sites
2. Tested soil at both study sites
3. Procured replacement soil for both study sites
4. Procured all seeds and planters for the vines crops
5. Conducted detailed literature review
6. Planted test crop of chard in greenhouse
7. Data Collection
8. Soil nutrient data for both roofs

Summary statistics and discussion of results:

There were no overall study statistics obtained; however, the process of getting the research project initiated did reveal some critical information regarding the setup of the study.

Nutrient data from the roofs of the study sites revealed that there was a need to modify the proposed plan of study slightly. When the proposal was written, the soil on the UDC roof was relatively newly placed, while the soil on the Potomac School roof had been in place for several years. It was assumed that new soil on the Potomac School roof would be necessary, and it would have a similar nutrient profile to that of the UDC roof. Discussions with colleagues in the UDC Center for Urban Agriculture and UDC Water Resources Research Laboratory as preparations were being made to begin the study, however, revealed that tests conducted in other areas of the roof had revealed a dramatic change in the nutrient profile over the two (2) years the material had been in place. The decision was thus made to test the soil on both study sites. The results indicated that the two study sites were dramatically different, and confirmed that the nutrient profile of the UDC roof was significantly different from the new soil to be used on the Potomac roof. This data led to the decision to replace the planting material on both study sites so that the overall results of the study could not be impacted by different soil profiles. By the time the soil was procured, the growing season was winding down. The decision was made to keep the soil in its' manufacturer's packaging and wait to install until just before the 2018 growing season.

The chard planted in the greenhouse, was in small containers with shallow soil. The study sites will be such that the plant roots will be able to expand; however, the planting beds will only be about 40% deeper than the starter pots. The greenhouse plants required regular watering during the warm months of summer. This result confirmed the study design that an irrigation system will be critical to the success of the crops. Plans are underway to have the irrigation systems installed at both study sites.

During the study year, critical materials/components for the research project were procured and/or installed. Work is underway to ensure that both study sites will be configured and a data will be collected for the full growing season in 2018. During the reporting period, one undergraduate student worked for two semesters to assist with the literature review, initial plantings in the greenhouse, and the procurement of equipment and supplies. Both the student and the PI gained knowledge regarding soil chemistry and the soil requirements for a crop producing green roof. This knowledge is critical because of the increase in green roofs and the fact that architects are the ones who often write the specifications for the construction

of these roofs.

In addition, the PI gained preliminary knowledge on the installation of data loggers and data collection systems. This information will be important for the current project, as well as future building science projects. This research project was presented at a joint meeting of the DC Chapters of the American Institute of Architects and the U.S. Green Building Council. The research was one part of a larger presentation about the UDC green roof, including benefits, design considerations and challenges, and research attendees received professional continuing education credits. There were approximately 40 attendees.

For the next reporting period, the full research project should be operational. The following tasks are planned:

- Replace soil on both study sites
- Install irrigation system on both study sites
- Install data loggers and data collection system
- Plant all study plants
- Collect data at both study sites - temperature, relative humidity, solar radiation, wind speed, crop cover density
- Perform data analysis The target audience for this project is residents of the District and students and practitioners in architecture.

1.2.1.4 The Impact of Farmers Markets - Food Security, Regional Economy and Diet

Following a pilot study of the University of the District of Columbia (UDC) Farmer's Market in 2015, this three-phase, interdisciplinary research project examines and quantifies the impact of farmers markets on food security, regional economy, and dietary behavior of residents in Washington, DC. Each phase's research is built on the previous one, with the research focus of each subsequent phase narrower than the previous one (from national to regional, to regional/low-income families). Each phase of the research project and its corresponding objectives, methods, data collection and expected outcomes are summarized as follows:

Phase I (2016-17) We will explore market relationships with food security at both the city and household level nationally. This phase will utilize public-use data and be completed through statistical analysis using a panel regression at city- and household-level on a national scale.

Phase II (2017-18) We will implement a randomized survey of 500 residents of DC and Washington DC Metropolitan Area provided through a contractor, in order to understand how people are interacting with farmers markets, as well as value and characteristics of all consumer food purchases. The survey results will be used to explore local dietary habits, environmental knowledge, participation in farmer's markets, as well as to quantify farmers markets' impact on Gross Regional Product (GRP), income, and employment. Overall, this will aid us in identifying and quantifying the barriers, economic and social, to participation and utilization of local food markets in the DC region.

Phase III (2018-19) We will conduct qualitative research on low-income DC households and more clearly define policies and incentives to promote low-income communities to utilize local farmer's markets. This objective will be completed through focus group discussions and in-depth interviews of low-income families in DC.

It is anticipated that the results from this research project will be published in four separate research articles that contribute to direct-to-consumer agricultural marketing, food security and nutrition and diet literature. The research articles will be presented at academic and extension conferences, as well as disseminated to the public through CAUSES outreach activities. The survey data obtained through the

project will be maintained by UDC CAUSES' urban agriculture data hub as a public accessible baseline data for regional farmers' market usage, diet and health, and food security. In addition, this research project will present a unique opportunity for training CAUSES students in survey development and implementation on a broad scale.

Farmer's markets offer a unique way for urban residents to access local, affordable, and healthy vegetables. Research has shown that when farmers produce for local, instead of national or global markets, their customer base diversifies and available produce options for local residents increase (Halweil 2015). This diversification can also be good for local dietary and nutrition concerns. A case study in New York found that in local markets, farmers produced higher quantities of produce that matched dietary intake deficiencies of impoverished communities (Peters et al. 2003), while another study in 2013 indicated that helping SNAP participants participate increased low income nutrition significantly (Obadia and Porter, 2013). Our study region, the District of Columbia, is one of the fastest growing cities in the U.S. with vast disparities in socioeconomic and health status. In 2012, unemployment rates within DC vary from 3.9 percent in Ward 3 to 24 percent in Ward 8. Average family income varies from $246,528 in Ward 3 to $43,973 in Ward 8 (Neighborhood Info DC, 2016) and this disparity is still increasing.

Our research will directly address the Sustainable DC goals for 2032 of having five (5) times as many green jobs as now, cutting city-wide obesity rate, and aiding 75% of residents in accessing healthy, local food within ¼ mile of their home. In Phase III of our research, we will focus on identifying key barriers to farmer's market participation and how economic, social, and cultural factors relate to local food access. In DC, there are broad issues to accessing fresh, healthy food, especially in underserved and low-income regions. Many of DC's low income wards have extremely high unemployment rates. Thirteen percent (13%) of all households in DC have food insecurity, five percent (5%) with very low food security (increased by 1% in the past four (4) years). In 2008-2012, 30.5% of households with children in the District of Columbia indicated that they were unable to afford enough food. This is the second worst rate in the nation, exceeded only by Mississippi (Food Research and Action Center, 2013).

Nearly 200,000 DC residents live on neighborhood blocks where the closest healthy food retailer is more than three (3) times farther than the closest fringe food retailer. Nine of DC's Census tracts (with a combined population of over 34,000 people) are classified as "food deserts" where the majority of residents live more than a mile away from a supermarket (USDA ERS 2014). Most of these food deserts occur in Wards 5, 7, and 8, where 95% of the population is African-American and more than one third of households have yearly income below the federal poverty line ($22,000 for a family of four). Black unemployment rates in DC are the highest in any U.S. State, with over 13.6% of black residents unemployed (Wilson, 2015). In 2010, 1 in 9 DC residents were classified as being in "deep poverty" or living on income half that of the official poverty level, most of whom live in Wards 7 and 8 (DC Fiscal Policy Institute 2011). These food access and unemployment issues can be addressed through local, direct to consumer produce markets. The missing part of this puzzle is how to address sociocultural and economic barriers to proliferate these markets.

Our research will work on increasing farmer's market participation and food security and ameliorating food and health-related socioeconomic issues throughout the city. Specifically, our project focuses on the NIFA goal of increasing overall food security. Additionally, our econometric study will focus on food miles and how far people must travel to get to local, fresh food locations, addressing the NIFA goal of reducing greenhouse gases. Our research will directly address the Sustainable DC goals for 2032 of having 5 times as many green jobs as now, cutting city-wide obesity rate, and aiding 75% of residents in accessing healthy, local food within ¼ mile of their home. In particular, our project focuses on identifying key barriers to farmer's market participation and how economic, social, and cultural factors relate to local food access.

Additionally, we will be conducting the broadest econometric study conducted in DC, detailing both how farmer's markets contribute to the national and local economy and how expanding markets will expand job

opportunities at multiple levels. Finally, we will also be investigating the impact of farmer's markets on impoverished regions and food access, using focus groups and in person surveys. During the reporting period, our activities included the following:

Research:
Phase I:
State-level longitudinal analysis using farmer's market number as dependent and independent variables are conducted. Preliminary findings show that 1) Washington DC among the state experiencing the most rapidly growth of farmers' market; 2) instead of being a solution for poverty and food insecurity as we hypothesized, farmers' markets are seen growing faster in higher-income states, and respond to faster economic growth. These preliminary findings suggest we look at the issues at city and metro levels, which we are doing currently;

Phase II
Questionnaire IRB approved. Through contractor (GfK knowledge Panel), we have collected 440 filled questionnaires in the Washington DC metro area. The data have been cleaned and ready for analysis; Research meetings were held periodically between PI and co-PIs; questionnaires were peer-reviewed by economists from George Mason University and Department of Interior through appointments and meetings.

Grant Management:
We hired two student research assistants (at different times) to collect and clean data on farmers' market operation numbers at the state, city and metropolitan levels.They were able to form a longitudinal table with food security index, farmers' market numbers, as well as demographic data from 2006-16;

Implan software for economic impact analysis purchased;
We purchased computers/tablets and accessories as we proposed extension activities.

Part of the preliminary findings from Phase I were presented at the Farmers' Markets Collaborative meeting at DC Hunger Solution in Dec 2017 to about 20 participants and more than 200 stakeholders in the region through email. We hired two undergraduate student research assistants (at different times) from UDC. They were trained the basics of data collection, cleaning, entering, and analysis using Excel and SPSS through hands-on experience and practice. They were also educated in the topics of food security, poverty and nutrition.

Part of the preliminary findings from Phase I were presented at the Farmers' Markets Collaborative meeting at DC Hunger Solution in Dec 2017 to about 20 participants and more than 200 stakeholders in the region through email. We are currently developing a fact sheet based on these findings and the fact sheets will be distributed at Van Ness UDC Farmers' Market starting in May 5th 2018, which is expecting 1000 foot traffic each market day.

During the next reporting period, we plan to accomplish and initiate the following steps towards our research objectives:

- Improve Phase I paper by adding a similarity analysis of the cities and submit paper to a journal for publication and conferences;
- Analyze the survey data in answering three questions: 1) Who shops at farmers' markets more? 2) What are the economic impacts? and 3) What are the impacts on health?
- Draft two-three papers accordingly; submit these papers for publications and conferences;
- Outline Phase III study, develop questionnaire and in-depth survey instruments, recruit focus groups, and obtain IRB approval for the study and hire a qualitative research assistant for this phase work;
- Conduct Phase III study.

The main audience of Phase I and II of this study is academic and related policy makers (e.g. USDA). The main audience for Phase III is communities in DC, the Washington Metropolitan area and the nation. Fact sheets disseminating findings are being produced. Publication is expected in 2018.

440 completed randomized surveys on farmers' market usage (spending, frequency, shopping behavior, etc.), health, and demographic information were collected in the Washington Metropolitan area. Findings from this research were disseminated at a bi-monthly DC Farmers' Market Collaborative meeting.

1.2.1.5 Assessing the Urban Production Potential and Nutrient Profiles of Two Crops Native to the Tropics

Our research aims to mitigate the negative impact of climate change (NIFA goal) and regional population growth on food production by improving food security (NIFA goal) within a quarter mile of 75% of DC residents (Sustainable DC Initiative). Specifically, we will use two tropical crops, roselle (Hibiscus sabdariffa) and sweet potato (Ipomoea batatas), to answer the following questions: 1) Which cultivars are the highest performers in urban agricultural production? and 2) What are the nutrient profiles of the highest performing cultivars of each crop? This information will benefit farmers and gardeners who are looking to improve production in urban areas. Ultimately, this information will also help consumers, who will have access to crops with higher nutrients.

Seven varieties of sweet potato greens and five genotypes of hibiscus were grown on a green roof in downtown Washington, DC (UDC's main campus) and in field rows at UDC's Firebird Farm (Beltsville, MD) in 2017. Our focus in 2017 was on yield and nutrient content of leaves, which are edible for both crops. Leaves were harvested twice, separated by whether they were marketable or unmarketable quality, and then weighed to determine yield. The nutrient content of leaves was also analyzed by collaborators at the Beltsville Human Nutrition Research Center (USDA-ARS). The data from sweet potato harvests and nutrient analysis have not yet been analyzed. Analysis of hibiscus data is ongoing, but preliminary results show that the genotypes do produce different amounts of marketable leaves within a location. Phenolics and carbohydrates were higher in leaves of hibiscus on the green roof than at Firebird Farm. We also partnered with the Center for Nutrition Diet and Health at UDC and employed a graduate assistant to conduct a literature review of the potential of hibiscus to alleviate some of the problems associated with metabolic syndrome. That work is currently being prepared for publication and is expected to be submitted to a peer-reviewed journal in 2018.

One graduate and two undergraduate students were trained in production and research methods and regularly worked on this project. Approximately 45 students from UDC's Master Gardener Program also learned about propagation and some participated in planting, maintenance, and harvesting. Three undergraduate students volunteered on the Green Roof as part of their Senior Capstone Course and an estimated 26 volunteers were able to learn about the system and participate in parts of research. Lastly, the green roof was a site of regular tours and Firebird Farm hosted an open house to explain the work to visitors.

This was the first year of a three-year project, so the field experiments will be repeated in 2018 and data analysis and dissemination of results will occur in 2019.

1.2.1.6 The DC Sustainable Agriculture Research and Education (DC SARE) Ethnic and Specialty Crop Development Program

Our farm uses sustainable growing methods to produce a range of fresh herbs and vegetables that are rare in area supermarkets. Many of them are so-called ethnic crops that do not originate on the American continent, but can be grown locally. As defined by the USDA, specialty crops are fruits and vegetables, tree nuts, dried fruits, horticulture, and nursery crops that are cultivated or managed and used by people for food, medicinal purposes, and/or aesthetic gratification to be considered specialty crops. Firebird Farm

is the home for many herbs and spices from Ethiopia and several species of vegetables from West Africa. Located just north and east of the District, the farm enjoys a humid subtropical climate that allows us to grow ethnic crops. Our crops include, but are not limited to, collards, hybrid kale, hybrid pac choi, hybrid patty pan squash, hybrid smooth leaf spinach, specialty salad greens, swiss chard, mustard greens, bunching onions, red Russian kale, baby peppers and long beans.

The UDC Ethnic Crops program was established to meet the needs of the rapidly changing ethnic makeup of the region's consumers. We will look to expand upon our Ethnic Crop Program by experimenting with a few ethnic crops to determine their ability to grow in Washington, DC. Ethnic and specialty crops are in high demand in a diverse metropolitan area like Washington, DC. This is, in part, why CAUSES entered into ethnic crop production. In making these products accessible and affordable, we are helping to connect most consumers to new types of food. We are also giving native born and local immigrant populations a taste of home, right here in the Mid-Atlantic. In his position as ethnic crop development specialist, Yao Afantchao works closely with local community gardeners and advises residents how to grow and cook a variety of flavorful international menu options. This program also introduces commercial growers to expanding ethnic produce marketing opportunities. According to BBC News, the Washington, DC area has the largest population of Ethiopians in the U.S. - about 250,000 people - and is the second largest metropolitan population of Ethiopians in the world (coming second only Ethiopia's capital of Addis Ababa). There is, therefore, a sizable market for Ethiopian food products in Greater Washington.

Growing Ethiopian herbs and spices on the farm helps us to further expand our reach into this market. Ethnic produce presents a significant opportunity for Mid-Atlantic farmers as high-value alternative crops and excellent sources of income. Ethnic food products in North America account for more than 12 percent of all retail food sales, and are projected to sustain five percent annual growth. Ethnic crops grown at Firebird Farm during the reporting period include: gboma (African eggplant), sawa sawa (edible flower), jamma jamma (huckleberry), avuvo (broad leaf vegetable), kitely (a cross between a tiny eggplant and green tomato, Scotch Bonnet (hot pepper), jute leaf (similar to okra), and waterleaf (much like greens).

The main objective of the DC Sustainable Agriculture and Education Program (SARE) Ethnic Crops is to develop an educational outreach program that will train and sustain urban food producers in the District of Columbia. We developed a "Train the Trainer" program for an Agriculture Extension Educator/Advisor who will share information with growers across the Washington Metropolitan (District of Columbia, Virginia, West Virginia) for the best sustainable practices in growing ethnic crops in order to satisfy the growing demand of ethnic crops, especially in growing and diverse immigrant population of the region.

During the reporting period, 15 individuals signed up for the Hands-on Ethnic Specialty food training to learn about food production, processing and eventually value addition and marketing to the Washington DC metro area. Five new small holder farmers or landowners expressed interest in the production of ethnic crops in the Washington DC Metro area, provided it is commercially viable. With the help of labor provided by 60 volunteers, the DC SARE Ethnic Crops project harvested 6,000 lbs. of fresh ethnic vegetables, which were distributed among trainees, their respective communities, volunteers, and African and Caribbean retail stores to test marketability and demand for the harvested ethnic crop. Community members received booklets and manuals about how to begin their own gardens or join the African Ethnic program as producers for the market.

1.2.1.7 Aquaponics System and Crop Production at Firebird Farm

Urban agriculture has been defined as the cultivation of crops and rearing of animals, including aquaponics, aquaculture and urban forestry, within and surrounding the boundaries of cities. The Center for Urban Agriculture and Gardening Education (CUAGE) focuses on a multifunctional approach to food production activities, as well as herbs, medicinal and ornamental plants for home consumption and for the market. CUAGE contributes to fresh food availability of urban dwellers, as well as to the greening of the nation's capital and teaches the productive reuse of urban waste. CUAGE will seek global relationships in

urban and peri-urban agriculture. In developing countries, urban agriculture is recognized for the provision of local food, as well as recreational, educational and social services. An important aspect of urban and peri-urban agriculture is that it provides income and employment and contributes to local economic development, poverty alleviation and the social inclusion of the urban poor and women.

Aquaculture includes the production of fish seafood from hatchery fish to shellfish which are grown to market size in tanks, ponds, cages and raceways. It also includes productions of ornamental fish for the aquarian trade and growing plant species used in range of food, and pharmaceutical, nutritional, and biotechnology products. If you connect the fish tank water (fish waste) to water a hydroponics system, plants get an automatic food supply of almost everything they need to grow from the fish water and in turn the plants filter the water for the fish. The fish waste from the tank helps to grow different vegetables and/or crops organically. Plants grow fast because they get rich alive nutrients.

We have implemented aquaponics systems in two greenhouse facilities at the Firebird Farm. There are two 500 gallon water tanks in one greenhouse. The farm grows tilapia species. There are approximately 300 tilapia in both tanks of the aquaponics system of the farm. The fish weigh approximately three pounds each. Demonstration activities were conducted with stakeholders to include regular crop harvesting at the farm. We continue investigations and experiments on crop production, infrastructure and maintenance of this sustainable method of food production for the District of Columbia and other urban areas.

A contained mini Food Hub for demonstration of different aquaponics plant side growing methods was approved upon. The aquaponics system has two 300 gallon tanks and connects to two hoop houses. Several different variations on plant growing systems were constructed.

1.2.1.8 Using Green Roofs as Research and Educational Training Spaces to Enhance Urban Specialty Crop Production

The urban population of the world has grown rapidly, from 746 million in 1950 to 7.2 billion in 2014. Within the United States, the Northeastern region is the most urbanized. Even within this heavily urbanized region, Washington, DC is notable because it has a population density greater than any state in the country and continues to grow by 1,000 residents per month. Supporting this population growth in a sustainable way is a primary challenge for Washington, DC, in part, because land for agriculture becomes increasingly removed from the city center, reducing access to locally grown food. Further complicating sustainable development and food production within the metropolitan Washington, DC area are the changing climatic conditions which increase severe weather events such as heat waves and deluges and alter normal temperature and precipitation cycles.

In 2016 we initiated a pilot project to explore improving food security as a mitigation strategy against the negative impact of climate change and regional population growth on food production. Specifically, we grew six varieties of strawberries and tomatoes on three green roofs to determine which varieties were the highest performers in urban agricultural production. In 2017 we expanded this work by growing the varieties on the same green roofs, but also in raised beds and a hydroponics system at Firebird Farm in order to provide a comparison to green roof production.

We initiated variety trials with strawberries because of their high nutrient content and because of a collaborative project that was initiated with the Beltsville Area Research Center (USDA-ARS). Dr. Kim Lewers, a Research Geneticist from the USDA-ARS, specializes on strawberries and teamed with Dr. Matthew Richardson (UDC) to supervise an undergraduate research project. The six varieties used for this project were Sweet Ann, Seascape, San Andreas, Portola, Albion, and Monterey. Tomatoes were similarly chosen because of their high nutritional value and because of a collaboration with a non-profit partner. Growth of the plants was quantified as they became established in 2018. When plants started producing fruit, we weighed the yield from each plant twice per week, separating the marketable yield from the damaged, diseased, and unmarketable yield. The marketable yield was scored using a 1-9 scale, which

was developed by the USDA and takes into account anything that reduces the visual appeal of the crop.

Nine pounds of marketable strawberries were produced in the hydroponics and raised beds at Firebird Farm and 25.4 pounds of marketable strawberries were produced on the green roof at UDC's main campus. The other two green roofs did not produce berries because of extreme weather (early season heat). Yield was relatively low because we were maximizing plant growth in 2017. In 2018 we will be using techniques to maximize yield and we will be installing new systems on the two green roofs that failed to produce in 2017 that should ameliorate the conditions caused by extreme weather. The combined data from these two years will be used to determine which varieities of strawberries perform best in urban areas. During 2017 we also identified a major insect pest, the long-necked seed bug (Myodocha serripes), which has not been previously reported as a major pest of strawberries, so 2018 will also focus on learning about the biology and ecology of this pest in collaboration with the USDA-ARS and other universities.

We harvested 3,789 tomatoes from Firebird Farm and UDC's green roof. Production at the other two green roofs was almost zero because of the same extreme weather that affected strawberry production. We have not yet analyzed the data from 2017, but research on tomatoes will continue as previously discussed for strawberries. Collaborators at the Beltsville Human Nutrition Research Center (USDA-ARS) have also expressed interest in partnering to determine the nutritional content of strawberries and tomatoes that are grown in different production systems during 2018.

1.2.1.9 Biological Control of the Harlequin Bug

The harlequin bug (Murgantia histrionica) is a stink bug and a major pest of crops in the plant family Brassicaceae, which includes important vegetable crops such as cabbage, turnip, broccoli, cauliflower, and many others. The bug is especially prevalent in urban areas that use hoop houses to grow crops because food for the bug is potentially present year-round. There are no known natural enemies of the bug, although parasitoids have not been thoroughly studied. We partnered with an Entomologist at the USDA-ARS's Beltsville Area Research Center (BARC) to direct an undergraduate research project in 2016 to identify whether parasitoids are an important cause of mortality of eggs of harlequin bug. During 2016 we found two wasp species that parasitized the eggs of harlequin bug. This was the first time that these parasitoids have been reported attacking Harlequin bug. We also observed that Harlequin bugs lay eggs on certain crop species, but prefer feeding on different crop species.

During 2017 the same undergraduate worked with us again to determine whether use of those different hosts also occurred under laboratory conditions. We are in the process of analyzing data from 2016-2017 in order to disseminate our findings.

1.2.2 Community Outreach and Education (Cooperative Extension)

Many of the food security initiatives described in the research section of this report, also have implications for our community outreach and education initiatives. Support for locally grown food and hyper-local food sector initiatives is growing across the District of Columbia. This includes a growing appreciation for locally grown food to a recognition that food that is grown closer to where it is consumed also has positive implications for reducing CO_2 emissions. Urban agriculture is catching on, and unlike large-scale cash crop operations, urban agriculture utilizes small spaces and focuses on specialty and ethnic crops. A growing number of DC residents subsidize what they buy at the grocery store through vegetables grown at community garden plots and in their backyards. Yet agricultural and gardening literacy is low, and DC residents are in need of technical assistance on a range of issues from crop propagation to plant selection, plant maintenance, nutrient management, soil remediation, and integrated pest management. These initiatives are especially important in those neighborhoods that lack access to a full-service grocery store.

CAUSES community outreach and education programs address the educational and capacity building needs of a wide range of residents and organizations from novice gardeners to experienced gardeners, schools, community organizations, and those interested in the commercial aspects of urban agriculture

and urban sustainability. Community outreach and education activities for fiscal year 2017 include offering workshops, demonstrations, community events, site visits, workforce development certificates, and entrepreneurship programs.

1.2.2.1 DC Master Gardener Program

The DC Master Gardener Program was started as a means of extending the horticultural and pest management expertise of University of the District of Columbia to the general public. The program is designed to train volunteer horticultural educators. Participants receive 45-50 hours of basic horticulture training and then agree work in their communities on a master gardening project to teach District of Columbia Residents how to cultivate garden spaces, and manage landscapes designs suitable for the urban scape, to sustainable land use practices, using research-based information. This environmental horticulture approach reduces fertilizer and pesticide use resulting in improved soil and water quality. Benefits of the Master Gardeners Program for DC neighborhoods include the following:

- Enjoy a healthier environment by reducing fertilizer runoff into our watersheds and the Bay.
- Save money and reduce health risks by minimizing use of toxic pesticides.
- Improve soils and save landfill space by composting yard waste.
- Reduce water use through horticultural practices.
- Create beautiful and ecologically sound landscapes for local conditions.
- Learn ways to provide habitat for native wildlife and beneficial insects.
- Teaching the benefits of home food production and developing skills and knowledge in growing food, managing community gardens, or contributing to food banks or kitchens.

In FY 17, 198 Master Gardeners and Trainees provided 9,000 hours of horticultural expertise to the District of Columbia. The value of volunteer time is $38.77 per hour according to www.independentsector.org with a total value of $348,930.00 in savings to the District of Columbia. Forty-seven (47) Master Gardener Trainees completed 50 hours of basic horticulture training, a final exam and 50 hours of volunteer hours. Various Master Gardener projects through all eight wards have been established which includes the UDC Food Hubs, schools, parks, beautification projects, landscape design, youth gardens, local and national botanical gardens, and partnerships with non-profit organizations.

Master Gardeners also contributed over 600 volunteer hours to the success of the Ward 3 Food Hub including its award winning green roof and roof top greenhouse. The value of their volunteer hours equates to almost $24,000 in savings to the University. Their duties included propagation of vegetables and companion plants, planting, weeding, irrigation, and harvesting. Produce was harvested and donated to DC food banks, including the UDC Student Food Pantry, the UDC Center for Nutrition, Diet, and Health, the East Capital Street farm stands. One third (1/3) of Master Gardeners continue their education in a horticulture related field and obtain employment.

1.2.2.2 Urban Agriculture Workshops and Certificates

Urban Agricultures is a global and growing pursuit that can contribute to economic development, job creation, food security, and community based capacity building. These positive impacts can, however, be limited by competition for scarce space with other forms of urban development, a lack of formalized land use rights, and health hazards related to food contamination. The use of green roof technology has the potential to alleviate some of the land-use pressures that urban agriculture faces. It would not only enable the use of land for development and agriculture, but may facilitate the formation of formal space and water use agreements and enable redistribution of ground level resources among urban farmers.

UDC/CAUSES also partners with local organizations such as Bread for the City to promote local food and nutritional security. Bread for the City assists CAUSES in managing the City Orchard at the UDC Firebird Farm. All of the fruit is donated to feed Bread for the City constituents--the vulnerable residents of DC who

rarely have access to fresh fruit. The farm also donates produce to groups that feed underserved populations such as DC Central Kitchen, the Capitol Area Food Bank, and the DC Food Recovery Network. Partner organizations bring volunteers to Firebird Farm and regularly pick-up produce from the farm. The farm also produced food to support a 10-person Community Supported Agriculture (CSA) program with six (6) additional shares being donated to the UDC Student Food Pantry. The CSA model is used to support farmers for a whole growing season and give customers a weekly share of nutritious, locally grown produce.

The UDC Food Pantry was started in May 2017 to respond to the high prevalence of food insecurity among UDC students. The farm produced 3,022 pounds of specialty and ethnic crops that were distributed among a wide range of constituencies. During the reporting period, we have continued to work diligently and purposely to continue to build capacity for expanded research in aquaponics, sustainable agriculture, ethnic crops and specialty crops at our research farm in Beltsville, MD. At Firebird Farm, our goal is to research and test techniques in sustainable urban agriculture and to apply them to various urban setting in DC neighborhoods.

1.3 Health, Nutrition and Childhood Obesity

1.3.1 Relevant Research

What follows is a summary of research activities in the area of Health Nutrition and Childhood Obesity as well as other preventable food related health impacts. Much of this research exemplifies the close collaboration between the academic programs and the land-grant programs in CAUSES. On the academic side, the Department of Health, Nursing and Nutrition houses the ACEND accredited undergraduate and graduate programs; on the land-grant side, the Center for Nutrition, Diet and Health leads our nutrition and health related research and community outreach efforts. However, other land-grant centers and the academic programs in the Department of Architecture and Urban Sustainability contribute to our health and nutrition focused research and community outreach efforts.

1.3.1.1 Changing the Health Trajectory for Older Adults through Effective Diet and Activity Modifications

Adults at midlife and older age comprise the fastest growing population segment in the U.S. Baby boomers, who make-up much of this population shift, have higher rates of obesity, chronic disease and disabilities than previous generations. Older adults are at higher risk of developing arthritis, sarcopenia, diabetes, hypertension, hypercholestrolemia, age-related mascular degeneration, and cardiovascular disease (CVD) than younger adults. These conditions that are associated with disabilities, compromise physical capacity and loss of independence but are preventable by diet or/and physical activity, providing the basis for the proposed work of this transdisciplinary team.

Adults make daily choices without being aware of how that seemingly, inconsequential decisions may impact their health. Numerous biological, environmental and behavioral risk factors influence an individual's daily health choices. To better understand the factors influencing age-related diseases and health-promotion in midlife and older adults, this multistate research project will examine: (1) environmental factors influencing the adoption of health-promoting lifestyle changes and (2) evaluation of lifestyle interventions that lead to measurable outcomes. The projects under each of these study areas, either directly or indirectly, address overweight/obesity and chronic disease reduction in midlife and older adults. The major goals of this project are to:

1. identify biomarkers of successful aging and the impact of diet/physical activity on these biomarkers throughout the life cycle;
2. examine the community environment, including its traditions, culture, and beliefs, and how it can be used to promote healthy eating and successful aging; and

3. examine the effectiveness of novel interventions in influencing/promoting the attainment of a healthy weight via increased fruits, vegetables, and grains intake and physical activity for successful aging.

During the reporting period, we accomplished the following: The project reached 96 older Americans, 87 of whom were African Americans, one Caucasian, one Asian, one Native American, and three not reported. The purpose was to determine what barriers exist that prevented the consumption of fresh fruits, vegetables, and whole grains among older Americans in Wards 5, 7, and 8. The results of this study showed that the lack of knowledge of the importance of eating more fruits and vegetables was the main barrier among participants in this study.

Research assistants were instrumental in meeting the goals of the project to administer a survey instrument in these communities. These research assistant were able to experience first-hand the opportunity to discuss nutritional barriers and to provide nutritional education to a group of seniors who otherwise may not have received this information. The four research assistants and the principal investigator have just completed an article for submission to the American Journal of Undergraduate Research (AJUR), a peer review journal designed to facilitate publication for undergraduate students. Research assistants were guided in coding and performing descriptive analysis of the surveys. These analyses were graphed for inclusion in the journal submission. Four research assistants and the principal investigator convened an annual meeting and made a presentation of the progress of the project in June 2017. In total, 10 undergraduate students participated in grant activities over the course of the reporting period. Four undergraduate students were consistent for the entire reporting period and the remaining six were intermittent between fall, spring, and summer semesters.

This project focused on older adults 55 and older who lived in Ward 5, 7, and 8. In the next reporting period, this project will seek to join three other universities in the multi-state project to determine collection methodology. This project is interested in gathering additional data using the same instrument as the other three institutions in an effort to compare results from urban to rural to urban.

1.3.1.2 Parental Practices Supporting Positive Eating Behaviors during Independent Eating Occasions

Among Early Adolescent Children It is necessary to further explore the impact of parental practices and its effects on early adolescent eating behaviors during independent eating occasions. In the first phase, formative qualitative research methods will be used to explore the behaviors around independent eating occasions among adolescents, including the extent to which they report how parents' rules, expectations, modeling and availability of foods influences their choices and behaviors.

Among parents, we will seek to identify the extent to which they are aware of the food choices and behaviors that their children make while they are eating independently. This data collection aims to understand the phenomena of eating related parental practices, how parents are motivated or impeded in practicing them, how they are successfully implemented, and if children's eating is impacted positively when parents utilize various positive practices.

In objective two, quantitative methods will be employed to identify associations between parental practices and food and beverage choices, eating behaviors, and weight among early adolescents with attention to examining independent eating occasions. An appropriate, validated instrument does not currently exist to measure these associations; therefore, we need to develop and test a questionnaire to determine which parental practices should be promoted.

Results from objective one and two of our study will provide a broader understanding of the influences that determine the frequency of positive parental practices and the effects of these practices on obesogenic behaviors of early adolescents. These findings will allow us to identify realistic strategies and motivators in order for parents to promote positive practices.

Ultimately, sharing how best to influence early adolescents' eating behaviors and particularly those when the parent is absent would be valuable in trying to shape healthful food intake among early adolescents to prevent obesity. The major goals of this project include:

Objective One - Explore and identify key parental practices (role modeling, making healthy foods available, and setting rules/expectations and other practices) that may impact eating behaviors and food choices during independent eating occasions and weight among low-income, multi-ethnic early adolescents.

Objective Two - Examine the association between key parental practices and positive eating behaviors during independent eating occasions among low-income, multi-ethnic early adolescents.

Data were collected by each of the 12 universities for Objective 1 of the study. Members of the team at the various locations each collected data from 5 parent-infant dyads this past year and we ended up with a dataset that included information from over 50 families (over 100 individuals). Using these data, we organized into several groups to assess the different types of data collected and begin working on manuscripts in subgroups, as well as coding the data to develop the surveys that will be used in Objective 2.

The main accomplishment of the 2016-2017 of the W3003 group was collecting the pilot data for Objective 1. The various cites each collected data from approximately 5 parent-child dyads, including parent surveys, child surveys, anthropometric measurements (heights, weights, waist circumferences), parent interviews, and child interviews. This yielded an initial sample of over 50 parent-child dyads, with rich, in depth data from interviews and pictures of foods eaten, as well as surveys and objective anthropometric measurements.

Progress on this task was facilitated through monthly conference calls in which we reviewed IRB approval processes, and data collection progress, discussed and worked to resolve issues, and devised 'next steps.' The work invested in developing and testing the protocols has positioned us to launch data collection for Objective 1 with a seamless approach that will enhance our data collection efforts.

At the 2017 annual meeting, we organized all of our data files from Objective 1 and put them into a master file. We discussed data collection challenges and issues that came up, as well as specific data from both the qualitative and quantitative datasets. We broke up into groups to begin coding the data and looking for themes to help develop our Objective 2 surveys that we are working on now. We made decisions on the details for the Objective 2 study (revised recruitment grid, assigned site and participants ID numbers, developed data management plan), reviewed and revised the study timeline, and developed an outline for 8 new manuscripts (and accompanying writing groups) that will come from Objective 1. We also strategized a plan to submit a USDA AFRI grant, reviewed the W3003 bylaws, and elected the new 2017-18 leadership.

We revised the recruitment grid for objective 2 to add new members, and stratify not only by child race/ethnicity, but also sex of child. Each member is expected to recruit up to 40 parent-child dyads, for a total of up to 480 families. We also assigned site and participant ID numbers (to be used in the Objective 2 study) and developed a data management plan. The 2017 W3003 annual meeting was held on Wed 03/15/2017 (to Sat 03/18/2017) at the University of Hawaii at Manoa (as well as the New Otani Kaimana Hotel in Honolulu), which was the home university of a research team member.

The next annual meeting will be held at the University of Georgia, which is also the home university of a research team member. Additionally, three students have worked on the project at UDC, which included one graduate and two undergraduate students.

Abstracts have been submitted for presentations at two upcoming professional meetings. Manuscripts writing groups have been organized to write papers to be published. Findings from Objective 1 will be used in our Extension education programs. We will collect data for Objective 2: Quantitative Data Collection: To examine the association between key parental practices and positive eating behaviors during independent eating occasions among low-income, multi-ethnic early adolescence using quantitative methods. Each research team member is expected to recruit 40 parent-child dyads, for a total of up to 480 families. The next annual meeting is scheduled for the University of Georgia from March 21-24, 2018. The University of Georgia is the home university of a research team member.

A parent practice questionnaire is being developed based on findings from Objective 1. The questionnaire will be validated with parents to assess the frequency of parent practices and their association with eating behaviors and food intake of early adolescents during independent eating occasions and with their weight. Each state will participate in the collection of the data. Parents will complete a parent practice survey and their adolescent child will complete a food frequency questionnaire to estimate the quality of the child's diet. Students participating on this project included an undergraduate nutrition major and a graduate students majoring in urban sustainability. The target audience during this reporting period included a convenience sample of parents and their early adolescent children 10 to 13 years of age. Parents had primary responsibility for food acquisition and preparation for early adolescents. UDC recruited African American children and parents.

Two abstracts have been submitted for conference presentations. The responses are pending:

Suzuki, a, Anderson, A, Choi, S, Cluskey, M, Gunther, C, Hongu, N, Jones, B, Lora, K, Misner, S, MonroeLord, L, Penicka, C, Reicks, M, Richards, R, Tophham, G, Wong, S, Banna, J.(2018) Characterizing Eating Behaviors of Adolescents Ages 10-13 in Hawaii While eating alone.

Rickelle Richards, Blake Jones, Alex Anderson, Jinan Banna, Mary Cluskey, Carolyn Gunther, Nobuko Hongu, Karina Lora, Scottie Misner, Lillie Monroe-Lord, Marla Reicks, Glade Topham, Siew Sun Wong (2018) Parental practices and impact on child weight among succeeders and strivers. Submitted for presentation at 2018 Academy of Nutrition and Dietetics annual meeting.

Recruitment materials were developed to reach the target audiences. The materials included flyers, presentations at schools, 4-H clubs, schools, after school programs and other activities. The materials developed included the title of the project, objective(s), time needed, and contact information for the principal investigator for interested individuals to receive additional information.

1.3.1.3 Merging Health with Culture: A Heritage Model for Improving Plant-based Food Consumption and Mitigating Health Disparities among Urban Minorities

Racial/ethnic minorities and immigrants represent the fastest growing urban population in the United States. Elevated rates of health disparities among immigrants who assimilate into Western culture and US born minorities suggest a need for alternative health promotion strategies.

In addition to the movement toward sustainable ethnic crop production in Washington DC, this project will support the implementation and evaluation of culturally relevant nutrition interventions that emphasize dietary guidelines without deviating from one's own identity. This project aims to combat obesity and other food related illnesses (NIFA goal) and reduce the obesity rate by 50% (Sustainable DC Initiative) by merging the promotion and maintenance of US Dietary Guidelines with a culturally relevant emphasis on a Heritage Health model. The goals/objectives of the project follow:

- Compare dietary intake, health behavior, and indicators of metabolic syndrome among first-generation racial/ethnic minority sub-groups residing in the US vs. US-born racial/ethnic minorities through National

Health and Nutrition Examination Survey (NHANES) data.
- Implement the African/African American and Latino Heritage interventions for targeted DC residents using the six-week Oldways Ambassadors curriculum.
- Assess baseline and follow-up levels of acculturation, dietary intake of fresh plant-based foods, and indicators of metabolic syndrome among nutrition intervention participants.
- Explore perceptions of health status, connection to heritage, lifestyle customs, and how those factors impact food choices, physical activity, and adaptation within the urban environment.

This project was approved near the end of FY 17; thus, there are no accomplishments to report at this time. The opportunities for training and professional development have been the recruitment of two undergraduate interns and one pending graduate intern. In 2018, students will be trained in curriculum development for the nutrition education aspect of this project, program implementation, data collection (health screening measurements, surveys, and interviews), and data management via electronic spreadsheets. We will disseminate results as data becomes available by human subjects for the next phase of this project period (summer and fall of 2018).

During the next reporting period, we plan to analyze the 2016 National Health and Nutrition Examination Survey (NHANES) data on parameters for nutrition, physical activity, acculturation level, and health status of US-born vs. immigrant subjects that we obtained from the CDC. This will serve as a foundational justification for the community-based intervention during the summer months. In addition, we will purchase supplies needed for the nutrition classes, design complementary nutrition education curricula for the weekly Oldways Ambassador Health and Heritage food demonstrations, and implement the six-week Health and Heritage program (Summer 2018) at partner sites, which will include baseline and follow-up data collection.

Our target audience consists of immigrant, migrant and US-born Black and Latino residents in the Washington DC area.

1.3.2 Community Outreach and Education (Cooperative Extension)

Over the past 30 years, obesity rates among children and adolescents have almost tripled throughout the United States. An estimated 17% of children and adolescents aged 2-19 years are obese. The Healthy People 2010 goal of 5% obesity among children was not met. Obesity in children is defined as a BMI greater than or equal to the age-and sex-specific 95th percentiles of the 2000 CDC Growth charts. Childhood obesity is associated with an increased risk for developing type 2 diabetes, high blood pressure, sleep apnea, and high blood cholesterol www.cdc.gov/nchs/data. Children who are obese are also more likely to become obese adults, further increasing their risk for obesity related diseases, including heart disease and certain cancers.

Obesity rates have affected low-income children at a disproportionate rate. Data published from the 2009 Pediatric Nutrition Surveillance System study showed that almost 1/3 of the 3.7 million low-income children aged two to four years old were obese or overweight. Obesity in low income children ages two to four years old has increased in the District of Columbia, from 10.9% in 1998 to 13.3% in 2008 (Center for Disease Control, Morbidity and Mortality weekly report, http://www.cdc.gov/mmwr) with more boys being obese as compared to girls.

The program objectives of the CAUSES Center for Nutrition, Diet and Health (CNDH) are:

- Demonstrate healthy cooking skills through modified techniques in food preparation.
- Teach food and health literacy skills.
- Provide instruction on safe food handling and storage techniques.

The Center for Nutrition, Diet and Health programs and activities addresses two of the five priority areas of

the National Institute of Food and Agriculture (NIFA) as follows: Combating Childhood Obesity and Prevention programs include Farmers Markets Nutrition Education Program, SMART Nutrition for Seniors, Nutrition and Wellness Certificate program in partnership with 11th Street Bridge Park project, Nutrition Education for Preschoolers, Fitness by Faith, Pavillion of God, National Community Church, Unity Healthcare Wellness Program - Minnesota Avenue, District of Columbia Farmers' Markets, and Bodywise Health and Fitness Program - Physical Activity, and under Food Safety is Professional Food Managers Certification Program and food safety at farmers markets, in the classroom and community events.

FY 2017 program activities are described in the following section.

1.3.2.1 Bodywise Health and Fitness Program - Physical Activity

The Bodywise Program promotes health, wellness and fitness for DC residents 60 years of age and older. Regular exercise has been linked to reduction in premature mortality, functional decline, disability and coronary heart disease. Benefits achieved from the program include increase in cardiovascular efficiency, improved muscular strength and flexibility and increased knowledge of physical activity. The physical activities include water aerobics, yoga, low-impact aerobics, and movement/chair exercise. The program is designed to provide seniors with an opportunity to enjoy a better quality of life. Over 500 seniors throughout the District are enrolled in the Bodywise program. Approximately 90 classes are offered monthly. Classes are taught by UDC Bodywise instructors and contracted instructors from LG Fitness, Inc. The classes were offered in six of the eight wards at UDC, Wilson Aquatic center, Takoma Aquatic Center, Phillip T. Johnson Senior Center, Allen House, The View at Edgewood and Overlook at Oxon Hill. The most popular class is water aerobics followed by low-impact aerobics and yoga.

During this reporting period, an unduplicated count of 470 of the 500 seniors enrolled participated in the Bodywise classes generating 2597 contacts. The results of the survey revealed that 82.5% of the participants believed they experienced increase in cardiovascular efficiency, 83.6% increased knowledge of physical activity, 88.3% improved muscular strength and flexibility, 69.2% believed they experienced improvements in quality of life, 63.1% increase in socialization, and 53.8% reduced stress and helped with relaxation.

1.3.2.2 11th Street Bridge Park - Nutrition and Wellness Certificate Program

The east side of our nation's capital is plagued inequities in the social determinants of health, which are not conducive to lifestyle behaviors that can reduce rates of obesity and diet-related diseases.[2] Community mobilization of the members and stakeholders is a capacity-building process that has garnered potential in creating more sustainable change.[4] Our highest income Ward (Ward 3) has access an array of grocery stores, upscale restaurants, and attractive run/walk/bike paths within a one to two mile radius. On the contrary, Wards 5, 7, and 8 have limited grocery stores (four in Ward 5, three in Ward 7, and one in Ward 8) and safe open play spaces within walking distance according to the DC Office of Planning of the Government of the District of Columbia.

The purpose of the Nutrition and Wellness Certificate Program was to provide African American Ward 8 residents of Washington DC ages 18 to 25 with the tools to understand the essential role of nutrition and physical activity on health and well-being through a supportive environment that is conducive to improving eating and lifestyle behaviors, healthy food preparation skills, safe protocols for physical activity and exercise programs, and engagement in mobilizing the community through this process. The objectives were: 1) to gain awareness of health risks through body composition screenings; 2) to understand the connection between diet, fresh produce, and chronic disease prevention; 3) to improve food literacy and recognize marketing gimmicks on nutrition labels; 4) to learn to prepare garden-fresh food in healthy and palatable ways; 5) to understand the health risks associated with inadequate sleep; 6) to learn the different components of physical activity and health; 7) to meet the minimum national recommendations for physical activity for adults at 150 minutes of moderate activity or 75 minutes of vigorous activity; and 8) to demonstrate examples of moderate and vigorous physical activity, and distinguish between cardio, muscle

strengthening, and flexibility exercises.

This initiative began as a work in progress with several stakeholder meetings and listening sessions with members of the Ward 8 Faith Council and other organizational representatives of this community in the prior year. This stage was essential understanding their needs and establishing partnerships with local sites for an interdisciplinary project that included urban agriculture and sustainability trainings in addition to Nutrition and Wellness. The Nutrition and Wellness certificate program consisted of biweekly workshop sessions held at Union Temple Baptist Church and biweekly sessions at Wayne Place Transitional Facility (Far Southeast Family Strengthening Collaborative, LLC) for 12 weeks. The series kicked off with health and body composition screenings. Participants gained insight on their "health numbers" and how those numbers could impact their risk factors. For instance, Body Mass Index (BMI) is often the most convenient method for assessing obesity risk although the results are not based on where the body fat is predominately located. However, the comprehensive body composition assessment allowed participants to see and understand their distribution of muscle to fat tissue, the influence of diet and exercise, and how results could impact their metabolism, heart disease, type 2 diabetes, and cancer risk regardless of the numbers on the scale. This program engaged participants in holistic health activities including discussion forums on nutrition education, healthy cooking demonstrations, fitness demonstrations, and pre and posttests of physical activity concepts. This program component encouraged participants to set goals and make informed decisions about their eating habits and other lifestyle practices. Topics included the following: 1) Assessing Health Risks -- Truth by Numbers; 2) Healing Properties of Plant Foods; 3) Lean Proteins and Clean Fats; 4) What's Sleep Got to do With It; 5) Health Deceptions in Food Marketing and Labeling.

Participants engaged in hands-on food demonstrations that introduced them to innovative food preparation techniques for the fruits and vegetables harvested from their urban gardens. They frequently commented that they would use the recipes they learned as a useful starting point to expand their knowledge and creativity. Some of the recipes included the use of kale in smoothies and the use of their fresh fruits and herbs to create homemade vinaigrette dressings. The Nutrition and Wellness Certificate Program was developed and led by Dr. Tia Jeffery, a registered dietitian/nutritionist and project specialist for the Center for Nutrition, Diet, and Health (CNDH), and Helen Naylor, also a registered and licensed dietitian in the Center for Nutrition, Diet and Health.

During program sessions, participants were challenged to consider their own contribution to finding solutions to food insecurity and nutrition problems that plague their community. They recognized the collective power they share including their collective political power to improve local and national food and health policies by electing officials who support their needs. They also recognized the power of example to their families and fellow community members. And last but not least, they recognized their own purchasing power, which is the power to choose to support their local farmers' markets and community gardens and refusing to buy the highly processed foods that perpetuate negative health outcomes and increase medical expenses. The nutrition and wellness classes concluded with a focus on understanding health as a treasure, and the Garden of Hope as a symbolic bridge that strengthens this most valuable treasure. Our next steps will build upon the health trainings accomplishments with the 11th Street Bridge Park faith community partners and beyond. This holistic approach aligns with the evidence-based connection between health and healing with spirituality. With wider capacity, a participatory certificate training plan will mobilize the congregation to lead in mobilizing their local communities as health promotion sites. Our goal is for underserved residents to have direct access to these resources and continued collaboration efforts with local partnerships that position us to empower our community to make informed decisions about their lifestyle choices. The Nutrition and Wellness certificate Program was duplicated at Union Temple Baptist Church and Wayne Place Transitional Facility (Far Southeast Family Strengthening Collaborative, LLC).

The Far Southeast results showed on the pre-test findings, 20 percent of participants scored 1 to 5 out of 10, 40 percent of participants scored 6 to 8 out of 10, and 40 percent of participants scored 9 to 10 out of

10 (n=13). Post-test findings indicated that 0 percent of participants scored 1 to 5 out of 10, 40 percent of participants scored 6 to 8 out of 10, and 50 percent of participants scored 9 to 10 out of 10. Participants received certificates. The Union temple Baptist Church results showed on the pre-test findings, 10 percent of participants scored 1 to 5 out of 10, 40 percent of participants scored 6 to 8 out of 10, and 50 percent of participants scored 9 to 10 out of 10 (n=12). Post-test findings indicated that 0 percent of participants scored 1to 5 out of 10, 10 percent of participants scored 6 to 8 out of 10, and 90 percent of participants scored 9 to 10 out of 10.

"The Nutrition and Wellness course sessions led by Dr. Tia Jeffery were both fun and informative. It was great to exchange ideas about the health benefits of eating well, making healthy choices, nutrition facts, fitness and ultimately how to sustain a lifestyle of well living. The highlights for me were the cooking demos and learning new recipes using simple but healthy ingredients. I would recommend this course to anyone interested in making positive changes toward a healthier life." ~ Dr. Koqwinda Chambers

1.3.2.3 Unity Healthcare Wellness Program - Minnesota Ave

Studies indicate a direct link between the environmental impact of education level and socioeconomic status on cardio-metabolic diseases and their associated risk factors.1 CNDH has an ongoing partnership with the Unity Health and Produce Plus programs for SNAP-eligible clientele in DC, funded by a non-profit, DC Greens. Participants with cardio-metabolic risk factors receive a monthly supply of fresh produce on the condition of their commitment to weekly attendance to group exercise and nutrition education classes. The CNDH Nutrition Specialist facilitated the nutrition education group sessions at a Unity Healthcare clinic on a bi-weekly basis. Participants learned food and health literacy skills, provided feedback on their challenges and progress in a supportive environment, and were exposed to various methods for preparing the fresh produce they received. Approximately 63contacts were reached during this reporting period. They consisted of 100 percent African American, 97 percent female, and 3 percent male. Around 90 percent of the participants were satisfied with their exposure to new recipes, indicating that they would buy the produce and prepare the food at home more often.

1.3.2.4 Fitness by Faith Report

Close to half of the 10 leading causes of death among residents of Washington DC are diet-related.[2] The "church" is an organizational structure that individuals look toward as a foundation for spiritual healing and growth of mind, body, and spirit. In addition, one of the missions of faith-based organizations that aligns with the mission of cooperative extension is educating and serving local communities with resources to improve quality of life. The utilization of non-traditional venues as health promotion sites such as faithbased organizations have been fundamental for encouraging behavior change and positive outcomes.[3] Therefore, this land-grant partnership with faith-based sites for implementing nutrition education and physical activity promotion with a train-the-trainer philosophy was a viable approach for the interdisciplinary connection between faith leaders and the community. Explore the battlefield for the mind when it comes to food and nutrition and how faith communities should guard their minds and become sites for health promotion outreach that mobilize their community with resources to guide them toward nutrition and physical activity behaviors that contribute to reductions in obesity and chronic diseases.

The objectives were: 1) Increased servings of fresh fruits and vegetables to recommended amounts among 80% of program participants by the end of the six-week series; 2) Improve physical activity to national recommended levels among 80% of program participants by the end of the six-week series; 3) Increase participant involvement in leadership efforts to encourage healthy eating, adequate exercise, and a health-promoting environment in the surrounding community. The Fitness by Faith series is a six-session interactive nutrition education program for faith-based organizations. This program focuses on integrating nutrition education from a science and Christian perspective. The classes are an hour and a half long and include participant activities and cooking demonstrations.

1.3.2.5 National Community Church

Multicultural residents of Wards 3, 5, and 6 ages 25 and over participated in this program. Throughout this series, a total of 9 contacts participated in Ward 3 of Washington, DC. They consisted of 4 African American contacts, 4 White contacts, and 1 Asian contact. Out of the 8 individuals who completed the program evaluation survey, all agreed that the educator presented the learning material in a clear and understandable manner, 38% indicated the information was very useful, 25% indicated that the information was useful, 25% indicated that the information was somewhat useful, 0% indicated that the information was not useful, and 12.5% did not indicate whether or not the information was useful. Using paired-sample t-tests, body weight and composition measurements as well as eating behaviors from baseline to follow-up indicated the following outcomes: There was a significant decrease in waist measurements from the beginning of the program (33.0 inches +/- 2.4) to the end of the program (31.1inches +/- 2.2), (p = 0.00); There was a significant decrease in hip measurements from the beginning of the program (41.1 inches +/- 1.8) to the end of the program (39.5 inches +/- 2.0), (p =0.01); There was a significant increase in body fat percentage for the control group from the beginning of the program (31.5% +/- 3.3) to the end of the program (33.4% +/- 3.3) , (p = 0.00); There was a significant increase in moderate physical activity levels from baseline (677.5 minutes/week +/- 348.3) to the end of the program (1,395.0 minutes/week +/- 681.1), (p =0.05); There were decreases in sweets, sugar sweetened beverages, red meat, and processed meat, but they were not statistically significant (p> 0.05). For the next fiscal year, this program will explore the potential for further integration of technology into the activities including text messages, social media, bimonthly newsletters or fact sheets and work with the Health Ministry coordinators that belong to the network of faith organizations within the Leadership Council for Healthy Communities in DC Wards 4, 5, 7 and 8.

1.3.2.6 Pavilion of God

This nutrition education program was integrated into their weekly bible study session each week to accommodate the scheduling barrier, with a special emphasis on the scientific aspects of nutrition led by the educators and health from a Christian perspective led by clergy leaders. This style is also an evidence-based method published in scientific literature by the University of North Carolina's team of extension specialists. The target audience was African American ages 40 and over. Throughout the fall series, a total of 10 African American in Ward 4 participated. Using paired-sample t-tests, body weight and composition Report Date 03/27/2018 Page 27 of 114 2017 University of the District of Columbia Combined Research and Extension Annual Report of Accomplishments and Results measurements and eating behaviors from baseline to follow-up indicated the following outcomes: 1) There were decreases in weight, waist circumference, hip circumference, and body fat percent, however, they were not statistically significant; 2) there was a significant increase in legume consumption from baseline (3.1 +/- 0.6) to the end of the program (4.4 +/- 0.7) (p=0.02); 3) there was a significant increase in whole grain consumption from baseline (6.5 +/- 0.9) to the end of the program (8.8 +/- 1.1) (p = 0.02); 4) there was a decrease in sweets consumption from baseline (16.8 +/- 1.7) to the end of the program, but not statistically significant (13.0 +/- 1.0) (p = 0.06); 5) there was a significant decrease in red meat consumption from baseline (4.3 +/- 0.6) to the end of the program (3.1 +/- 0.7) (p = 0.04); 6) there was a significant decrease in pizza consumption from baseline (3.4 +/- 0.6) to the end of the program (2.6 +/- 0.5) (p = 0.02); 7) there was a significant difference in moderate activity METs from baseline (660.0 minutes/week +/- 339.4) to the end of the program (1,140 minutes/week +/- 285.1) (p = 0.05); and 8) there was a significant difference in the number of days of physical activity per week from baseline (2.9 days +/- 0.7) to the end of the program (1.8 days +/- 0.6) (p = 0.03).

1.3.2.7 District of Columbia Farmers' Markets in low-income Communities

The UDC Center for Nutrition, Diet and Health nutrition educators, nutrition students and volunteers provided resources that promote higher usage and consumption of fresh fruits, vegetables, and herbs through nutrition education, food demonstrations, taste testing, recipes, produce guides and handouts to market shoppers at 15 different farmers markets located in diverse low-income, socioeconomically underserved communities with limited access to fresh and healthy local produce in Wards 1, 2, 4, 5, 6, 7 and 8 over a period of 6 months from May 2017 through October 2017. The materials accommodated a

variety of literacy levels. The farmers markets were: DC Urban Green Farmers Market, Quarles Farmers Market, Deanwood Recreation Center Farmers Market, Overlook at Oxen Run Farmers Market, Barry Farms Recreation Center Farmers Market, Kenilworth Parkside Farmers Market/ Parkside at Circle 7, SW Farmers Market, 14th & Kennedy Street Farmers Market, Acadia's Mobile Market at Children's National Hospital, Ward 8 Farmers Market, Rhode Island Row Farmers Market, UDC East Capitol Farmers Market and Shaw Farmer Market. Most of the markets had a limited number of Produce Plus Vouchers available to low income market shoppers. Each week the nutrition educator demonstrated a recipe using produce sold at the market and provided nutrition education. A three-question survey was completed by market shoppers. The survey questions were : 1) are you planning on eating more fruits and vegetables, if no, why, 2) after tasting the recipe, do you plan to make it at home, if no, why, 3) if the famers market a good place to buy fruits and vegetables, if no, why.

The results showed that the combined markets unduplicated contacts were 1,397 and the indirect contacts or combined markets reach was in excess of 30,000 diverse market shoppers. The unduplicated contacts were 334 or 24% male and 1,063 or 76% female. The ethnicity of the unduplicated contact included: 11 or 0.78% Native American, 31 or 2.2% Asian, 1260 or 90% African American, 14 or 1% Native Hawaiian, 58 or 4.1% Caucasian, 12 or 0.85% Hispanic- African American, 1 or 0.07% Hispanic- Native Hawaiian and 10 or 0.71% Hispanic- Caucasian. A total of 2% of the direct contacts were Hispanic and 98% were NonHispanic. Of the 1,397 unduplicated contacts, 639 completed the three-question survey. The results showed that of the 639 individuals surveyed, 628 or 98.3% plan on eating more fruits and vegetable and 10 or 1.6% did not; 601 or 96.1% after tasting the recipe, plan to make it at home and 33 or 5.2% did not; 634 or 99.2% responded positive to farmers markets being a good place to buy fruits and vegetables and 4 or 0.6% did not.

1.3.2.8 Other Community Outreach Activities

Residents of Washington DC are in need of the guidance that links them with education and programs to improve their access to services and evidence-based information about nutrition and health, especially those with health inequities and fewer resources. The purpose is to network and expand outreach among community residents and stakeholders of the District of Columbia to promote the nutrition education programs and build new relationships with stakeholders.

- Preschool Nutrition Education (Fall 2016 - Spring 2017): On a monthly basis, preschool children at Orr Elementary School in Ward 8 engage in interactive activities with the nutrition educator using Choose My Plate and healthy food demonstrations as learning models. Themes included food safety, dairy and calcium-rich foods, fruits, veggies, whole grains, and physical activity.
- Senior Health and Wellness Fair (Summer 2017): CNDH organized the fair and manned a booth for the Annual Senior Health and Wellness community fair in June of 2017.Out theme was Blue Zone Pathways to Healthy Aging, with an emphasis on promoting evidence-based lifestyle behaviors that are common among individuals residing in what are known as "Blue Zones." Blue Zone countries are the five areas of the world with the highest quantity of active seniors and centenarians. Blue zone recipe samples and 80 Facts Sheets were distributed.
- Marion Barry Youth Leadership Institute Career Fair (Summer 2017): High school students participated in the Annual MBLI career fair to gain exposure to careers in a variety of professions. The registered dietitian/nutritionist of CNDH led eight rap sessions with 20 participants per 20 minute session by educating students on the role of RDs/RDNs as health care providers, nutrition educators, and advocates for health promotion.
- Barry Farms Recreation Center's Back-to-School Wellness Fair (Fall 2017): CNDH led a "Healthy Foods to Improve Learning "theme at this outreach event. 80 handouts and Facts Sheets were distributed and food demos that focused on smart choices for breakfast and snacks were interactively performed with the children. This was also an opportunity to teach food safety, in which hand-washing and use of gloves while prepping were emphasized.

• Coolidge High School Panel for Health Science Career Awareness (Fall 2017): The CNDH Dietitian/Nutritionist and Chair of the Department of Health, Nutrition, and Nursing led a Health Science panel for 20 high school participants at Coolidge High School to discuss careers in health fields and facilitate a Q and A period.
• Mayor's Holiday Celebration for Seniors; CNDH led food demonstration and nutrition and health booth with nutrition education resources for 3,500 seniors.

The Nutrition Education for Preschoolers Program educates individuals to adopt healthier lifestyles in accordance with the "Dietary Guidelines for Americans" and "MyPlate". Public school, daycare center, and Head Start program teachers are trained to implement the Color Me Healthy curriculum and the 48-lesson curriculum in nutrition and food safety among children and their families, improving their ability to select healthy foods, safely handle food, and properly prepare and store foods. Children in participating preschool/prekindergarten classes receive nutrition education lessons that incorporate hands-on experience with fresh fruits and vegetables. Parents are offered nutrition educational sessions covering topics related to their child and to their personal health.

Five basic concepts are taught within the preschool/prekindergarten classrooms. These include: 1) Food safety/hand washing, 2) Vegetables, 3) Fruits; 4) Whole grains, Dairy and protein, and 5) Physical activity. We believe getting individuals to make positive changes around these topics will lead to healthier lifestyles and a reduction in obesity and overweight among the target groups. These topics are followed in order by the nutrition educator. One topic is taught each month, and the teachers continue the nutrition education during the remaining weeks of the month. Once all five concepts have been taught, the nutrition educator will cycle through them again using different approaches in order for the individuals to review and broaden their knowledge on each topic. In addition to the nutrition lessons in the classroom, parent workshops are held in order to address nutrition related questions and concerns.

The program is implemented by nutrition educators and graduate nutrition students. A nutrition educator/ graduate nutrition student is assigned a number of D.C. public and chartered schools, daycare centers, and Head Start centers located throughout the District that serve low-income children ages two to five years old. The nutrition educator trains the teachers at each site on how to use research and evidence-based curriculum to incorporate nutrition, food safety, and physical activity education into lesson plans. The nutrition educator also works with the students in each classroom, as well as provides parent workshops on various health related topics. The nutrition educator partners and collaborates with the site's parent coordinator in order to set a date, time, and recruit parents accordingly for each meeting or workshop. The topics are taught in a variety of ways.

An example of an activity used to teach food safety/hand washing: Food safety/Hand Washing - a stuffed Elmo comes with the nutrition educator to the lesson to enforce the idea that "germs are bad." A story is told about Elmo going to school and forgetting to wash his hands before he eats, after using the restroom, and how his friends coughed and sneezed on him. Glitters, or "germs," are sprinkled on Elmo after each incident to show how the germs are spread. We then lay Elmo down to sleep, because he is sick. We then review how to cough, sneeze, and wash our hands correctly. Each student goes through the steps of washing their hands, using soap and warm water, to get rid of the germs.

1.3.2.9 Unity Healthcare We Can

Unity Healthcare (3924 Minnesota Avenue NE), in Ward 7, is responsible for the healthcare of District community members. Since FY14, UDC SNAP-Ed participated in Unity Healthcare's We Can Program. We Can is a family-centered obesity prevention program that provides exercise and nutrition programs for adults middle-aged and senior adults seeking to change their weight status. Helen Naylor and Teresa L. Turner provide nutrition education and healthy food demonstrations for the participants on Wednesdays. In FY14, SNAP-Ed educators provided services for one afternoon class. Because the program was so successful, Unity Healthcare requested and invited UDC SNAP-Ed to provide services to an additional

evening class. Our visits increased from biweekly in FY14 to weekly in FY15. In FY14, Unity's We Can direct contacts equaled 53. In FY2015, their direct contacts equaled 311. There was a significant increase of 487% participation. Indirect contacts for FY15 totaled 1423. Partnerships included Wholesome Waves and DC Greens.

1.3.2.10 The UDC Farmers' Market

Farmers' markets in urban areas are the most important type of direct agriculture marketing, and they play an essential role in the local food system, connecting growers, distributors and customers and helping residents easily gain access to fresh food in the urban setting. In 2017, there were a total of 58 farmers' markets in the District of Columbia [1]. The Center for Sustainable Development and Resilience (CSDR), College of Agriculture, Urban Sustainability and Environmental Sciences (CAUSES), University of the District of Columbia (UDC) (hereinafter referenced as CSDR CAUSES UDC), in collaboration with The National Latino Farmers and Ranchers Trade Association and Van Ness Main Street, operates the UDC Van Ness Farmers' Market (hereinafter referenced as "the Market") every Saturday from mid-May to late November, 8:00AM to 2:00PM. The Market is located at 4340 Connecticut Avenue N.W. (in front of UDC David A. Clark School of Law. The purpose of this economic impact study is to quantify the economic impact of the Market that goes far beyond the sales value. Operating 28 days per year, occupying over 1,760 sq. ft. of space, and with 12 vendors in 2017, the Market is estimated to have received an annual attendance of 11,200 shoppers [2] and experienced gross annual receipts of $269,702. Compared to food spending happening at grocery stores, spending at the Market has a larger multiplier effect throughout the local economy. Using the Sticky Economy Evaluation Device (SEED) methodology [3], the Market is estimated to have contributed $817,000 to the District of Columbia's economy and over a million to the Washington D.C. Metropolitan Area economy, a 50 percent increase from 2016.

This increase in economic contribution indicates that the Market is more mature in its eighth year of operation, providing a great environment for vendors as well as the community to access fresh produce and local goods. In addition to the six fresh produce and protein vendors, the 2017 market has six nonfood vendors selling local goods ranging from lotion, baked goods, baby clothes, jewelry, and arts and crafts.

Since 2016, the Market established an advisory partnership with Van Ness Main Street. The partnership has implemented a variety of activities on the market days to attract more attention and improve community cohesion, including: art performances, entertainment programs, children's programs, and cooking demonstrations. These special programs have brought more attention to the market and, therefore, more business to the vendors.

Some of the qualitative quotes from our customers include:
"Coming to the Farmers' Market is my favorite part of Saturday. I make brunch from the food I bought from the market and bring back items I cooked for the farmers to taste! It is important that the produce is local, and the farmers are friendly."

"Omar (one of our vendors) is great. His produce really lasts a long time." "Omar uses no pesticides. That is why I come back to this market."

"The reason I come to this market is the compost (deposit). Please never take it away! It is also great to see the community and catch up with friends - I haven't seen my neighbors for a while but I just ran into one at the market and we got to catch up. It would be great to extend this market year round."

"I come to get the figs and quince, and drop off my compost. This market represents farmers of color, which I really appreciate. Could you add Tofu, fresh ravioli? There should be plenty of vegan customers in this area who will appreciate those."

"This market is not as good as the one at Sheraton Elementary School. The produce got rotten in 2-3

days. And where is the organic selection?"

References:
[1] Local Food Directories: National Farmers' Market Directory. USDA Agriculture Marketing Service. January 2018. https://www.ams.usda.gov/local-food-directories/farmersmarkets

[2] Since the market is on a busy street instead of an enclosed area, we assume that about 1/3 of the total pedestrians (1,000-2,400 per market day) are our shoppers.

[3] SEED online economic impact calculation is operated by MarketUmbrella.org with free access.4.
Alternative Energy and Capacity Building

1. 4.1 Relevant Research

The following section summarizes our research activities in the area of alternative energy and economic capacity building in the new green economy.

1. 4.1.1 The Five Pillars of Economic Development

Many underserved urban neighborhoods have been excluded from economic development success even in times of economic expansion. Economic development challenges are typically exacerbated in times of economic stagnation.

Washington DC is especially challenging in this regard. It is a tale of two cities. Wards 2 and 3 in the NW of the District have household incomes of $110,000 per year, low unemployment rates of 4% or less and less than 10% of the population are African American; neighborhoods in Wards 7 and 8 east of the river have household incomes of $35,000 per year, unemployment is close to 20% and over 80% of the population are African American. This bi-furcation distorts economic development success as averages within the District are not sufficiently descriptive of the realities of the city's most underserved neighborhoods.

Yet economic development success is possible. The key lies in identifying viable economic development strategies that strengthen the individual and community based assets of underserved communities and meet local needs. Using the pioneering work of Dr. Sabine O'Hara (O'Hara, S. and Vazquez, J. 2007) as its starting point, this alternative approach to economic development provides a bottom-up methodology to assessing a community's economic development potential that enables local residents to define and shape their own future. The research seeks to generate information about local needs and individual and community based assets in two Washington DC neighborhoods, Deanwood and Congress Heights.

The project has been completed and an extensive report is currently under review by community stakeholders. It is entitled "The Five Pillars of Economic Development: A Study of a Sustainable Future for Wards 7 and 8 in Washington, D.C." The report consists of the following sections:

I. Rethinking Economic Development
i.Why we need a new approach to economic development
ii.The Five Pillars approach
iii. Engaging local neighborhoods

II. Taking Account of Where We Are
i. Background information
ii. Education
iii. Health
iv. Environmental Quality and Recreation
v. Social and Cultural Amenities

vi. Technology and Transportation
vii. A Five Pillar Composite

III. A Community Based Vision of Successful Development Outcomes
i. The focus group process
ii. Telling the story of economic development

IV. Implementing the Vision
i. Shorter term action items
ii. Closing Persistent information gaps
iii. The Sustainable DC Connection

V. Conclusions
Well over 50 indicators in the five pillar areas were collected at the level of the eight Wards of the District of Columbia rather than the aggregation level of the District. They reveal significant disparities between in eight Wards in almost all indicator categories, as well as compelling starting points for closing existing gaps.

Most compelling, however, is the community engagement approach that is so central to the Five Pillars approach to economic development. The vision of a successful development future must be the vision of the community. The approach taken to give expression to this local community vision was to write a collective story. This kind of story can be widely shared and invites broad dialogue from a wide range of stakeholders including those who do not commonly participate in development and planning decisions, and those who are less familiar with the use of quantitative indicators.

Starting point for the collective story was a focus group process conducted at community centers in Ward 7 and 8. Participants were randomly selected through a community outreach effort that included churches, schools, businesses, community centers, neighborhood associations, libraries, businesses, and door-to-door solicitations. The goal of this broad based approach was to get representation from a range of civic organizations and interest groups as well as a wide age spectrum of residents from the Deanwood neighborhood in Ward 7 and the Congress Heights neighborhood in Ward 8. A resident from the Deanwood neighborhood, who was also a graduate of the University of the District of Columbia, spearheaded the outreach efforts to recruit focus group participants. Additional UDC students and landgrant staff members assisted in the outreach and recruitment efforts by distributing flyers door-to-door, visiting schools, churches, and libraries, and making phone calls.

The story follows the five pillars areas and captures the future vision of residents and other stakeholder groups for their community with respect to education, health, environmental quality, social and cultural amenities and information and transportation. It begins as follows:

The year is 2030. The Deanwood and Congress Heights neighborhoods of Washington, D.C. are thriving communities that are sought after by residents and visitors alike. The neighborhood demographics represent a mix of young to middle-aged singles, families, and people of retirement age, and a diverse mix of races, ethnicities, and cultures that give the area its vibrancy. Both neighborhoods have benefitted from the trend toward urbanization that resulted in the continued growth of the DC metro region; but they also benefitted from deliberate strategies that made home ownership and rents affordable including housing co-ops, land trusts, and rent subsidies. The newly forged connection between the two historical neighborhoods created a more robust demand for a range of services. In addition, the local demand of neighborhood residents is now supplemented by a steady stream of visitors from the DC metro area and from across the nation and the world. Job growth has occurred largely from within around key initiatives like hospitality, health and wellness, green infrastructure, alternative energy, and the proud history of the Chocolate City" (O'Hara 2018)

The report concludes by identifying low hanging fruit of compelling story lines within each of the five pillar areas that lend themselves for implementation using the collected indicators to track progress toward the vision portrait in the story. The report is expected to be published later this spring and will also serve as the basis for submitting at least three papers for publication.

1.4.2 Community Outreach and Education (Cooperative Extension)

1.4.2.1 Sustainable Energy and Green Infrastructure

Human activities can negatively impact hydrological and chemical cycles, pollute air and water, degrade soil, reduce biodiversity, and affect energy use. Improving the energy efficiency of building is particularly important in the District of Columbia since the majority of emissions stem from building and not from mobile sources. To improve the management of buildings for increased energy efficiency, UDC offered a 56-hour Green Building Operator's Certification to District building operators that led to an energy shift of in selected District operated facilities. As a result of the documented improvements in building management, District taxpayers realized annual economic savings on energy use of over $500,000.

Similarly, the percentage increase in water reuse and conservation due to green infrastructure practices continues to reduce pressure on water use and water runoff management. As water reuse increases, the use of water released to the greywater system decreases. Regrettably, there are few qualified technicians in the District of Columbia who are trained to maintain green infrastructure installations that contribute to the reuse of water. UDC offered 60 underemployed or unemployed District residents with a high school diploma or equivalent 106 hours in green infrastructure construction, inspection, and maintenance. 45 residents qualified for and passed the National Green Infrastructure Certification Exam. Participants who successfully complete the National Green Infrastructure Certificate are placed into part or full-time employment opportunities in the green infrastructure industry. This initiative ultimately affects the quality of life of program participants and DC residents at large economically, socially, and environmentally.

1.5 Water Safety and Water Management

1.5.1 Relevant Research

1. 5.1.1 Development of a Novel Stormwater Runoff Collection and Treatment System for Urban Agriculture and Food Security

With the fast increase of urban population, vast quantities of energy and water are being consumed whilst harmful quantities of wastewater and stormwater runoff are generated through the creation of massive impervious areas. In addition, rising oil prices, unreliable rainfall and natural disasters have all contributed to a rise in global food prices. Food security is becoming an increasingly important issue, especially urban residents here in US. There is an urgent need of developing effective and economical feasible solution for the best management practices to minimize storm water runoff, reduce soil erosion, maintain groundwater recharge, and minimize surface water and groundwater contamination from combined sewer overflows[1].

In the last decade, researchers from universities and nongovernmental organizations, as well as industry consultants, have proposed new techniques and methodologies to remedy wastewater which include using micro/nanostructured membrane/filtration, nanoparticle catalytic, and chemical reaction, etc. [1-12]. However, these methods often times are inapplicable for urban agriculture farm or household, because the cost of the system and requirement of post processing are usually time-consuming and expensive [4, 5, 12]. This project will address this issue by the design and development of a novel stormwater collection and treatment system which can harvest and store stormwater from densely populated urban areas and use it to produce food at relatively low costs. This will reduce food miles (carbon emissions) and virtual water consumption and serves to highlight the need for more sustainable land-use planning.

The broader goal is to assist in exploring an efficient and cost effective way to improve regional and global food security, create local capacity and improve social, economic and environmental condition of people and organizations in the District of Columbia through integrating research, teaching and community service in this project . This project will be accomplished through two tasks:

1) Storm water Treatment Material preparations; and
2) Storm water collection and treatment system design and development.

The efficiency of the system will be evaluated at the EPA Certified Environmental Quality Testing Lab at the UDC Van Ness Campus. To broaden the impact of the project, the results will be disseminated through the following approaches: 1) Live demonstration of the stormwater collection and treatment system at the Firebird Farm of UDC; 2) Hands-on workshop and training sessions; 3) Presentation and tour program at University open house and Engineering Discovery Day at UDC to local high school students and visitors; and 4) Conference poster/presentation and journal publications. The research is very much useful for the District of Columbia because it can help solve the urban stormwater runoff issue and reduce the cost of stormwater management cost to meet the increasing volume of stromwater runoff and pollution, especially in metropolitan area.

The following progress has been made:

Objective 1: To design and manufacture the metallic oxide nanoparticles infused mesoporous material. Completed.
1. Major activities completed: A hybrid mesoporous materials with metallic oxide nanoparticles has been developed. Another improved synthesis method has been developed to prepare this hybrid material and proven to be a cost effective and efficient way.
2. Data collected: Using the improved hydrothermal method, we could synthesize the hybrid material within 12 hours. So far, several batches of the hybrid materials of different sizes of TiO2 nanoparticles have been developed and compared.
3. Discussion of the results: Current results have shown that this modified hydrothermal method can be used to improve the process of synthesis of the material with a very high yield rate (~70%) and a short time frame (less than 12 hours). The next step is to optimize and further improve this method to reduce the time and improve yield rate. This finding have been published at a peer-review journal and presented at three national conferences.

Objective 2: To characterize the microstructure and evaluate the pollutant removal performance of the synthesized material. Completed:
1. Major activities completed: The capability and efficient of this hybrid material has been tested using EPA standard procedures for heavy metals and organic dyes removal.
2. Data collected: Several batches of the hybrid materials of different concentrations of nanoparticles have been developed and used for heavy metal removal test following EPA standard procedure. The results have shown that this hybrid material is very effective in absorbing the heavy metals tested here (Pb, As, Cu, and Cd) with an efficiency around 90%. The size of the nanoparticle infused onto the mesoporous structure has a significant impact on the absorption efficiency. The material has also shown good filtration for organic dyes.
3. Discussion of the results: Current results have shown that this hybrid material can be used to remove heavy metals and artificial dyes from contaminated water effectively. The next step is to optimize the structure of the material to further improve its efficiency and test its capability in removing pesticides and paratheatrical contaminants.

Objective 3: To design a stormwater collection and treatment system with synthesized material. Completed:
1. Major activities completed: An improved design of the stormwater collection and treatment system has

been developed and a prototype has been built.
2. Data collected: A compact and expandable stormwater collection and treatment system prototype has been developed, which can be used to harvest and store stormwater from densely populated urban areas and use it to produce food at relatively low costs. This system consists of an expandable storage tank that has a minimum volume and occupied space of 5 cubic feet and can expand to a theoretical maximum volume of 19 cubic feet. The filtration system consists of a mechanical filtration with a filter size of 250 microns and a chemical filtration system with the mesoporous nanostructured material, MCM 48, to filter heavy metals and other pollutants.
3. Discussion of the results: Current results have shown that this system can be easily attached to the down spout of a typical DC house. The installation took less than 20 minutes and did not include difficult alteration. The system fit into the confined space, and did not collect unwanted bugs or rodents.

Objective 4: To evaluate its performance, and optimize the design to reduce the cost and time-consumed of per-liter clean water processed. Completed.
1. Major activities completed: The initial design of the stormwater collection and treatment system has been redesigned and optimized for a reduced cost and time.
2. Data collected: We have performed some preliminary testing and we are still working on to collect more data
3. Discussion of the results: We are still in the process of collecting more data

The system was demonstrated at the 2017 Science Discovery Day at UDC, in which local middle and high school students and teachers visit the lab and observed the demonstration of the mesoporous material and the stormwater system.

The system has also been presented at Spring 2017 ASEE Mid-Atlantic Conference at Morgan State University between April 7-8, 2017, AWRA Summer Specialty Conference on Climate Change Solutions: "Collaborative Science, Policy, and Planning for Sustainable Water Management" June 25-28, 2017 at Tysons, VA, and the 2017 ASME International Mechanical Engineering Congress and Exposition (IMECE) from Nov. 3 to 9 at the Tampa Convention Center in Tampa, FL.

The results obtained have been disseminated to the targeted audience (DC residents and high school students) through two major activities during this reporting period: 1) over 100 local high school students, UDC students and faculty toured the PO's laboratory at the 2017 UDC Discover Innovation Day, in which the hybrid material with nanoparticles and the proposed stormwater collection and treatment system were demonstrated; 2) three conference presentations; and 3) one published peer-reviewed journal paper.

We will continue testing and optimization of the stormwater collection and treatment system. We are also working on the further optimization of the synthesis process of the hybrid MCM material. More containment including different tract metals and organic contaminants will also be tested to evaluate the performance of the system. The results will be further disseminated to the targeted audience through various outreach activities, including publications, demonstrations, and workshops.

1.6 Food Safety

1.6.1 Relevant Research

1.6.1.1 Soil Analysis for Trace Elements and Urban Gardening in the District of Columbia: Food Safety

As food security and global warming made urban gardening popular in the densely populated cites like the District of Columbia, soil contamination and food safety is also raising health concerns. Growing edible crops in a contaminated growing media or soil with a high level of heavy metals such as Pb and Cd may pose risk to human health. The goal of this study is to identify and quantify trace elements (Pb, As, Cd, Cr,

Cu, Ni, Se and Zn) in the soil and products of home and community gardens, to include idle places that can potentially be used for urban gardening in the District. The objectives of this work are five-folds: (1) a background study for soil contamination and urban gardening in DC, (2) testing trace elements in the soil of home and community gardens, (3) geocoding soil test results, (4) assessment of potential accumulation of trace elements in different products that might grow on the contaminated sites, and (5) development of guidelines for best practices that reduce human exposure to high levels of metals. Soil samples and plant tissues will be collected and analyzed according to EPA methods in the new UDC Environmental Quality Testing Laboratory using Inductive Couple Plasma and Mass Spectrophotometer (ICPMS). The expected outcomes include geocoded soil test results using ArcGIS10 or ArcInfo at the UDC Modeling and Simulation Laboratory. This research project is interdisciplinary as it encompasses soil chemistry, biology, nutrition, food safety, computer science, agronomy, soil sciences and geographic information system, and as such it will benefit the university in training students from various majors, as well as providing support forward a mission of sustainable DC. Most importantly, the outcome of this work will also be applied to write a bigger grant proposal.

The project has been completed. During the life of the project, we accomplished several tasks. First, we collected and tested more than 600 soil and plant samples from community and home gardens in DC for metal elements including total and extractable trace metals Be, Mn. Co, Ni, Cu, Zn, As, Se, Mo, Cd, Sb, Ba, Hg, Tl and Pb), minerals (K, Ca, Mg, Na, and Fe), pH, extractable phosphate and nitrate level. The results were compared with the EPA soil screening guidelines and soil nutrient management guidelines.

Secondly, we geocoded the Arsenic and Pb level in GIS Map, including garden plots that exceeded level of EPA soil screen guidelines. This information is very useful to inform the DC residents about their soil quality in their yard as well as their neighborhood.

Third, we assessed potential uptake of arsenic and lead by vegetable crops grown in a contaminated soil using a pot experiment in the green house. Three vegetable crops were applied for this experiment including tomatoes, lettuce and radish. The results show that there is no evidence that both Pb and As elements are accumulated by these vegetables.

Fourth important accomplishment is we established nationally accredited (NELAP) soil testing laboratory service in trace metals and minerals analysis at the University of the District of Columbia. The Environmental Quality Testing Laboratory is now nationally accredited in soil and water testing in metal elements and microbial analysis in water and wastewater. We also established soil testing service for DC residents and beyond. With minim fee as low as $20, one can receive recorded quality lab testing service for 7 soil quality variables including K, Mg, Ca, pH, soil organic matter content and extractable phosphate and Pb. As part of the soil testing service package, we provide interpretation of soil test result and recommendation for soil amendment when needed since 2014.

Finally, the findings of the project were presented at local and national conferences, including UCOWR

1.6.1.2 Pesticide residue on fruit and vegetable from farmers markets and community gardens in Washington DC

Adequate daily intakes of fruits and vegetables (FV) is recommended as part of healthy eating practices, however daily consumption of FV with elevated pesticide residues poses risk to human health. Organically produced foods are very small part of the total food sales in US, only 4%, and 96% of our food supplied by the traditional farming that may use pesticides such as herbicides, insecticides or fungicides. Pesticides are applied to improve the quality and quantity of FV. Pesticide residue in FV is among many biological and chemical food contaminants that are of concern when addressing food safety in the ever-increasing demand for food security locally as well as globally. According to World's Food organization, food contaminated with harmful biological and chemical substances is responsible for 200 diseases, ranging from diarrhea to cancers. According to USEPA, the pesticide residue exceeding EPA tolerance levels in

food in the U.S. between 1994 and 2014 is low, but indicates an increasing trend. The trend shows that there is a need for continued monitoring for pesticide residue in the fresh produces. The objectives of this study include:

(1) to identify most commonly used pesticide in the District and its surrounding,
(2) to assess fast screening method for pesticide residue analysis on fruit and vegetables,
(3) provide training to DC gardeners on pest management practices, and
(4) writing a final technical report.

In this reporting period, we have tested 79 samples collected from main supermarket and farmers markets in all eight DC Wards. Four selected fruit and vegetables include organic and traditional produced tomato, apple, nectarine, and potato.

In this reporting period, the main goal of this research project was to collect and analyze five types of fruit and vegetables from two sources: (1) market basket of the main super market, and (2) market basket of a local farmers market. Five types of fruit and vegetables were selected for the market basket study including tomato, potato, strawberry, nectarine, apple and lettuce. The selection was made based on the USDA's pesticide data program (USDA, 2015). According to USDA (2015), these produces were reported to have detectable pesticide residues.

We collected 79 samples of fruit and vegetables from five main supermarkets (48 samples) located in five DC Wards (1,2,3,5,6 and 8), and eight local farmers markets (31 samples) from all eight wards of the District of Columbia. The samples were analyzed for 138 types pesticide residues including 39 fungicides, 52 herbicides, 38 insecticides, four (4) pesticide metabolites, one (1) plant growth, and one (1) repellant.

Samples from the main supermarket include 15 samples from organically produced farming and 33 samples from traditional farming, whereas samples from the farmers market include all 31 samples from the local farmers markets. All samples were extracted using QuEChERS and analyzed using Gas Chromatography Mass Spectrophotometery (GC-MS). The results showed that all samples from the main supermarket have at least one detectable pesticide residues, and 50% of the collected samples exceeded the EPA tolerance limit in four or more pesticide residue; and 65% samples exceeded the EPA tolerance limit in 1 or more pesticides. Most frequently detected pesticide includes tetrahydrophthalimide and thiabendazole.

All samples from the farmers market have four or more detectable pesticide residues, which means 100% of the samples collected from the local farmers market exceeded the EPA tolerance limit. This is an interesting finding and needs further studies as locally produced fresh produces are expected to have no or lower pesticide residues. The market basket samples from the farmers market showed more percentage of samples that exceeded the EPA tolerance limits than the samples from the main supermarket.
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During this reporting period, this research project provided training opportunity for our lab personnel, researchers, and students to conduct pesticide analysis in environmental samples using state-of-the-art sample preparation and sample analysis including Horizon sample extraction and dry vap, GC-MS. The lab personnel and four graduate students were trained in sample preparation and lab analysis. One MS thesis was supported by this project.

One Master of Science thesis student worked on this project starting September 2017 through December 2017. The results were disseminated through powerpoint presentation at the local and national conferences. We are also planning to prepare a factsheet related to best practices in food preparation to reduce pesticide residues in fruit and vegetables.

In the next reporting period, we will test the effect of different food processing techniques on pesticide

residues in fruit and vegetables, and organize training on integrated pest management practice for community and home gardens. The participants of this project include researchers and graduate students. In this project, five researchers were involved in the project activities, including three PIs and one graduate student with staffing role and one graduate student with non-staffing role.

The target audience of this project includes DC residents, UDC students majoring food science or nutrition, DC Department of Energy and Environment, Environmental Protection Authority, urban agriculture researchers, and sustainable DC affiliates.

Publications during this reporting period include:
Almushayti, Albatul and Tolessa Deksissa (2017). Assessing the Most Common Pesticides Residues in Fruits and Vegetables from the Main Supermarket in DC Using GS/MS. 2018 Emerging Researchers National (ERN) Conference in STEM, Oral Presentation, Accepted.

Almushayti, Albatul (2017). Assessing the Most Common Pesticides Residues in Fruits and Vegetables from the Main Supermarket in DC Using GS/MS. MS Thesis , University of the District of Columbia, Washington DC.

The proposed Integrated Pest Management training was not conducted during this reporting period, but we are planning to organize one in the next reporting period. The reason for this change was we would like to have a monitoring data for the prevalence of pesticides residue in the main supermarkets as well as farmers market prior to organizing training. No other changes were made.

During the next reporting period, we plan to do as follows:
1. Write more publications and fact sheets.
2. Conduct training for DC residents on the integrated pest management practice.
3. Apply for NELAP laboratory accreditation in pesticide residue analysis in water.

1.6.2 Community Outreach and Education (Cooperative Extension)

1.6.2.1 Sustainable Water Roundtable.

This project has provided training and professional development opportunities for the Principal Investigators, faculty, graduate and undergraduate students. Working on this project, the PI's had the opportunity to apply state-of-the-art laboratory techniques, including sample preparation for total and extractable trace metal analysis in soil, bio-solids and plant tissues using the latest lab equipment, Nexion 300 D ICP-MS and EPA 2008. Faculty and students were trained in these advanced techniques. The project advanced professional experience of three research faculty, 15 graduate students, and 27 undergraduates for the last three years. Furthermore, 6 MS thesis were conducted and completed based on the research capacity partly developed through this project.

The results of the project have been disseminated via conference proceedings, local and national oral and poster presentations and direct contact with the DC residents that have received free soil testing services as part of the project activities. DC urban gardeners have received interpretation of their soil testing result and recommendations for further action to improve their soil quality. Through the life of the project, we disseminated soil testing result and recommendation for more than 600 soil test results.

During this reporting period, three graduate assistants and two lab senior personnel or co-principal investigators have participated on this research project. Students assisted in sample collection, sample preparation and sample analysis. The lab personnel assisted in the sample preparation for lab analysis. The target audience of this project included DC residents who are currently gardening or planning to garden, home gardeners and community gardeners, DC Department of Environment, Environmental Protection Authority, urban agriculture researcher, and sustainable DC affiliates. During this project, we

analyzed soil samples for more than 600 garden plots or gardens. The majority of the gardens tested for trace metals and minerals were home gardens (78%).

The main outputs or outcome of this research project includes national accreditation of UDC's Environmental Quality Testing Laboratory, and publications of conference presentations. As the result of this research support UDC is now accredited in soil and water testing for trace metals and major elements through the National Environmental Laboratory Accreditation Program (NELAP). The lab now established a minimum fee based soil and water testing service for the DC residents. Furthermore, a new website was created for the lab service: www.udc.edu/EQTL.

Publications or presentations made through the life of the project included:

- Tilhoo, Kailash, Mani Shehni Karam Zade, Sebhat Tefera, and Tolessa Deksissa (2018). Assessment of Trace Metal in the District of Columbia Food Hub's Soil, 2018 Emerging Researchers National (ERN) Conference in STEM. PowerPoint Presentation, Accepted.
- Rose, Sania, Trinh Vu, Yacov Assa, Sebhat Tefera, and Tolessa Deksissa (2016). Analysis of Arsenic, Copper, and Lead Contamination in Urban Gardens in the District of Columbia. The 2016 Emerging Researchers National (ERN) Conference in STEM, Washington, DC, February 25-27, 2016. PowerPoint Presentation.
- Rose, Sania, Trinh Vu, Yacov Assa, Sebhat Tefera, and Tolessa Deksissa (2016). Analysis of Arsenic, Copper, and Lead Contamination in Urban Gardens in the District of Columbia. The 73rd Joint Meeting BKX and NIS for 2016 will take place in Hampton, Virginia, April 6 - 9, 2016. PowerPoint Presentation
- Deksissa, Tolessa, Sebhat Tefera, and Yacov Assa (2016). Urban Soil Quality Assessment as Green Urban Stormwater Management Strategy. NCR-AWRA 4th Annual Water Symposium, Washington, DC, April 8, 2016. PowerPoint Presentation
- Deksissa, Tolessa (2016). Unbiased Soil and Water Quality Monitoring: Academic and City Collaborations, Director, Water Resources Research Institute, Sustaining Water Resources in the Mid Atlantic, Dec. 6, 2016. PowerPoint Presentation.

This is the final report, but we are planning to write the guidelines on the best practices to reduce food contamination through growing food crop on contaminated soil.

1.6.2.2 Certified Professional Food Manager Program (CPFMP)

Each year, roughly one out of six Americans get sick; 128,000 are hospitalized, and 3,000 die from foodborne illness," (Academy for Nutrition and Dietetics, 2016). Foodborne illness is a major problem throughout the country, and even here in Washington, DC. "More than 200 diseases are spread through food" (World Health Organization, 2016). With 5,500+ food establishments in the District of Columbia alone, the need for intelligent, passionate, and dedicated Certified Professional Food Managers is urgent.

There are only 22 sanitarians, two administrative staff, two supervisors, one program manager, and one food technologist employed by the District of Columbia. Thus, the Certified Professional Food Manager course is necessary to continue to train qualified individuals to help monitor and ensure our food's safety

The Certified Professional Food Manager Course is taught by Paul Brown Jr. It is a vital program in the District of Columbia that helps residents get the certification and confidence needed to gain employment in commercial food operations. It also helps to safeguard that the food that is being served to the public and residents of the District of Columbia, is safe and free from physical, chemical and biological contamination. The course is a three day, 16 hour course which delves into basic food safety and sanitation, and how to make sure employees, facilities, and food products are food-safe compliant. It runs from 9:00 am - 4:00 pm each day, and culminates with students taking a nationally recognized exam from Prometric. There is a pretest given at the beginning of the course that assesses the student knowledge provide to intervention

and a posttest following the intervention to assess the student knowledge after the intervention. These pre and posttests are used as practice in preparation for the National Exam. The National Exam is an 85 question test, in which student must achieve a score of 70% or better to become a Certified Professional Food Managers. Students are also required to complete practice exercises in the textbook to help prepare for the National Exam.

The course is taught regularly throughout the year at the University of the District of Columbia and we also work with partners throughout the city as well. The areas of focus in the city have been wards 5, 7, and 8. The vast majority of students tend to be African American and women. The course helps students get food manager certification by taking and passing a National Exam, which is good for five years. We also help them by giving the students some practice tests to get ready for the National Exam. We give them a pretest before we start teaching to see what they know before any lessons are taught and a posttest to see what they've learned from the lessons taught and from studying independently at home. Finally, we focus on our CPFM course on teaching basic food safety and its principles. We use the book, NSF HealthGuard Professional Food Manager Certification Training Version 6.0, as a guide to delve into the important aspects of food safety, foodborne illness, the food facility, pest management, and the principles of food safety.

This certification is helpful to anyone who would like to take the course, but is vital to those seeking employment in food service. It aids those working in commercial kitchens, restaurants, fast food, daycares and schools or those who are looking to go into business for themselves. This usually happens through the increasingly popular mobile food facilities (food trucks), bed and breakfasts', and catering businesses. This certificate is a requirement to work in commercial food settings or where food is being served to the public. It allows for upward mobility for those already employed in lower level food service.

Individuals have come from a host of different agencies throughout the city and surrounding area. We have partnered with and taught students, individuals and entrepreneurs who were employed, unemployed and under employed from places such as, Homes for Hope Community Inc., Grant Associates Inc., New Course Restaurant and Catering, DC Department of Health, DC Department of Aging, Bread for the City, Linden Manor, Elsie Whitlow Stokes, The Goodwill, New Course Restaurant and Catering, Zenful Bites, Levy Food Service, The Calpro Group and Levy Foods among other groups.

The results showed from fiscal year 2016 to fiscal year 2017, the unduplicated contacts were 69 including 13 males and 56 females and the duplicated contacts were 1173 and indirect contacts of 2933. The test scores were good. Although the assessment scores varied from site to site, students made an average score of 66 on the pretest, and an average score of 90 on the posttest. The national exam score was 75. Seventy-three percent of the students passed the national exam on the first take and became Certified Professional Food Managers. Students were allowed to repeat the course in order to improve their scores on the national exam. There were nine different courses taught in three different locations in FY17. The locations were UDC in Ward 3, Grant Associates in Ward 8 and Homes for Hope, Inc. in Ward 7.

In Ward 3, the high score for the pretest was 87; the low was 61, with an average of 73.5. The posttest high was 99 with a low of 89 and an average score of 96 and the national exam high score was 91 with a low of 72 and average of 83. In Ward 7 the high score for the pretest was 81, the low was 34; with an average of 62, the posttest high was 98 with a low of 68 and an average of 87 and the national exam high score was 88 with a low of 29 and average of 67.5. In Ward 8 the high score for the pretest was 75; the low was 46; with an average of 60. The posttest high was 96 with a low of 64 and an average of 81 and the national exam high score was 83 with a low of 71 and average of 77. "I was able to remember almost everything you said word for word...I got my pay day because of your class." Delores Robinson.

1. 7 Urban Families, Youth, and Communities

1. 7.1 Relevant Research

No research activities have been conducted in the area of 4H and Youth Development.

1. 7.2 Community Outreach and Education (Cooperative Extension)

During this reporting period, the UDC CAUSES 4-H program has been in the process of implementing organizational changes that will further improve the quality of our programs and the efficiency and effectiveness of our program delivery. The new organizational model builds on our strengths as an urban land-grant program that is located in a community that is rich in skills, knowledge, and civic mindedness. As we transition to our new organizational model, which will more effectively use the rich resources of the District of Columbia to the benefit of our 4H Clubs and the students and club leaders we serve, our programs and their delivery format have also been under review to ensure continuous improvement.

We ended the year reaching more than 8,000 youth indirect contacts and 3,000 in direct contacts. Consistent with our organizational transition, we faced a reduction in clubs but a boost in numbers of youth in 4-H programs.

We managed 17 4-H clubs, and three specialized 4-H programs: (1) the 4-H Nutrition Education program (food safety, security and nutrition), (2) the 4-H LifeSmarts program (sustainable energy, water quality and climate change), and (3) the 4-H Soccer Program (Childhood Obesity). The Camping Program and our Military Partnerships Program also continue to engage youth in our primary NIFA goals. We continued to introduce STEM Education activities in new and different formats, and were able to serve 3,018 youth during this reporting period.

1.7.2.1 4H Nutrition Program

For the past three years, we have worked with UDC CAUSES professor Dr. Michelle Harris in the Department of Health, Nursing and Nutrition to send college students into the classroom for a minimum of six weeks to present programming to children related to nutritious eating, exercise, food security, and food safety. The college students were given a stipend of $30.00 a week as needed for demonstrations and program materials. Two schools participated and 250 youth participated in the programming. 70% of our college students went past the six week class mandate because they became attached to the youth and appreciated the feedback from the teachers and children. College students were advised at the beginning of the semester that this program would account for 30% of their classroom grade. There is a request to expand the program from teachers and youth. We are reviewing funding options to expand the program and to position it as a model of engagement and service learning.

1.7.2.2 4H LifeSmarts

LifeSmarts, established in 1994, is a program of the National Consumers League offered to youth in grades 6th-12th grade. The LifeSmart program and the competition that is a centerpiece of the program, prepares students to enter the real world as smart adult consumers. 2017 marked the 21st year of participation in the 24 year old LifeSmarts program. Trained 4-H Volunteer William Cocke is the 4-H LifeSmarts program coordinator affiliated with the National Consumers League. Participants focus on five key topic areas: consumer rights and responsibilities, the environment, health and safety, personal finance, and technology. A LifeSmarts team consists of five youth and one adult coach working to win the state and national game show competition. Seven high school teams advanced to the state competition this year. The winning team traveled to the National Competition in San Diego, CA. The Junior Varity teams do not travel to the competition. Participants in the LifeSmarts program must also conduct an in-school food observation report and they provide training to four school groups to earn a $1,100.00 award.

1.7.2.3 4H Soccer Program

Addressing childhood obesity must take many forms to succeed. Our UDC 4-H CAUSES Soccer program engages youth in three age categories in learning about healthy eating and exercise, and uses the Health Rocks curriculum to learn about drug prevention, team building and skill mastery. Our UDC 4-H Soccer

program engaged more 637 youth. The youth participated in a nine week fitness program culminating in a soccer tournament championship and an overnight camping experience for 60 of the youth who participated in the soccer program at the Riverview camping facility in Maryland.

1.7.2.4 4H Health Rocks

Health Rocks our drug prevention program is presented by 4-H volunteers and interns. This year a professional development three-day program was provided for our coaches to strengthen communication skills, soccer skills and nutrition education for these important leaders. Thirty (30) coaches participated in the training on the UDC campus. The obesity prevention component of the overall healthy living message of the program is provided by the CAUSES Center for Nutrition, Diet and Health.

1.7.2.5 4H Military Kids

Our 4H Military Partnerships Program included monthly program activities at the DC National Guard when parents were attending drill. We also planned monthly programs and summer activities for our youth. During the program year we hosted a three day spring break program with the focus on Childhood Obesity offering nutrition education and food demonstrations. Our water quality lab engaged them in experiments in the lab learning Water Quality education. Food Safety Education was provided by community educator Paul Brown from the Center for Nutrition Diet and Health. The Participants enjoyed programs on campus to include a fashion show, diversity training, and visiting the art exhibit. Conflict resolution and bully prevention was provided by members of the drama department. Youth visited the Firebird Farm which is their favorite UDC food hub and swam in the UDC pool. They built bird houses and placed them in their communities and at the national guard location.

1.7.2.6 4H STEM

Students at the Takoma Education Campus (both 7th graders and 5th graders), youth from the Columbia Heights Education campus, and youth from The Roots Public Charter school participated in learning about embryology with chicks hatching in their classrooms. Students monitored the development of the chicks candling and documented change. These programs were led by our CAUSES interns and the students commented that the program represented their favorite science project. Sixty-Six (66) youth participated in the program twice weekly at their prospective schools.

Twenty-Five (25) youth at the DC Challenge Program participated in our STEM education program learning about 3-D Printers. Volunteer Keith Hammond worked with extension staff to provide the programming.

As we continue the implementation of our new organizational model we will be able to expand programming focused on topics of interest to the youth and youth leaders by building on the expertise of our extensive network of well trained volunteers. We are confident that this model will improve the quality of our programming by expanding our network of expertise utilizing the successful 4H train-the-trainer model.

Summary Comment

The data regarding program outputs and outcomes submitted in this report does not include any information about the SNAP Ed and EFNEP programming offered through the UDC CAUSES Center for Nutrition, Diet and Health.

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Total Actual Amount of professional FTEs/SYs for this State

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	24.0	0.0	22.0	0.0
Actual	16.2	0.0	12.7	0.0

II. Merit Review Process

1. The Merit Review Process that was Employed for this year

- Internal University Panel
- External University Panel
- External Non-University Panel
- Expert Peer Review

2. Brief Explanation

We have established a Merit Review Process for research/extension in Land Grant Programs that continues to work well at ensuring that research proposals are judged fairly and on their merit. For Hatch and Mini-grants offered through the Station, the process includes: the Development of a RFP; Solicitation of RFP; Receipt of Proposals; Review of Proposal Packets for Completion of Requirements; Peer Review; Director's Review; Completion of Required Forms for submission to USDA; Electronic Submission to USDA for expert panel review; USDA Approval; and Issuance of Award. The Peer Review panel includes representatives from various departments/schools across the University. Research projects are often joint ventures, conducted by faculty as well as qualified research and extension staff.

The Peer Review Committee assesses our program's proposed research/extension projects and activities based on the following criteria:

• Knowledge base of the research
• Adequacy of procedures and experiment to meet the objectives
• Feasibility of accomplishing the objectives
• Scientific merit of the proposed research
• Familiarity with work of others related to the proposal
• Outcomes and Impacts
• Appropriate budget for proposed research
• Budget Justification

All research/extension projects are monitored by the Director and Associate Director to ensure that objectives and timelines are being met. An annual progress report is required and is reviewed by the Station Director prior to electronic submission to USDA. All projects must include student learning experiences.

III. Stakeholder Input

1. Actions taken to seek stakeholder input that encouraged their participation

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals

- Survey of the general public
- Other (distribution lists; website)

Brief explanation.

CAUSES regularly seeks stakeholder input through its partnerships with non-profit organizations, DC agencies, and residents through neighborhood organizations and the ANCs, a network of neighborhood representatives that are active in every Ward of the District of Columbia. In addition, we collect program feedback from participants, community partners, and faith-based organizations. Particularly important is our work with individuals and organizations in the most underserved Wards of the District, Wards 5, 7 and 8. These are largely low income communities, characterized by extensive food desserts, high unemployment, high school dropout rates and other significant challenges. We have reached out to seniors, youth, single mothers, ministers, community advocates, working class and middle class residents. Three of our Urban Food Hubs, which are currently in various stages of implementation, are also located in Wards 5, 7 and 8. Additionally, stakeholder input is sought at both research and extension activities such as the Farmers' Market, workshops, seminars, and demonstrations throughout the eight Wards of the District of Columbia. We let our stakeholders know that their input is essential to the research conducted and extension services provided to benefit them, their families, and communities within the District of Columbia. We encourage their input via stakeholder surveys, interviews, and one on one dialogue, and two major stakeholder events held annually.

2(A). A brief statement of the process that was used by the recipient institution to identify individuals and groups stakeholders and to collect input from them

1. Method to identify individuals and groups

- Use Advisory Committees
- Use Internal Focus Groups
- Use External Focus Groups
- Open Listening Sessions
- Use Surveys
- Other (workshops, seminars, Quality of Life Day Event)

Brief explanation.

Our objective is to meet with residents and organizations across the eight Wards of the District. Currently, our focus is on the underserved population of the city, residents residing in Wards 5, 7 and 8. A large segment of this population are low income residents and many households in the District's most underserved Wards are led by a single parent or, in some cases, a grandparent(s). Research and Extension, separately as well as jointly, host a number of activities during the year including workshops, seminars, demonstrations, training sessions, a Farmer's Market on the University's main campus and one of our Food Hub locations as well as support for several other farmers markets across the District. At these events, stakeholder surveys are administered to willing participants and collected for assessment. In 2017 we also hosted an open house event at the Firebird Farm Agricultural Experiment Station and we hosted a stakeholder appreciation luncheon on our main campus at Van Ness. Since both events were very successful we plan to continue them in 2018.

2(B). A brief statement of the process that was used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Survey of traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals
- Meeting with invited selected individuals from the general public

Brief explanation.

Our objective is to meet with residents and organizations across the eight Wards of the District. Currently, our focus is on the underserved population of the city, residing in Wards 5, 7 and 8. A large segment of this population is low income residents with many households lead by a single parent or, in some cases, a grandparent(s). Research and Extension, separately as well as jointly, host a number of activities during the year including workshops, seminars, demonstrations, training sessions, and an annual Farmer's Market on the University's main campus. In addition, the CAUSES Landgrant center directors, along with the Dean and Associate Dean of Landgrant programs, have met with DC agencies and non-profit organizations to solicit information about priority needs for the District of Columbia. An important tool in structuring these informational meetings is the so-called Sustainable DC Plan, developed by former DC mayor Vincent Gray. The plan outlines the ambitious goals of making Washington DC the greenest, healthiest and most livable city in the United States by 2030. Moreover, the Sustainable DC Plan sets sustainable development targets that provide a roadmap for CAUSES to focus its activities in support of the Sustainable DC goals. The Directors of the five CAUSES Centers have now begun to convene networking meetings several times per year that bring together organizations and DC agencies in their respective areas of responsibility -- Urban Agriculture; Sustainable Development; Nutrition Diet and Health; Youth Development; and Housing and Community Planning.

3. A statement of how the input will be considered

- To Identify Emerging Issues
- Redirect Extension Programs
- Redirect Research Programs
- To Set Priorities

Brief explanation.

The assessment work of CAUSES is supported by a full-time assessment specialist, who is assisted by a full- time associate. This staff works closely with the five landgrant center directors and the five academic program directors in CAUSES to ensure that input received from stakeholders is reviewed, assessed and processed to improve on our applied research and community outreach activities. The result of this assessment and analysis work indicates that we are addressing many of the issues and concerns identified by our stakeholders. However, there are areas that offer opportunities for expansion and improvement of our work. Our ability to realize these opportunities depends largely on budget and personnel allocations, yet operational improvements will also be necessary to fully realize the potential of expanded and new research and community outreach opportunities. Especially critical are operational areas in human resources and procurement. The new President of the University of the District of Columbia has made operational and processing one of his priorities and has established a new organizational structure that includes a Chief

Operating Officer with responsibility for HR, IT, procurement, and facilities. As the University's landgrant college, CAUSES and its leadership is keenly aware of the responsibility to build capacity that improves the social, economic and environmental conditions of the District and its diverse stakeholders through relevant research and community education programs. In its monthly management meetings, the CAUSES center directors, academic program directors and operations staff are carefully reviewing and updating our Plan of Work to expand our effectiveness and reach.

Brief Explanation of what you learned from your Stakeholders

Stakeholders concerns have remained relatively consistent. In line with the Sustainable DC Plan and its targets, concerns of the broad range of DC stakeholders include improving health and especially preventive measures that improve health conditions before treatment becomes necessary; improved access to locally grown, high quality food; water quality including the goal to make the rivers within the District fishable and swimmable; improved infrastructure; more access to parks and outdoor recreation; better sustainability literacy. In addition, we have observed a growing interest in Urban Agriculture. In 2015 we launched an Urban Agriculture Certificate program and enrollment has continued to increase. Issues and topics of concern include the following:

- Safety of Foods: Growth, storage, and preparation of foods
- Economic Development: Jobs, training, sustainable neighborhoods
- Obesity: Healthy children and adults; Prevention of Chronic Illnesses; Healthy Eating; Activities for Children
- Urban Gardening: Growing their own food; exposure to different types of food, including ethnic crops and organic foods
- Healthy Food Choices: Eating better for better health and longevity
- Healthy Lifestyles: youth activities related to physical fitness and proper nutritio
- Sustainable energy: continued availability of resources for themselves, their children and generations to come
- Urban Agriculture
- Aquaponics and Hydroponics

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		**Research**	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
{No Data Entered}	{No Data Entered}	{No Data Entered}	{No Data Entered}

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	1005396	0	648149	0
Actual Matching	1128927	0	809424	0
Actual All Other	444080	0	232767	0
Total Actual Expended	2578403	0	1690340	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	249937	0	204014	0

V. Planned Program Table of Content

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Climate Change Mitigation

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	20%		0%	
111	Conservation and Efficient Use of Water	20%		0%	
112	Watershed Protection and Management	20%		0%	
124	Urban Forestry	20%		0%	
132	Weather and Climate	0%		50%	
141	Air Resource Protection and Management	20%		0%	
402	Engineering Systems and Equipment	0%		50%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	3.0	0.0	4.0	0.0
Actual Paid	2.9	0.0	2.9	0.0
Actual Volunteer	409.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
199589	0	153376	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
161275	0	115632	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
63440	0	33252	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

1. Research projects on the changes in soil, air and water quality due to environmental decreasing urban forest; urban gardening; aging storm and waste water infrastructures; and effectiveness of low impact development projects as best management practices to reduce non-point source pollution;
2. Maintain soil, air, and water quality monitoring programs and testing lab;
3.Train and certify DC Public School Teachers as Environmental educators;
4. Develop and distribute informational materials such as fact sheets and brochures regarding changes in natural resources and environmental issues in the District;
5. Provide workshops, demonstrations and technical assistance on the effect of environmental degradation as it relates to the quality of life for District residents; and
6. Involve youth in litter control campaigns and environmental awareness education via education workshops at DC Public and Charter Schools, community events such as "Quality of Life Day" and the Land Grant Programs Urban Agricultural Fair at Muirkirk Research Farm

2. Brief description of the target audience

1) District of Columbia residents
2) DC Public School Teachers
3) Youth, Grades K-12
4) Urban gardeners
5) Storm and waste water operators
6) Landscapers
7) Nursery Owners

3. How was eXtension used?

eXtension was not used in this Program.

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	2589	11540	225	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2017

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of articles published
  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Number of fact sheets published

Year	Actual
2017	5

Output #3

Output Measure

- Number of newsletter published
  Not reporting on this Output for this Annual Report

Output #4

Output Measure

- Number of workshops, demonstrations and technical assistance implemented.

Year	Actual
2017	12

Output #5

Output Measure

- Number of research projects completed

Year	Actual
2017	1

Output #6

Output Measure

- Number of soil, air and water samples test results

Year	Actual
2017	27

Output #7

Output Measure

- Number of informational materials distributed

Year	Actual
2017	100

Output #8

Output Measure

- Number of conference presentations

Year	Actual
2017	1

Output #9

Output Measure

- Number of certificate of completion issued

Year	Actual
2017	27

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Percent of program participants that will become more environmentally aware due to new knowledge from informational materials provided and workshop presentations
2	Percent of program participants that will implement new environmental skills to improve natural resources and the environment
3	Percent of soil, air, and water samples meeting EPA standards after implementation of research project.

Outcome #1

1. Outcome Measures

Percent of program participants that will become more environmentally aware due to new knowledge from informational materials provided and workshop presentations

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	85

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The concept of climate change is foreign to many communities of low socioeconomic status.

What has been done
Twelve workshops were offered that included education on climate change and its impacts.

Results
85% of participants articulated an increase in knowledge in their understanding of climate change.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
124	Urban Forestry
141	Air Resource Protection and Management

Outcome #2

1. Outcome Measures

Percent of program participants that will implement new environmental skills to improve natural resources and the environment

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	85

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The concept of climate change is foreign to many communities of low socioeconomic status.

What has been done
Twelve workshops were offered that included education on climate change and its impacts.

Results
85% of participants stated they would change behavior in response to the knowledge gained on the topic of climate change.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
124	Urban Forestry
141	Air Resource Protection and Management

Outcome #3

1. **Outcome Measures**

Percent of soil, air, and water samples meeting EPA standards after implementation of research project.

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes

Brief Explanation

Federal and local changes in funding for climate change initiatives changed our strategy and reduced our efforts.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

96% of participants expressed a change in knowledge.

Key Items of Evaluation

none

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Global Food Security and Hunger

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	25%		35%	
205	Plant Management Systems	25%		30%	
216	Integrated Pest Management Systems	20%		10%	
721	Insects and Other Pests Affecting Humans	20%		25%	
806	Youth Development	10%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	4.0	0.0	4.0	0.0
Actual Paid	5.1	0.0	1.9	0.0
Actual Volunteer	710.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
445332	0	136735	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
322552	0	115632	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
126880	0	33252	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

1) Conduct bio-intensive field and hoop house experiments in the use of composted waste as a soil amendment for growing nutrient dense vegetables in urban gardens; their impact on the environment will be conducted at Firebird Research Farm in Beltsville, MD;

2) Facilitate workshops, training sessions, demonstrations, field activities, and farm tours at for program participants to teach and update knowledge of sustainable agricultural techniques at each the Food Hub to establish, maintain, protect, and market both food crops and flower gardens;

3) Develop and distribute informational fact sheets, brochures, and newsletters related to production and protection of urban gardens;

4) Participate in local, National, and international conferences and meetings on sustainable agriculture and urban gardening;

5) Provide pesticide safety education and certification for monitoring insect and disease infestations and recommendations for control while preventing environmental degradation;

6) Maintain Urban Ag and Master Gardening certifications; trained food producers and gardeners will participate in making nutrient dense food crops accessible and affordable in food desert areas of the District while beautifying the city through volunteer hours; and

7) Strengthen Ethnic and Specialty Crop Program.

2. Brief description of the target audience

1) District of Columbia residents
2) DC Public School Teachers
3) Youth - Grades 3-8
4) Urban community gardeners
5) Urban food producers and farmers markets
6) Landscapers
7) Nursery owners

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	4596	13497	1486	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year:	2017
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	2	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of articles published

Year	Actual
2017	2

Output #2

Output Measure

- Number of fact sheets published

Year	Actual
2017	110

Output #3

Output Measure

- Number of Newsletters published

Year	Actual
2017	20

Output #4

Output Measure

- Number of workshops, demonstrations and technical assistance implemented.

Year	Actual
2017	156

Output #5

Output Measure

- Number of research projects completed
  Not reporting on this Output for this Annual Report

Output #6

Output Measure

- Number of soil, plant and water samples test results
  Not reporting on this Output for this Annual Report

Output #7

Output Measure

- Number of informational materials distributed

Year	Actual
2017	620

Output #8

Output Measure

- Number of conference presentations

Year	Actual
2017	15

Output #9

Output Measure

- Number of certificate of completion issued

Year	Actual
2017	13

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Percent of program participants that will adopt urban gardening techniques learned from informational materials provided and workshop presentations
2	Percent increase in urban gardens using some compost material as a soil amendment
3	Percent of soil, plant and water sample results within acceptable crop production range
4	Percent increase in the growth of a variety of ethnic crops in home, school, and community gardens in the District of Columia.
5	Percent of new food producers that will adopt the bio-intensive method of urban agriculture production

Outcome #1

1. Outcome Measures

Percent of program participants that will adopt urban gardening techniques learned from informational materials provided and workshop presentations

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	47

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
From consuming produce that is tastier and higher in nutritional value to decreasing CO2 emissions by harvesting as locally as your backyard, District residents are all "a buzz" about the many benefits of local food production. Urban agriculture has caught on, and unlike large-scale intensive agriculture operations, urban agriculture utilizes comparatively smaller spaces while focusing on diversified, edible crops. Many residents already subsidize what they buy at the grocery store through community garden plots and by growing in their backyards, yet are in need of technical assistance with issues ranging from cultivar selection and planting dates to fertilizing, soil contamination, and integrated pest management. Alternately, other District residents don't have access to grocery stores, let alone yard space or a nearby community garden in which they can grow their own food.

What has been done
Forty-Seven (47) participants were trained as Master Gardeners, receiving 45-50 hours of basic horticulture training. Program trainees agreed to work in their communities to teach District of Columbia residents how to cultivate garden spaces and manage landscapes sustainably using research-based information. This environmental horticulture approach reduces fertilizer and pesticide use resulting in improved soil and water quality.

Results
In FY 17, 198 (which includes 47 trainees) Master Gardeners and trainees provided 9,000 hours of horticultural expertise to the District of Columbia. The value of volunteer time is $38.77 per hour according to www.independentsector.org with a total value of $348,930.00 in savings to the District of Columbia. Forty-seven (47) Master Gardener trainees completed 50 hours of basic horticulture training, a final exam and 50 hours of volunteer hours. Various Master Gardener projects throughout all eight wards of the District of Columbia have been established which

includes the UDC food hubs, schools, parks, beautification projects, landscape design, youth gardens, local and national botanical gardens, and partnerships with non-profit organizations. Master Gardeners volunteered 600 hours to the success of the Ward 3 Food Hub (green roof/greenhouse). The value of their volunteer time is $23,262.00 in savings to the University. Their duties included propagation of vegetables and companion plants, planting, maintenance, and harvesting. Produce was harvested and donated to the following: food banks, including the UDC Student Food Pantry, UDC Center for Nutrition, Diet, and Health, East Capital Street Farmers Market, and volunteers. 1/3 of Master Gardeners continue their education in horticulture related field and obtain employment.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
205	Plant Management Systems
216	Integrated Pest Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #2

1. Outcome Measures

Percent increase in urban gardens using some compost material as a soil amendment

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Percent of soil, plant and water sample results within acceptable crop production range

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Percent increase in the growth of a variety of ethnic crops in home, school, and community gardens in the District of Columia.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The main objective of the DC Sustainable Agriculture and Education Program (SARE) Ethnic Crops is to develop an educational outreach program that will train and sustain urban food producers in the District of Columbia.

What has been done
We developed a "Train the Trainer" program for an Agriculture Extension Educator/Advisor who will share information with growers across the Washington Metropolitan (DC, MD, VA, WV) for the best sustainable practices in growing ethnic crops in order to satisfy the growing demand of ethnic crops, especially in the growing and diverse immigrant population of the region.

Results
During the reporting period, 15 individuals signed up for the Hands-on Ethnic Specialty food training to learn about food production, processing and eventually value addition and marketing to the Washington DC metro area. Five new small holder farmers or landowners expressed interest in the production of ethnic crops in the Washington DC Metro area, provided it is commercially viable. With the help of labor provided by 60 volunteers, the DC SARE Ethnic Crops project harvested 6,000 lbs. of fresh ethnic vegetables, which were distributed among trainees, their respective communities, volunteers, and African and Caribbean retail stores to test marketability and demand for the harvested ethnic crop. Community members received booklets and manuals about how to begin their own gardens or join the African Ethnic program as producers for the market.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
205	Plant Management Systems

Outcome #5

1. Outcome Measures

Percent of new food producers that will adopt the bio-intensive method of urban agriculture production

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

There were no external factors which affected the outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

In FY 17, 198 (which includes 47 trainees) Master Gardeners and trainees provided 9,000 hours of horticultural expertise to the District of Columbia. The value of volunteer time is $38.77 per hour according to www.independentsector.org with a total value of $348,930.00 in savings to the District of Columbia. Forty-seven (47) Master Gardener trainees completed 50 hours of basic horticulture training, a final exam and 50 hours of volunteer hours. Various Master Gardener projects throughout all eight wards of the District of Columbia have been established which includes the UDC food hubs, schools, parks, beautification projects, landscape design, youth gardens, local and national botanical gardens, and partnerships with non-profit organizations. Master Gardeners volunteered 600 hours to the success of the Ward 3 Food Hub (green roof/greenhouse). The value of their volunteer time is $23,262.00 in savings to the University.

Their duties included propagation of vegetables and companion plants, planting, maintenance, and harvesting. Produce was harvested and donated to the following: food banks, including the UDC Student Food Pantry, UDC Center for Nutrition, Diet, and Health, East Capital Street Farmers Market, and volunteers. 1/3 of Master Gardeners continue their education in horticulture related field and obtain employment.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Health, Nutrition and Childhood Obesity Prevention

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
703	Nutrition Education and Behavior	50%		50%	
704	Nutrition and Hunger in the Population	0%		25%	
724	Healthy Lifestyle	50%		25%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	3.0	0.0	4.0	0.0
Actual Paid	1.2	0.0	1.2	0.0
Actual Volunteer	325.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
101413	0	45927	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
161275	0	115632	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
63440	0	33255	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Nutrition Education and Wellness

1) Train-the-trainer
2) Health risk assessments
3) Physical activity protocols
4) Healing properties of plant food
5) Lean protein and clean fat
6) Health deceptions in food marketing and labeling
7) Healthy eating and sleep

Changing the Health Trajectory for Older Adults through Effective Diet and Activity Modifications:

1) Investigate and compare priorities of high fruit and vegetable consumers with the low fruit and vegetable consumers;
2) Design new and innovative activities through which nutrition education can be effectively rendered; and
3) Collect and modify traditional recipes to improve the nutrition density and to increase the vegetable content and publish the recipe book.

2. Brief description of the target audience

1. Low-income adults
2. African Americans
3. Residents of Wards 5, 7 and 8
4. Socioeconomic status on cardio-metabolic diseases and their associated risk factors

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	3879	2325	405	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2017

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	1	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Youth and adults will receive direct basic nutrition and food safety education

Year	Actual
2017	1640

Output #2

Output Measure

- Youth and adults will receive direct education on health issues and direct education and demonstration on physical activity

Year	Actual
2017	1640

Output #3

Output Measure

- Development of a manuscript for the publication of data on the mechanisms of action of g-T3 on MCF-7 breast cancer cells.
  Not reporting on this Output for this Annual Report

Output #4

Output Measure

- Employ microarray experiments and a range of cellular and molecular biological techniques to determine the molecular basis of the action of y-T3.
  Not reporting on this Output for this Annual Report

Output #5

Output Measure

- Number of articles published

Year	Actual
2017	1

Output #6

Output Measure

- Number of fact sheets published

Year	Actual
2017	15

Output #7

Output Measure

- Number of newsletters published

Year	Actual
2017	30

Output #8

Output Measure

- Number of workshops implemented

Year	Actual
2017	35

Output #9

Output Measure

- Number of research projects completed

Year	Actual
2017	1

Output #10

Output Measure

- Number of informational materials distributed

Year	Actual
2017	2440

Output #11

Output Measure

- Number of certificate of completion issued

Year	Actual
2017	20

Output #12

Output Measure

- Number of conference presentations

Year	Actual
2017	2

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Percentage of parent participants who make better food choices (fruits/vegetables).
2	Percentage of participants who improved eating habits.
3	Development of broad applications for the inhibition of breast cancer cell proliferation and possibly cell transformation
4	Number of participants who improved their dietary intake, including an increase in fruits and vegetables
5	Percentage of participants, who through information and interactive approaches, have adopted better eating habits thereby increasing their daily intake of fresh fruit and vegetables.

Outcome #1

1. Outcome Measures

Percentage of parent participants who make better food choices (fruits/vegetables).

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	10

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The purpose of the Nutrition and Wellness Certificate Program was to provide African American Ward 8 residents of Washington DC ages 40 and older with the tools to understand the essential role of nutrition and physical activity on health and well-being through a supportive environment that is conducive to improving eating and lifestyle behaviors, healthy food preparation skills, safe protocols for physical activity and exercise programs, and engagement in mobilizing the community through this process. The objectives were: 1) to gain awareness of health risks through body composition screenings; 2) to understand the connection between diet, fresh produce, and chronic disease prevention; 3) to improve food literacy and recognize marketing gimmicks on nutrition labels; 4) to learn to prepare garden-fresh food in healthy and palatable ways; 5) to understand the health risks associated with inadequate sleep; 6) to learn the different components of physical activity and health; 7) to meet the minimum national recommendations for physical activity for adults at 150 minutes of moderate activity or 75 minutes of vigorous activity; and 8) to demonstrate examples of moderate and vigorous physical activity, and distinguish between cardio, muscle strengthening, and flexibility exercises.

What has been done
This nutrition education program, Pavillion of God, was integrated into their weekly bible study session each week to accommodate the scheduling barrier, with a special emphasis on the scientific aspects of nutrition led by the educators and health from a Christian perspective led by clergy leaders. This style is also an evidence-based method published in scientific literature by the University of North Carolina's team of extension specialists. The target audience was African American ages 40 and over. Throughout the fall series, a total of 10 African American in Ward 4 participated.

Results
Using paired-sample t-tests, body weight and composition measurements and eating behaviors

from baseline to follow-up indicated the following outcomes: 1) There were decreases in weight, waist circumference, hip circumference, and body fat percent, however, they were not statistically significant; 2) there was a significant increase in legume consumption from baseline (3.1 +/- 0.6) to the end of the program (4.4 +/- 0.7) (p=0.02); 3) there was a significant increase in whole grain consumption from baseline (6.5 +/- 0.9) to the end of the program (8.8 +/- 1.1) (p = 0.02); 4) there was a decrease in sweets consumption from baseline (16.8 +/- 1.7) to the end of the program, but not statistically significant (13.0 +/- 1.0) (p = 0.06); 5) there was a significant decrease in red meat consumption from baseline (4.3 +/- 0.6) to the end of the program (3.1 +/- 0.7) (p = 0.04); 6) there was a significant decrease in pizza consumption from baseline (3.4 +/- 0.6) to the end of the program (2.6 +/- 0.5) (p = 0.02); 7) there was a significant difference in moderate activity METs from baseline (660.0 minutes/week +/- 339.4) to the end of the program (1,140 minutes/week +/- 285.1) (p = 0.05); and 8) there was a significant difference in the number of days of physical activity per week from baseline (2.9 days +/- 0.7) to the end of the program (1.8 days +/- 0.6) (p = 0.03).

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle

Outcome #2

1. Outcome Measures

Percentage of participants who improved eating habits.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1640

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The east side of our nation's capital is plagued inequities in the social determinants of health, which are not conducive to lifestyle behaviors that can reduce rates of obesity and diet-related diseases.2 Community mobilization of the members and stakeholders is a capacity-building process that has garnered potential in creating more sustainable change.4 Our highest income Ward (Ward 3) has access an array of grocery stores, upscale restaurants, and attractive run/walk/bike paths within a one to two mile radius. On the contrary, Wards 5, 7, and 8 have

limited grocery stores (four in Ward 5, three in Ward 7, and one in Ward 8) and safe open play spaces within walking distance according to the DC Office of Planning of the Government of the District of Columbia.

What has been done

This initiative began as a work in progress with several stakeholder meetings and listening sessions with members of the Ward 8 Faith Council and other organizational representatives of this community in the prior year. This stage was essential understanding their needs and establishing partnerships with local sites for an interdisciplinary project that included urban agriculture and sustainability trainings in addition to Nutrition and Wellness. The Nutrition and Wellness certificate program consisted of biweekly workshop sessions held at Union Temple Baptist Church and biweekly sessions at Wayne Place Transitional Facility (Far Southeast Family Strengthening Collaborative, LLC) for 12 weeks. Participants engaged in hands-on food demonstrations that introduced them to innovative food preparation techniques for the fruits and vegetables harvested from their urban gardens. They frequently commented that they would use the recipes they learned as a useful starting point to expand their knowledge and creativity. Some of the recipes included the use of kale in smoothies and the use of their fresh fruits and herbs to create homemade vinaigrette dressings. The Nutrition and Wellness Certificate Program was developed and led by Dr. Tia Jeffery, a registered dietitian/nutritionist and project specialist for the Center for Nutrition, Diet, and Health (CNDH), and Helen Naylor, also a registered and licensed dietitian.

Results

The Far Southeast results showed on the pretest findings, 20 percent of participants scored 1 to 5 out of 10, 40 percent of participants scored 6 to 8 out of 10, and 40 percent of participants scored 9 to 10 out of 10 (n=13). Posttest findings indicated that 0 percent of participants scored 1 to 5 out of 10, 40 percent of participants scored 6 to 8 out of 10, and 50 percent of participants scored 9 to 10 out of 10. Participants received certificates. The Union temple Baptist Church results showed on the pretest findings, 10 percent of participants scored 1 to 5 out of 10, 40 percent of participants scored 6 to 8 out of 10, and 50 percent of participants scored 9 to 10 out of 10 (n=12). Posttest findings indicated that 0 percent of participants scored 1to 5 out of 10, 10 percent of participants scored 6 to 8 out of 10, and 90 percent of participants scored 9 to 10 out of 10.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle

Outcome #3

1. Outcome Measures

Development of broad applications for the inhibition of breast cancer cell proliferation and possibly cell transformation

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Number of participants who improved their dietary intake, including an increase in fruits and vegetables

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1397

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Farmers' Markets are one of the oldest forms of direct marketing. Growers gather to sell their produce directly to the public. Shopping at a farmers' market is a great way to purchase fresh, flavorful produce. Farmers' markets provide opportunities for farm and ranch operators to sell produce directly to the public. The District of Columbia Metropolitan Area has more than 174 farmers markets in and around the nation's capital including roadside stands, community-supported agriculture programs, agritourist activities and other direct producer-to-consumer market opportunities. Farmers' Markets are very important to communities, especially low-income neighborhoods with food deserts and lacking grocery stores. The markets provide convenient access to fresh produce and enhance social engagement within the communities. Socioeconomically underserved residents have limited access to fresh and healthy local produce with limited groceries in those communities.

What has been done
The UDC Center for Nutrition, Diet and Health nutrition educators, nutrition students and volunteers provided resources that promote higher usage and consumption of fresh fruits, vegetables, and herbs through nutrition education, food demonstrations, taste testing, recipes, produce guides and handouts to market shoppers at 15 different farmers markets located in diverse low-income, socioeconomically underserved communities with limited access to fresh and healthy local produce in Wards 1, 2, 4, 5, 6, 7 and 8 over a period of 6 months from May 2017 through October 2017. The materials accommodated a variety of literacy levels. The farmers markets were: DC Urban Green Farmers Market, Quarles Farmers Market, Deanwood Recreation Center Farmers Market, Overlook at Oxen Run Farmers Market, Barry Farms Recreation Center Farmers Market, Kenilworth Parkside Farmers Market/ Parkside at Circle 7, SW Farmers Market,

14th & Kennedy Street Farmers Market, Acadia's Mobile Market at Children's National Hospital, Ward 8 Farmers Market, Rhode Island Row Farmers Market, UDC East Capitol Farmers Market and Shaw Farmer Market. Most of the markets had a limited number of Produce Plus Vouchers available to low income market shoppers. Each week the nutrition educator demonstrated a recipe using produce sold at the market and provided nutrition education. A three-question survey was completed by market shoppers. The survey questions were : 1) are you planning on eating more fruits and vegetables, if no, why, 2) after tasting the recipe, do you plan to make it at home, if no, why, 3) is the famers market a good place to buy fruits and vegetables, if no, why.

Results

The results showed that the combined markets unduplicated contacts were 1,397 and the indirect contacts or combined markets reach was in excess of 30,000 diverse market shoppers. The unduplicated contacts were 334 or 24% male and 1,063 or 76% female. The ethnicity of the unduplicated contact included: 11 or 0.78% Native American, 31 or 2.2% Asian, 1260 or 90% African American, 14 or 1% Native Hawaiian, 58 or 4.1% Caucasian, 12 or 0.85% Hispanic-African American, 1 or 0.07% Hispanic- Native Hawaiian and 10 or 0.71% Hispanic- Caucasian. A total of 2% of the direct contacts were Hispanic and 98% were Non-Hispanic. Of the 1,397 unduplicated contacts, 639 completed the three-question survey. The results showed that of the 639 individuals surveyed, 628 or 98.3% plan on eating more fruits and vegetables and 10 or 1.6% did not; 601 or 96.1% after tasting the recipe, plan to make it at home and 33 or 5.2% did not; 634 or 99.2% responded positive to farmers markets being a good place to buy fruits and vegetables and 4 or 0.6% did not.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle

Outcome #5

1. Outcome Measures

Percentage of participants, who through information and interactive approaches, have adopted better eating habits thereby increasing their daily intake of fresh fruit and vegetables.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	5651

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Bodywise Program promotes health, wellness and fitness for DC residents 60 years of age and older. Regular exercise has been linked to reduction in premature mortality, functional decline, disability and coronary heart disease. Benefits achieved from the program include increase in cardiovascular efficiency, improved muscular strength and flexibility and increased knowledge of physical activity. The physical activities include water aerobics, yoga, low-impact aerobics, and movement/chair exercise. The program is designed to provide seniors with an opportunity to enjoy a better quality of life. Over 500 seniors throughout the District are enrolled in the Bodywise program. Approximately 90 classes are offered monthly.

What has been done

Classes are taught by UDC Bodywise instructors and contracted instructors from LG Fitness, Inc. The classes were offered in 6 of the 8 wards at UDC, Wilson Aquatic center, Takoma Aquatic Center, Phillip T. Johnson Senior Center, Allen House, The View at Edgewood and Overlook at Oxon Hill. The most popular class is water aerobics followed by low-impact aerobics and yoga.

Results

During this reporting period, unduplicated count of 470 of the 500 seniors enrolled participated in the Bodywise classes generating 2597 contacts. The results of the survey revealed that 82.5% of the participants believed they experienced increase in cardiovascular efficiency, 83.6% increased knowledge of physical activity, 88.3% improved muscular strength and flexibility, 69.2% believed they experienced improvements in quality of life, 63.1% increase in socialization, and 53.8% reduced stress and helped with relaxation.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Populations changes (immigration, new cultural groupings, etc.)
- Other (Transportation)

Brief Explanation

The farmers' markets were located in parking lots, roadside stands, mobile markets, churches and other places without running water or cooking facilities for food demonstration. The duration of the markets ranged from 2 to 6 hours. Food

demonstrations included foods that farmers had available for sale on the day of the market. The food demonstrations and tasting increased sales of those produce. Farmers would sellout of all produce demonstrated.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The ethnicity of the unduplicated contact included: 11 or 0.78% Native American, 31 or 2.2% Asian, 1260 or 90% African American, 14 or 1% Native Hawaiian, 58 or 4.1% Caucasian, 12 or 0.85% Hispanic- African American, 1 or 0.07% Hispanic- Native Hawaiian and 10 or 0.71% Hispanic-Caucasian. A total of 2% of the direct contacts were Hispanic and 98% were Non-Hispanic.
Of the 639 unduplicated markets goers who completed the market survey, the data 103 or 16.1% were from Ward 1; 13 or 2% from Ward 2; 28 or 4.4% from Ward 4; 23 or 3.6% from Ward 5; 1 or 0.2% were from Ward 6; 465 or 72.8% were from Ward 7; and 6 or 0.9% were from Ward 8.

Key Items of Evaluation

Survey questions, survey responses, locations of the markets, gender, 76% females and 24% males, ethnicity

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Alternative Energy and Economic Capacity Building

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
608	Community Resource Planning and Development	0%		100%	
	Total	0%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	3.0	0.0	4.0	0.0
Actual Paid	0.0	0.0	2.6	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	136734	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	115632	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	33252	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

This research will build a pilot waste anaerobic digester at the Agricultural Experiment Station's Research Farm in Beltsville, Maryland for the production of biomass and demonstrate that using the resources that are easily available makes the production of energy efficient and reliable. The energy producing potential of the different types of waste products will be studied through continuous monitoring of the digestion biochemical processes, operating parameters, the energy content, and the analysis of the biogas products. A Fuzzy Logic Controller of the Anaerobic Digester System will be designed in parallel with the physical digester to enable us to model mathematically or simulate certain aspects of the digester processes for increased efficiencies and process stability.

2. Brief description of the target audience

DCDepartment of the Environment
DC Department of Transportation
DC Department of Public Works
Researchers

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	123	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2017
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of workshops completed

Year	Actual
2017	5

Output #2

Output Measure

- Number of fact sheets published

Year	Actual
2017	0

Output #3

Output Measure

- Number of articles published

Year	Actual
2017	0

Output #4

Output Measure

- Number of informational material distributed

Year	Actual
2017	750

Output #5

Output Measure

- Number of conference presentations

Year	Actual
2017	0

Output #6

Output Measure

- Number of certificate of completion issued

Year	Actual
2017	48

Output #7

Output Measure

- Number of research projects completed

Year	Actual
2017	0

Output #8

Output Measure

- Number of newsletters published

Year	Actual
2017	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Percent increase in renewable energy production use due to green infrastructure
2	Percent increase in water reuse and conservation due to green infrastructure
3	Percent increase in energy conservation due to green infrastructures

Outcome #1

1. Outcome Measures

Percent increase in renewable energy production use due to green infrastructure

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #2

1. Outcome Measures

Percent increase in water reuse and conservation due to green infrastructure

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	60

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Green infrastructure practices continue to increase, but there are few qualified technicians to maintain the practices.

What has been done
UDC offered 60 underemployed or unemployed District residents with a high school diploma or equivalent 106 hours in green infrastructure construction, inspection, and maintenance. 45 residents qualified for and passed the National Green Infrastructure Certification Exam.

Results
Participants are placed into part or full-time employment opportunities in the green infrastructure industry which ultimately affects quality of life economically, socially, and environmentally.

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #3

1. Outcome Measures

Percent increase in energy conservation due to green infrastructures

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual

2017 10

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Human activities can negatively impact hydrologic and chemical cycles, pollute air and water, degrade soil, reduce biodiversity, and affect energy use.

What has been done
UDC offered a 56-hour Building Operator's Certification to District building operators that led to an energy shift of % in selected District operated facilities.

Results
As a result, District taxpayers realized annual economic savings on energy use of over $500,000.

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

V(H). Planned Program (External Factors)

External factors which affected outcomes
- Other (Funding)

Brief Explanation

We could have offered additional programs if funding and human capacity (FTE) were available.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

85% of participants articulated a positive change in the subject matter and behavior.

Key Items of Evaluation

none

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Water Safety and Water Management

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	100%		50%	
111	Conservation and Efficient Use of Water	0%		50%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual Paid	1.3	0.0	1.7	0.0
Actual Volunteer	409.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
93355	0	75280	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
161275	0	115632	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
63440	0	33252	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Objective 1: To design and manufacture the metallic oxide nanoparticles infused mesoporous material.
Completed:

1. **Major activities completed**: A hybrid mesoporous materials with metallic oxide nanoparticles has been developed. Another improved synthesis method has been developed to prepare this hybrid material and proven to be a cost effective and efficient way.
2. **Data collected**: Using the improved hydrothermal method, we could synthesize the hybrid material within 12 hours. So far, several batches of the hybrid materials of different sizes of TiO2 nanoparticles have been developed and compared.
3. **Discussion of the results**: Current results have shown that this modified hydrothermal method can be used to improve the process of synthesis of the material with a very high yield rate (~70%) and a short time frame (less than 12 hours). The next step is to optimize and further improve this method to reduce the time and improve yield rate. This finding have been published at a peer-review journal and presented at three national conferences.

Objective 2: To characterize the microstructure and evaluate the pollutant removal performance of the synthesized material.
Completed:

1. **Major activities completed**: The capability and efficient of this hybrid material has been tested using EPA standard procedures for heavy metals and organic dyes removal.
2. **Data collected**: Several batches of the hybrid materials of different concentrations of nanoparticles have been developed and used for heavy metal removal test following EPA standard procedure. The results have shown that this hybrid material is very effective in absorbing the heavy metals tested here (Pb, As, Cu, and Cd) with an efficiency around 90%. The size of the nanoparticle infused onto the mesoporous structure has a significant impact on the absorption efficiency. The material has also shown good filtration for organic dyes.
3. **Discussion of the results**: Current results have shown that this hybrid material can be used to remove heavy metals and artificial dyes from contaminated water effectively. The next step is to optimize the structure of the material to further improve its efficiency and test its capability in removing pesticides and paratheatrical contaminants.

Objective 3: To design a stormwater collection and treatment system with synthesized material.
Completed:

1. **Major activities completed**: An improved design of the stormwater collection and treatment system has been developed and a prototype has been built.
2. **Data collected**: A compact and expandable stormwater collection and treatment system prototype has been developed, which can be used to harvest and store stormwater from densely populated urban areas and use it to produce food at relatively low costs. This system consists of an expandable storage tank that has a minimum volume and occupied space of 5 cubic feet and can expand to a theoretical maximum volume of 19 cubic feet. The filtration system consists of a mechanical filtration with a filter size of 250 microns and a chemical filtration system with the mesoporous nanostructured material, MCM 48, to filter heavy metals and other pollutants.
3. **Discussion of the results**: Current results have shown that this system can be easily attached to the down spout of a typical DC house. The installation took less than 20 minutes and did not include difficult alteration. The system fit into the confined space, and did not collect unwanted bugs or rodents.

Objective 4: To evaluate its performance, and optimize the design to reduce the cost and time-consumed of per-liter clean water processed.
Completed:

1. **Major activities completed**: The initial design of the storm water collection and treatment system has been redesigned and optimized for a reduced cost and time.

2. **Data collected**: We have performed some preliminary testing and we are still working on to collect more data
3. **Discussion of the results**: We are still in the process of collecting more data

2. Brief description of the target audience

During the reporting period, we have focused on: 1. Training opportunities to UDC students; 2. Outreach to local high school students and visitors, UDC students and faculty, and general audience who are interested in environmental protection; and 3. Technical information to researchers in similar field or interested in stormwater collection and treatment.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	2589	11540	225	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year:	2017
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	1	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Conference Presentations

Year	Actual
2017	3

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Sampling and testing of community municipal water

Outcome #1

1. **Outcome Measures**

Sampling and testing of community municipal water

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Water test results were within EPA standard for drinking water quality.

Key Items of Evaluation

None

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Food Safety

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	0%		100%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	100%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	3.0	0.0	4.0	0.0
Actual Paid	0.8	0.0	1.2	0.0
Actual Volunteer	325.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
64003	0	45927	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
161275	0	115632	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
63440	0	33252	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Food Handler Certification will include:

1) Pretest
2) Post Test
3) National Examination
4) DC Code Examination
5) Ability of agencies to pass DC inspections
6) Measure of knowledge acquired from food handler certification messages include in the national examination
7) Data Collection
8) Data Analysis
9) Reporting

2. Brief description of the target audience

- Catering and other small food preparation industries as well as non-commercial agency food handling staff members
- Ongoing participating food handlers
- Non-profits

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	3879	2325	405	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2017
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Classroom instruction/workshops on Food Handler Certification Regulations to include DC Code Examination or Serve Safe National Examination, and Practice Examinations

Year	Actual
2017	69

Output #2

Output Measure

- Number of articles published

  Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Number of fact sheets published

Year	Actual
2017	5

Output #4

Output Measure

- Number of newsletters published

Year	Actual
2017	1

Output #5

Output Measure

- Number of workshops implemented

Year	Actual
2017	27

Output #6

Output Measure

- Number of research projects completed

Year	Actual
2017	1

Output #7

Output Measure

- Number of informational materials distributed

Year	Actual
2017	54

Output #8

Output Measure

- Number of conference presentations
  Not reporting on this Output for this Annual Report

Output #9

Output Measure

- Number of certificate of completion

Year	Actual
2017	69

Output #10

Output Measure

- Number of soil samples tested

Year	Actual
2017	79

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Percentage decrease in the risk of factors of foodborne illness.
2	Number of participants gaining awareness, knowledge and skills in Food Handling techniques.
3	Number of participants scoring a required minimum of 70% on post test and national examination.

Outcome #1

1. **Outcome Measures**

Percentage decrease in the risk of factors of foodborne illness.

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

Number of participants gaining awareness, knowledge and skills in Food Handling techniques.

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Number of participants scoring a required minimum of 70% on post test and national examination.

2. **Associated Institution Types**

- 1862 Extension

3a. **Outcome Type:**

Change in Knowledge Outcome Measure

3b. **Quantitative Outcome**

Year	Actual
2017	69

3c. **Qualitative Outcome or Impact Statement**

Issue (Who cares and Why)
"Each year, roughly one out of six Americans get sick; 128,000 are hospitalized, and 3,000 die from foodborne illness," (Academy for Nutrition and Dietetics, 2016). Foodborne illness is a major problem throughout the country, and even here in Washington, DC. "More than 200 diseases are spread through food" (World Health Organization, 2016). With 5,500+ food establishments in the District of Columbia alone, the need for intelligent, passionate, and dedicated Certified Professional Food Managers is urgent. There are only 22 sanitarians, two administrative staff, two supervisors, one program manager, and one food technologist employed by the District of Columbia. Thus, the Certified Professional Food Manager course is necessary to continue to train qualified individuals to help monitor and ensure our food's safety.

What has been done

The Certified Professional Food Manager Course is taught by Paul Brown Jr. It is a vital program in the District of Columbia that helps residents get the certification and confidence needed to gain employment in commercial food operations. It also helps to safeguard that the food that is being served to the public and residents of the District of Columbia, is safe and free from physical, chemical and biological contamination. The course is a three day, 16 hour course which delves into basic food safety and sanitation, and how to make sure employees, facilities, and food products are food-safe compliant. It runs from 9:00 am - 4:00 pm each day, and culminates with students taking a nationally recognized exam from Prometric. There is a pretest given at the beginning of the course, that assesses the student knowledge provide to intervention and a posttest following the intervention to assess the student knowledge after the intervention. These pre and posttests are used as practice in preparation for the National Exam. The National Exam is an 85 question test, in which student must achieve a score of 70% or better to become a Certified Professional Food Managers. Students are also required to complete practice exercises in the textbook to help prepare for the National Exam.

Results

The results showed from fiscal year 2016 to fiscal year 2017, the unduplicated contacts were 69 including 13 males and 56 females and the duplicated contacts were 1173 and indirect contacts of 2933. The test scores were good. Although the assessment scores varied from site to site, students made an average score of 66 on the pretest, and an average score of 90 on the posttest. The national exam score was 75. Seventy-three percent of the students passed the national exam on the first take and became Certified Professional Food Managers. Students were allowed to repeat the course in order to improve their scores on the national exam. There were nine different courses taught in three different locations in FY17. The locations were UDC in Ward 3, Grant Associates in Ward 8 and Homes for Hope, Inc. in Ward 7. In Ward 3, the high score for the pretest was 87; the low was 61, with an average of 73.5. The posttest high was 99 with a low of 89 and an average score of 96 and the national exam high score was 91 with a low of 72 and average of 83. In Ward 7 the high score for the pretest was 81, the low was 34; with an average of 62, the posttest high was 98 with a low of 68 and an average of 87 and the national exam high score was 88 with a low of 29 and average of 67.5. In Ward 8 the high score for the pretest was 75; the low was 46; with an average of 60. The posttest high was 96 with a low of 64 and an average of 81 and the national exam high score was 83 with a low of 71 and average of 77.

4. Associated Knowledge Areas

KA Code	Knowledge Area
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Appropriations changes
- Government Regulations
- Other (lower literacy levels of course participants)

Brief Explanation

The course is taught regularly throughout the year at the University of the District of Columbia and partners throughout the city as well. The areas of focus in the city have been wards 5, 7,and 8. The vast majority are low literacy and English not being the first language. Twenty-five percent of the participants do not pass the national exam with the first take. Therefore, individuals not passing are allowed to repeat the course. Returning citizens, unemployed and under employed individuals from low-income communities are enrolled in the course from agencies such as, Homes for Hope Community, Inc., Grants Associates, Inc., Bread for the City, and New Course Restaurant and Catering.

The Certified Professional Food Manager Course is taught by Paul Brown Jr. It is a vital program in the District of Columbia that helps residents get the certification and confidence needed to gain employment in commercial food operations. It also helps to safeguard that the food that is being served to the public and residents of the District of Columbia, is safe and free from physical, chemical and biological contamination. The course is a three day, 16 hour course which delves into basic food safety and sanitation, and how to make sure employees, facilities, and food products are food-safe compliant. It runs from 9:00 am - 4:00 pm each day, and culminates with students taking a nationally recognized exam from Prometric. There is a pretest given at the beginning of the course, that assesses the student knowledge provide to intervention and a posttest following the intervention to assess the student knowledge after the intervention. These pre and posttests are used as practice in preparation for the National Exam. The National Exam is an 85 question test, in which student must achieve a score of 70% or better to become a Certified Professional Food Managers. Students are also required to complete practice exercises in the textbook to help prepare for the National Exam.

The course helps students get food manager certification by taking and passing a National Exam, which is good for five years. We also help them by giving the students some practice tests to get ready for the National Exam. We give them a pre-test before we start teaching to see what they know before any lessons are taught and a post-test to see what they've learned from the lessons taught and from studying independently at home.

Finally, we have a we focus our CPFM course on teaching basic food safety and its principles. We use the book, NSF HealthGuard Professional Food Manager Certification Training Version 6.0, as a guide to delve into the important aspects of food safety, foodborne illness, the food facility, pest management, and the principles of food safety.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The evaluation includes pretest, posttest and national exam. The findings were as follows:
The results showed from fiscal year 2016 to fiscal year 2017, the unduplicated contacts were 69 including 13 males and 56 females and the duplicated contacts were 1173 and indirect contacts of 2933. The test scores were good. Although the assessment scores

varied from site to site, students made an average score of 66 on the pretest, and an average score of 90 on the posttest. The national exam score was 75. Seventy-three percent of the students passed the national exam on the first take and became Certified Professional Food Managers. Students were allowed to repeat the course in order to improve their scores on the national exam. There were nine different courses taught in three different locations in FY17. The locations were UDC in Ward 3, Grant Associates in Ward 8 and Homes for Hope, Inc. in Ward 7. In Ward 3, the high score for the pretest was 87; the low was 61, with an average of 73.5. The posttest high was 99 with a low of 89 and an average score of 96 and the national exam high score was 91 with a low of 72 and average of 83. In Ward 7 the high score for the pretest was 81, the low was 34; with an average of 62, the posttest high was 98 with a low of 68 and an average of 87 and the national exam high score was 88 with a low of 29 and average of 67.5.In Ward 8 the high score for the pretest was 75; the low was 46; with an average of 60. The posttest high was 96 with a low of 64 and an average of 81 and the national exam high score was 83 with a low of 71 and average of 77.

Key Items of Evaluation

Pretest scores, posttest scores and national exam scores.The populattion served are low literacy and have not been exposed to food safety information in the pass. A large neumber of the participants are returning citizens.

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Urban Families, Youth, and Communities

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
806	Youth Development	100%		100%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	8.0	0.0	2.0	0.0
Actual Paid	1.3	0.0	1.3	0.0
Actual Volunteer	511.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
101704	0	54170	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
161275	0	115632	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
63440	0	33252	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

1) Leadership Development Meetings
2) Woodworking Projects

3) Language Program - Spanish
4) Gardening Projects
5) Computer Labs
6) Curriculum Development
7) Fact Sheets
8) The UDC 4-H Soccer Program
11) Videotape series
12) Community Business entry-level training

2. Brief description of the target audience

1) Youth
2) Adults
3) Seniors
4) Military Personnel
5) DC residents
6) College students
7) Ex-offenders
8) Low to moderate income residents
10) Low income families with youth in high risk communities
11) Small, new start, home based businesses

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	3842	2325	8520	8148

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2017
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total

Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of participants in parenting workshops.
  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Conduct 15 sessions per year for junior and senior high schools in the District of Columbia on financial planning.
  Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Percent increase in the number of 4-H clubs throughout the city.
  Not reporting on this Output for this Annual Report

Output #4

Output Measure

- Youth will receive training in the areas of STEM education, and sewing, health and fitness, and camping.

Year	Actual
2017	3777

Output #5

Output Measure

- Youth will receive leadership development training through conferences and special programs.

Year	Actual
2017	3777

Output #6

Output Measure

- Youth that are members of a military family will receive 4-H programming as members of the 4-H program and as a seperate group of military participants though the 4-H military partners program.

Year	Actual

2017	200

Output #7

Output Measure

- Number of youth participating in 4-H club activities that have a parent/s that is/are incarcerated.
  Not reporting on this Output for this Annual Report

Output #8

Output Measure

- Number of articles published

Year	Actual
2017	3

Output #9

Output Measure

- Number of fact sheets published
  Not reporting on this Output for this Annual Report

Output #10

Output Measure

- Number of newsletters published
  Not reporting on this Output for this Annual Report

Output #11

Output Measure

- Number of workshops implemented

Year	Actual
2017	414

Output #12

Output Measure

- Number of research projects completed

Year	Actual
2017	0

Output #13

Output Measure

- Number of informational materials distributed

Year	Actual
2017	900

Output #14

Output Measure

- Number of conference presentations

Year	Actual
2017	2

Output #15

Output Measure

- Number of certificate of completion
  Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of children who have increased their knowledge of the essential elements of team work through participation in 4-H club actitivies.
2	Number of children who demonstrate responsibility as a result of participation in 4-H Program activities. participation.
3	Number of parenting workshop participants who have used their knowledge of support services available to apply for assistance in an effort to meet some of their parenting needs.
4	Number of Youth demonstrating an immediate and long-term commitment to civic engagement.

Outcome #1

1. Outcome Measures

Number of children who have increased their knowledge of the essential elements of team work through participation in 4-H club actitivies.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	637

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Parents and educators in the Columbia Heights community were concerned about youth drug activity, and escalating crime rates among youth, and unhealthy eating habits.

What has been done
The UDC 4-H Soccer Program has expanded enrollment and fine-tuned training to include 400 more youth and specialized training for youth and coaches. A professional development program to include best practices of soccer skills, communication with youth, drug prevention and healthy eating for athletes was provided on the campus of UDC during our coach's conference. Youth also received special training during the program year and during the overnight camp. The number of youth served was tripled from 200 to 637 participants as two more tournaments were added during the program year. Practices and games are implemented late into the night ending around 11:00pm in the summer and 8:00pm during the school year, with additional practices on Saturdays.

Results
In comparison to the crime rate among youth in 2015 (1,050 youth) to the decline in 2016 of (916) and the current crime rate of (769 youth), the youth crime rate in that neighborhood is declining. 100% of the youth participants have improved their soccer playing abilities. 60% have improved eating habits thanks to the food demonstrations provided by Chef Herb Holden, who also accompanied them to the UDC 4-H overnight camp. School attendance has increased by 30% and the program continues to grow. Two of the youth in the program have received fully funded scholarships to attend UDC on the soccer team. Youth select an outstanding leader to receive a special trophy during the closing ceremony during the year.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #2

1. Outcome Measures

Number of children who demonstrate responsibility as a result of participation in 4-H Program activities. participation.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Youth in the city deal with food security and are surrounded by youth in school that struggle with issues of food security. Young people at one school expressed and interest in starting a school garden to leave a mark at their school after they graduate to high school. The youth at Chance Academy want to create a school garden that will allow students to take home food every weekend from their garden.

What has been done
School gardens have been developed and maintained at five school locations with a more substantial curriculum and program activity plan for greater learning and opportunities in place. UDC 4-H Volunteer leaders Nona Kumah, main volunteer leader in charge of all gardening programs, Lucila Trejo, Tonya Hannah, Seleni Solomas have worked with the 4-H program to secure supplies and created school gardens at their schools. Sylvia Lynch, our military partner, has worked with a group of 38 youth using the UDC Firebird Farm and workshops presented by UDC staff both at UDC and their base to educate the youth about food security. The youth have received workshops and information related to food security while visiting the UDC CAUSES food hubs near their schools. In their 4-H clubs they have completed activities related to locating food desserts, areas that lack access to nutritious food, in their communities. They have learned how a community garden can impact food security concerns.

Results
Using pre and post test and program surveys for youth and adults we have learned that 100% of the youth in the gardening programs know what food security is and how it can relate to lower

scores and grades in school. 89 % of the youth can identify the container garden, the vertical garden and the community garden and how they work in a small space or for small dwellings. 78 % of the youth understand how to plan a garden using a planning grid and how to test the soil before planting, 66 % of the youth in the program have a firm grasp on the correct time to plant certain vegetables, two groups planted new gardens this year with two groups maintaining their old gardens with new youth the military partners worked with the CAUSES food hubs to learn the information they needed to know about food security and gardening. 100% of the youth want to continue gardening and they will be learning to grow peanuts in the District of Columbia this spring and make peanut butter for sandwiches.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #3

1. Outcome Measures

Number of parenting workshop participants who have used their knowledge of support services available to apply for assistance in an effort to meet some of their parenting needs.

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Number of Youth demonstrating an immediate and long-term commitment to civic engagement.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	250

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Youth in the District of Columbia and the nation struggle with childhood obesity.

What has been done

For the last four years, we have worked with UDC CAUSES professor, Dr. Michelle Harris, in the Department of Nutrition and Dietetics, to send college students into the classroom for a minimum of six weeks to present 4-H programming to children related to nutritious eating, exercise, food security, and food safety. The college students were given a stipend of $30.00 a week as needed for demonstrations and additional program materials.

Two schools participated this year with ten classrooms and 250 youth were provided programming. College students were advised at the beginning of the semester that this program would account for 30% of their classroom grade. Weekly youth participated in nutrition education and created their own presentations about the information they learned.

Results

From our pre and post test, we learned that 100% of the youth enjoyed trying new vegetables prepared in different manners. 100% of the youth could relate the most important meal of the day. 97% of the youth could identify the five food groups and they fully understood the food plate portions, 84% could identify two or more healthy snacks, 71% could list the four main rules of food safety and two important things to find on a food label, 70% of our college students went past the six week class mandate because they became attached to the youth and appreciated the feedback from the teachers and children. There is a request to expand the program from teachers and we are looking for additional funds.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Populations changes (immigration, new cultural groupings, etc.)
- Other (Community Support)

Brief Explanation

During this program year we were adjusting to building one large program with our UDC 4-H soccer program. While we had 30 volunteers in that program the development and program planning took up a lot of time for the one agent and director in the 4-H program.
Volunteers remain very dedicated and hard working and this program will continue to grow. In the new program model there will be no 4-H agents and we are working to keep volunteers engaged but not overwhelmed.
We have a new assistant director that will work on volunteer training and a new 4-H

program assistant that will also work on volunteer training in a certificate program. We will also have a staff person focused on securing volunteers with special expertise and scheduling them with our 4-H clubs in different settings around the city. We are providing more intense training for volunteers at this point and it is taking some time to be sure the right people for our programs are secured.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Our overall programs evaluations are very positive and show room for celebration and growth. In our largest program our soccer program we saw a reduction in the crime rated among youth in the Columbia Heights neighborhood from 2015 (1,050 youth) to the current crime rate of (769 youth), the youth crime rate in that neighborhood is declining. This information was secured form a publication from the Metropolitan Police Department (beginning in 2015). 100% of the youth participants have improved their soccer playing abilities and fitness outcomes because they became more physically active. 60% have improved eating habits.

We have learned that 100% of the youth in the gardening programs know what food security is and how it can relate to lower scores and grades in school. 89 % of the youth can identify the container garden, the vertical garden and the community garden and how they work in a small space or for small dwellings. 78 % of the youth understand how to plan a garden using a planning grid and how to test the soil before planting, 66 % of the youth in the program have a firm grasp on the correct time to plant certain vegetables, 100% of the youth want to continue gardening and they will be learning to grow peanuts in the District of Columbia this spring and make peanut butter for sandwiches.

From our pre and post test we learned that 100 % of the youth enjoyed trying new vegetable prepared in different manners.100 % of the youth could relate the most important meal of the day. 97 % of the youth could identify the five food groups and they fully understood the food plate portions, 84% could identify two or more healthy snacks, 71% could list the 4 main rules of food safety and two important things to find on a food label, 70% of our college students went past the six week class mandate because they became attached to the youth and appreciated the feedback from the teachers and children. There is a request to expand the program from teachers and we are looking for additional funds. Youth are being observed eating healthier snacks prepared by college students and being more active outside.

Key Items of Evaluation

We are adjusting to a reduction in staff and new model for programming but growing steadily. We need to expand the volunteer base across the city to reach youth in more communities, without extension agents. This process is moving forward at a steady pace.

VI. National Outcomes and Indicators

1. NIFA Selected Outcomes and Indicators

Childhood Obesity (Outcome 1, Indicator 1.c)	
0	Number of children and youth who reported eating more of healthy foods.
Climate Change (Outcome 1, Indicator 4)	
0	Number of new crop varieties, animal breeds, and genotypes whit climate adaptive traits.
Global Food Security and Hunger (Outcome 1, Indicator 4.a)	
0	Number of participants adopting best practices and technologies resulting in increased yield, reduced inputs, increased efficiency, increased economic return, and/or conservation of resources.
Global Food Security and Hunger (Outcome 2, Indicator 1)	
0	Number of new or improved innovations developed for food enterprises.
Food Safety (Outcome 1, Indicator 1)	
0	Number of viable technologies developed or modified for the detection and
Sustainable Energy (Outcome 3, Indicator 2)	
0	Number of farmers who adopted a dedicated bioenergy crop
Sustainable Energy (Outcome 3, Indicator 4)	
0	Tons of feedstocks delivered.