2019 Annual Report of Accomplishments and Results

CENTRAL STATE UNIVERSITY

I. Report Overview

The NIFA reviewer will refer to the executive summary submitted in your Plan of Work. Use this space to provide updates to your state or institutions as needed.

1. Executive Summary (Optional)
For the Fiscal year 2019, CSU continued to receive 100 percent match support from the State of Ohio. Dr. Siddhartha Dasgupta became the Associate Administrator of the CSU Cooperative Extension Program (CSU CEP). This fiscal year also saw new leadership of the CSU CEP Agriculture and Natural Resource program (ANR), with the hiring of Dr. Alcinda Folck as the new Program Leader.   CSU CEP has collaborated with federal, state, and local entities, and has expanded outreach capacity with community-based groups, various industry sectors, specialty groups, and state organizations. While CSU CEP maintained operations in seven Ohio Counties, including Cuyahoga, Lucas, Franklin, Butler, Hamilton, Montgomery, and Greene. During this fiscal year, plans to increase Extension services across to the four corners of Ohio were made by having four regional offices in the Northwest, Northeast, Southwest, and Southeast. In total, CSU CEP will provide direct services in 53 counties out of 88 counties in Ohio (60%). The 2019 fiscal year saw the relatively new CSU CEP consolidating its presence and programming in Central Ohio with new Extension offices, classrooms, and kitchens in Xenia (in collaboration with the YMCA and Clark State Community College), Dayton, and Trotwood (in collaboration with the City Government of Trotwood).   Extension programs by CSU CEP focused on the needs of Ohioans in under-represented, limited resources, and socially disadvantaged individuals and families in rural, urban, and Appalachian areas of the state. During the 2019 fiscal year, CSU CEP served the needs of small-scale farms, low-income families, people living in government-assisted housing developments, and children, youth, and families at risk (CYFAR).   **Accomplishments of the Agricultural Research Development Program (ARDP)**   The Agricultural Research Development Program (ARDP), the equivalent of the Experimental Station, at Central State University (CSU) continues its efforts on the 4 main projects and the sub-projects contained within the major projects. During the reporting period, ARDP at CSU engaged a specialist in hemp breeding and production. Dr. Craig Schluttenhofer was hired, and the State of Ohio approved cultivation of hemp in the State and relaxed the rules on the use of hemp. Dr. Schluttenhofer, with a Ph.D. on the subject, became a unique asset to the State and started

working with the Ohio Department of Agriculture and officially planted hemp at CSU. The ARDP hired Dr. Brandy Phipps in the area of nutrition with a 50% assignment in research and 50% in teaching Exercise Science. ARDP, with the infusion of additional Evans Allen funds, started planning additional positions in multiple areas including two positions in specialized corn breeding. ARDP collaborated with the Montgomery County Environmental Services in establishing and researching Smart Water Technology applications in their wastewater collection systems. Water flow sensors were installed at appropriate locations in the system to assess the infiltration of water into the systems to discern locations of improvements needed in the system

ACCOMPLISHMENTS IN PROJECT I - **OPTIMAL AGRONOMIC PRACTICES TO REDUCE NUTRIENT LOADING IN OHIO'S WATER BODIES**

Project goals and accomplishments were communicated to local stakeholders and communities during research, extension, and community meetings, including Ohio Conservation Tillage Conference, Ohio No Till Conference, Farm Science Review, and meetings organized by community solutions and Tecumseh Land Trust (local groups working to conserve soil and water resources in the study watershed). An update on this project was provided to the Greene County Soil and Water Conservation District (SWCD) Board at their monthly meeting with the goal of possibly procuring additional funding and support to through the SWCD district. An update will also be provided to the Montgomery County SWCD at an upcoming board meeting. Goals and accomplishments were communicated to several area high school students and teachers who toured the CSU research facility and participated in several events during the project year. The participants included students from Centerville High School, Global Stem Academy, Thurgood Marshall and several other schools present in the Future Farmers of America (FFA) events and regional Envirothon events. A study on the impact of climate change on nutrient loading in the study watersheds was published in a peer reviewed research journal. Similarly, a summary of the nutrient loading data collected by citizen volunteers in the study watersheds was published in another peer reviewed journal.

CSU-Montgomery county partnership: Montgomery County, Ohio and Central State University (CSU) have partnered in an effort to promote projects, initiatives and collaboration that focus on water resources management and advanced agricultural technologies. As a part of this effort, Montgomery County Environmental Services (MCES) worked with CSU to develop a flow monitoring program in the Stillwater sewershed. The sanitary sewer pipes that delivers wastewater to treatment plants in this area have been experiencing age-related deterioration. The groundwater table in the Stillwater sewershed is rising. There are multiple pipe crossings under the Stillwater river, causing inflow and infiltration (I and I) of ground water, storm water and surface water into the separated sewer pipes to increase. Many of the pipes run adjacent to farm fields. MCES staff worked with CSU co-op students developing a program to collect water quality samples. The co-ops and staff analyzed the collected data in order to quantify flow-related characteristics and water quality parameters in this sewershed support. Staff and co-ops were also able to interoperate the hydrographs provided through the data collection to learn more about system characteristics that can be applied towards operating practices.

Drain runoff estimation using Pulsed Neutron Activation (PNA) for flow measurement in tile drained landscapes: Poorly drained agricultural landscapes in the broader Midwest and in Ohio are often tile-drained to facilitate cultivation of row crops. Accurate measurement of flow rate during wet and dry periods at the edge of farmers' fields is critical for the computation of nutrient loadings from each field and the assessment of best management practices. The Edge of Field (EOF)site in Brookville, Ohio is tile-drained and is equipped with a continuous flow monitoring system. However, installations such as these are cost prohibitive and limits its widespread adoption to assess best management practices. As an alternate to this installation, the use of PNA method for flow measurements are being evaluated. The existing literature on Pulse Neutron Activation technique has been reviewed, and a review paper on this topic has been published. to test this A test to detect the technique in tile drained landscapes in the study of watersheds, as well as in the Stillwater sewer shed monitoring program is expected. What opportunities for training and professional development has the project?

ACCOMPLISHMENTS IN PROJECT II ENHANCEMENT OF FARM PRODUCTIVITY, CONSERVATION AND SUSTAINABLE UTILIZATION OF NATURAL PRODUCTS

Natural Products Research Project activities helped to introduce new crops to Ohio including hemp, and permitted Central State to be the first university in the State to: 1) plant hemp in over 70 years, 2) host an event to educate extension agents about hemp production, 3) host a hemp field day, 4) produce an extension bulletin on hemp. The project-initiated efforts on new honeybee stocks for mite resistance. Project research observed that feral bee colonies display a higher rate of mite-biting behavior in Midwest populations. Queen cells can be used to diversify the genetics in regional beekeeping. Changes in knowledge related to specialty crop production and apiculture have led to changes in action: farmers are trying production of new crops; queen cells from mite-resistant colonies are being used in new apiaries throughout Ohio; beekeepers are trained actively; and beekeepers inform their community about this effort to improve bee resistance to Varroa mites. Beekeepers are setting up swarm traps to catch feral colonies and increase the diversity of their bee stocks.

1. Novel alternative crops

A total of 672 natural product extracts were tested for antibiotic activity against Chromobacterium violeceum. Of those, 108 were found to be inhibitors and 18 were toxic to the bacteria. By performing these tests, it was possible to analyze different extracts and assess their potential as anti-bacterial agents for use in natural product formulations. Studies on the hydroponic treatment of aromatic plants showed that yield significantly increased as compared to soil treatment. Essential oil content of the leaves was higher for the soil grown samples; but per dry basis, the amount was not affected by treatment. In a similar respect, the active constituents in the essential oils did not significantly differ between treatments as determined by GC-MS analysis. The study showed that hydroponically-grown sage performed well under this type of cultivation, and the quality of active ingredients in the herb was not compromised. Research areas have been expanded at CSU's agricultural research station (ARDP). Additional areas have been planted to expand CSU's perennial collection including perennial grain crops. Field trials were conducted with 30 sweet potato and 24 mustard germplasm accessions from USDA-ARS. Partnerships are continually being formed to initiate activities with Ohio farmers to facilitate production of novel crops. In support of setup of the CSU aquaponics facility, hydroponics systems were investigated for specialty crops. In August 2019, legislation passed in Ohio that made efforts to introduce hemp to the state possible. CSU was able to help introduce hemp as a crop to Ohio by the following: 1) assisting the Ohio Department of Agriculture in better understanding hemp so it could

create appropriate regulations, 2) planting hemp at CSU, 3) educating extension agents about hemp production, 4) hosting a hemp field day, and 5) producing an extension bulletin on hemp.

2.*Conservation of prairies and wetlands*

Population data was collected for reptiles and rodents at three wetland conservation sites for another season as part of a five-year study. On the basis of the preliminary data, it appears that the Massasauga rattlesnake population in the Prairie Road Fen and Spring Valley sites is reducing; however, the Cedar Bog site shows an increase in the population. The variation in precipitation has affected water levels in the wetlands, and the inundated area has increased significantly leading to a change in the vegetation patterns, which has adversely affected the snake population. CSU mediated several meetings between the land owners and Natural Resources Conservation Service (NRCS), who were convinced to apply for the federal NRCS easement program; and after the easement, to donate the property to CSU for faculty and student research. Eleven acres of the property were approved by the NRCS and closing documents are being processed.

3.*Honey bee cultivation*

3.1. Mite Biting Behavior in Ohio Honey Bees: To select optimal honeybee stocks with high mite-biting behavior, one undergraduate student conducted screening for mite-biting behavior in different colonies in the Western and Central Ohio. The details of the 40 colonies and mite-biting behavior were recorded. Workflow was standardized and developed for mite sample observations and comparisons, and technical writing and scientific presentation skills for students were developed. More colony data is being added to the database of mites.

3.2. The Evolution of Honey Bee Mandibles: To understand the mite-biting behavior, the evolution and functional morphology of the weapon that bees use was compared to attack mites which are the mandibles. The mandibles of these bees are used for biting mite legs or body parts, building combs, secreting mandible glands to feed young brood, and many other functions in the hive. The student used a micro CT scanner called HeliScan at The Ohio State University (Electron Microscopy and Analysis, CEMAS) to scan 16 samples from 5 colonies representing Purdue mite-biting bees and package bees (considered as less mite-biting behavior) with more than 500GB of data. Ohio feral bees were compared to Apis cerana collected in China and worker bees collected at Purdue University, IN.

3.3. Queen quality and queen cells: Honeybees are the most important managed pollinators contributing significantly to the US economy. However, managed bee colonies are in a 60-70% annual decline in Ohio. CSU students worked with beekeepers from Southern, Western, and Central Ohio to improve the queen quality of honeybee stocks by using the 48-hr queen cells. The bee lab provided exclusive training on honeybee genetics, queen development, queen cell biology, 48-hr queen cells, swarm traps, and nutrition in the summer of 2019.

4. Small animal production: CSU initiated the position for employment of an animal scientist. Other accomplishments for Activities related to Food, Nutrition and Health program at CSU were included with this project for the current reporting cycle. During this time, investigators developed a focus of research that will guide scientists in their development of research projects and funding proposals.

5. During the period, a proposed a 5-year research plan and budget for the newly established Food, Nutrition and Health division was made, research projects were developed, funding proposals were submitted, and IRB applications were made for projects to begin between after 9/30/19. Description of this project is given separately.

ACCOMPLISHMENTS IN PROJECT III ENHANCED CROP PRODUCTION EFFICIENCY THROUGH MECHANIZED INTEGRATED PEST MANAGEMENT STRATEGIES
Research Goals: 1. Developed novel, field-ready, scalable, integrated pest management strategies for agriculture, forestry, and other land management needs. 2. Expanded field testing and the range of plants/applications for current directed-energy, mechanized weed control systems already being tested at CSU. 3. Demonstrated the economic benefit of these non-chemical alternatives versus traditional chemical weed control. 4. Developed, tested, and applied business models that take advantage of these benefits to small/specialty farms (existing and new farmers, producers). 5. Adapted the underlying technology platform to new applications, informed by outcomes and potential new uses as identified from CSU's existing (capacity building) research

Overall Summary of Accomplishments: • A comprehensive soybean database that contains over 100,000 images is available. • New databases of sweet corn and hemp were initiated. • Neural networks have been tested on a new dataset of 3,000 images of soybean seedlings using 12 new neural networks. • Weed identification application is being tested for accuracy. • There are 6 undergraduate students in agricultural technology research. • A robotic system platform, built for testing, has been refined toward a prototype autonomous weed suppression system. • One publication was submitted and five presentations were made by researchers and undergraduate researchers on technology weed control.

Goal I Accomplishments: The goal was to develop an automated organic weed control system using directed energy and deep learning targeted for small farms in conjunction with Global Neighbor Inc. Design focused on moving from a hitch platform to combining all components to a robotic platform. Directed energy arrays and a camera detection system were incorporated to a remote controlled, four-wheel drive robotic platform. The new platform allows field applications to occur remotely. We used transfer learning to fine-tune a number of pre-trained neural networks and develop customized neural networks to distinguish various weeds from crops in anticipation of moving an automated weed control device into the field. The system is implemented using two languages: MATLAB and Python (with Tensorflow library), and is tested on three platforms: PC, Android Device and Raspberry PI. • The original pull-behind device to kill weeds using directed energy was adapted to an automated towing robot (Agi 1), which was customized and tested for field use. It successfully identified crop rows. • A second pull-behind device was developed for Edwards Air Force Base. The donation of this second device for field testing has been initiated. • Various solutions for total autonomous field driving of the robot Agi 1 are being tested. A virtual environment to safely test-drive protocols, as well as ultra-sonic safety measures/obstacle avoidance, are in process. Small robotic cars were purchased to safely test multiple self-driving protocols rather than use the larger and heavier field robot Agi 1 prototype. • The RGB camera system for an automated robot weed killing system using directed energy was developed with improved camera interface including the following changes: • Resigned the picture recording program to make it user friendly and to be used with any computer (assuming proper software is installed). • Improved picture recording program to make use of multi-thread to eliminate desynchronization

between cameras. • Improved the base framework's readability, efficiency, and overall structure of the program to make future modifications much easier. • Adjusted frame rate calculation to ensure it runs exactly at the desired frame rate. • Developed a new process for taking pictures that will decrease the number of cameras required saving up to $900 in equipment costs • New neural networks have been customized and tested on a new dataset that contains 3,000 images selected and cropped from the 2017-2019 database. Twelve new neural networks were tested including alexnet, densenet201, resnet101, nasnetmobile, squeezenet, mobilenetv2, aception, googlenet, resnet18, inceptionresnetv2, inceptionv3, resnet50 and shufflenet. The system was evaluated on a highly diverse dataset that consists of images taken from a real soybean field. In the dataset, nine weed species against soybean seedlings in five stages were tested and various conditions, including weather, humidity, year, shadow and dirt, were considered. The results showed that up to 98% weed classification accuracy, which is comparable to the current state-of-the-art plant classification accuracy.

Goal II Accomplishments: Plots of soybean and sweet corn (approximately 0.25 acres each), 36 inch rows, were planted in April, June and July, 2019 to provide: 1) a continual source of crop seedlings for database development to train neural networks to distinguish soybean and corn seedlings from common weeds in Ohio, and 2) a ready source of newly germinated weeds to test efficacy of directed energy weed suppression. • A comprehensive database that contains over 100,000 soybean images across 2017 - 2019 is now available. • A database of sweet corn seedlings was initiated in 2018-2019. A database of hemp seedlings was initiated in 2018-2019. • A weed identification application developed in 2017-2018 available on iOS and Android Platform continued to be tested for accuracy. • Two different directed energy devices were tested on common field weeds. The first device delivered a maximum of 4 w/m2 visible/IR and 932 mw/cm2 UVA. The second prototype device delivered 0.66 w/m2 of 440 nm visible and 0.04w/m2 squared IR. The first device showed almost 100% weeds killed with no re-growth, while the other showed 56% weed kill without re-growth. With both tests of 100 weeds each, there was no account for weed age and maturity. The younger the weed, the better the control. This suggests that directed energy is best used as a pre-emergent and prior to canopy close.

Goal III Accomplishments: Cereal rye was planted fall 2019 to be evaluated spring 2020 for its ability to suppress weeds in combination with crimping and directed energy replacing glyphosate treatment. The cover crop for 2019 was insufficient for testing due to weather conditions.

Goal IV Accomplishments: Current energy sources are mounted gas generators and batteries. Energy consumption is still a major source of concern for deploying into a field. Researchers are working to design lighter autonomous robot platforms still rugged enough to withstand field use. Prototype directed energy systems using LED light sources, and specific wavelengths have dramatically decreased energy use. Once a prototype has been successfully deployed, cost estimates of production will follow. Energy requirements are being balanced with cost, speed and effectiveness as the design moves forward to field testing.

Goal V Accomplishments: Directed as a systemic weed control that will control vegetation and kill young weeds. The original use of directed energy was to develop weed-killing capacity for the Air Force to clear bomb sites, roadways and the like, of brush. This technology currently is being added to an autonomous robot to kill weeds in a crop field as part of an integrated pest management study. Tests of this prototype should begin in 2020. Additional uses have shown that directed energy, in conjunction with repeated cutting with or without black plastic mulch, may control knotweed species such as Japanese knotweed in greenhouse studies. Directed energy has been adapted in a new way to control weeds. In fields with non- or low-shattering weeds found in Ohio such as waterhemp, amaranth species, poison hemlock, burdock, evening primrose, and giant goldenrod, directed energy may be used to prevent weed seed germination in the soil seed bank. Initial trials on chaff from fields infested with waterhemp show up to 100% prevention of germination after a 30 sec dose of

directed energy high in infrared light as tested on 1500 seeds. Experiments are ongoing on other broadleaf weed seeds collected at the end of the growing season 2019. Delivery systems are being designed to hit weed seeds in no-till fields to suppress weed seed growth the following season and minimize viable weed seeds in the seedbank. Another novel control method for noxious knotweed species is to use the weed for human use. Knotweed species in Greene County, OH, identified as Bavarian knotweed, have been shown to contain resveratrol, a heart healthy supplement for humans. The current source of resveratrol is Southeast Asia. Studies have been initiated to extract resveratrol from local sources of knotweed as a possible alternative natural source for resveratrol.

Activities related to Food, Nutrition and Health program at CSU were included with this project for the current reporting cycle. During this time, investigators developed a focus of research that will guide scientists in the development of research projects and funding proposals. A proposed a 5-year research plan and budget is underway for the newly established Food, Nutrition and Health division with developed research projects, submitted funding proposals and IRB applications for projects to begin between after 9/30/19.

IV. Approaches for Wellness Enhancement through Integrated Research on Food, Nutrition, and Health – (Food, Nutrition, and Health)

This project was developed as a program to expand the capacity of ARDP at CSU in the fields of Food, Nutrition and Health.

An individual's health and the health of their community encompass many factors: behavioral, economic, environmental, cultural, educational, and genetic. Diseases related to obesity, sedentary lifestyles, nutrient deficiencies and food insecurity are major health concerns in the U.S. There is no doubt that diet, nutrition, and exercise are important to overall health. Healthy food and physical activity are fundamental human needs. Evidence indicate that poor nutrition and a lack of moderate to vigorous physical activity are among the leading risk factors for various chronic health conditions, including obesity, heart disease, hypertension, and diabetes. Those living in underserved communities have numerous challenges in their lives, including knowledge about and access to healthy foods and safe exercise. One of the central goals of Healthy People 2020 is to eliminate health disparities and achieve health equity. Given the health benefits of nutrient-dense food and regular physical activity, efforts must be made to expand knowledge of the factors affecting health, particularly those that can be addressed through nutrition and exercise intervention, through application of nutrigenomic research, nutrition/exercise education and programming, and the creation or enhancement of food production and delivery systems to underserved populations.

Therefore, the major goal of this research effort is to positively impact community health through a variety of methods, and to also seek understanding of the mechanisms of action of nutrients in disease development and progression. The goal is to recommend nutrients as potential preventative or adjuvant treatment modalities. The expected outcomes include: (1) development of individual nutritional consulting built around an individual's genetic makeup, (2) determination of best practices in bringing health education and exercise programming to individuals in rural areas and in communities which lack access to basic fitness equipment, (3) recommendation of nutrients as potential preventative or adjuvant treatment modalities for disease, and (4) development or enhancement of food production methods to ensure a sustainable and accessible supply of affordable, safe, nutrient-dense food and impact sustainability efforts, agricultural economy, and human health.

II.   Merit and Scientific Peer Review Processes

The NIFA reviewer will refer to your Plan of Work. Use this space to provide updates as needed or activities that you would like to bring to NIFA's attention.

Process	Updates
1. The <u>Merit Review Process</u>	None
2. The <u>Scientific Peer Review Process</u>	None

III.   Stakeholder Input

The NIFA reviewer will refer to your Plan of Work. Use this space to provide updates as needed or activities that you would like to bring to NIFA's attention.

Stakeholder Input Aspects	Updates
1. **Actions taken to seek stakeholder input that encouraged their participation with a brief explanation**	• CSU CEP received stakeholder inputs through interviews and discussions with officials and professionals that were directly serving low-income communities. This included management of the Greater Dayton Premier Management, an organization that provides housing to low-income individuals and families. City officials of Xenia, Ohio, a city with a significant volume of economically depressed communities, also provided direction in Extension programming. These discussions revealed topics of interest for stakeholders and meaningful delivery methods that would address the needs of these communities. The corresponding Extension programming covered topics such as food and nutrition, diabetes mitigation, job skills development, personal/family financial management, etc. • CSU CEP 4-H professionals engaged administrators and teachers in schools with significant number of at-risk children to start 4-H programming in STEM, agriculture, natural resources, and physical activity topics for both in-school and after-school programs. Examples include the Cesar Chavez College Preparatory School and Midnimo Scross Cultural Middle School in Columbus, Ohio. Also served were schools in Xenia and Dayton, Ohio. The interviews with school officials provided the necessary guidance to develop meaningful 4-H programming.

	- CSU CEP hosted a booth at the 2019 Ohio Farm Science Review in London, Ohio. This event is visited by thousands of our stakeholders, many of whom were unaware of our new 1890 Land-Grant program. The event was used to raise awareness, education about Land-Grant research and extension topics, and survey interests to formulate future programming. - CSU CEP staff met with the Muskingum Watershed Conservation District to discuss future events and partnerships with the watershed. - CSU CEP staff participated in the Ohio Food and Agriculture Council to create networks for collaboration and partnerships. - State Apiarist, Barb Bloetscher, met with CSU Land-Grant staff to discover the resources available for beekeeping work for CSU. Ms. Bloetscher is interested to help with onboarding and professional development of future CSU CEP ANR Extension Educators. - Farm visit in Brown County, OH, to discuss the use of the farm as a "learning lab" where CSU would conduct research and student learning activities. Additionally, the farm could be used as a future incubator to help beginning farmers with access to land. - CSU CEP had a booth at the 2019 Ohio State Fair which was used to contact the public and create awareness of CSU CEP programming.
2. Methods to identify individuals and groups and brief explanation.	CSU CEP identified stakeholder groups by various social barriers faced by communities in our service areas. The barriers include low education, low income, low credit ratings, criminal records, lack of job training, schools with at-risk youth, and failing farms. In order to develop stakeholder priorities that are relevant to CSU CEP, community partners were engaged in conversations. The partners include

	officers of non-profit organizations, directors of small business assistance centers, directors of public housing projects, agricultural teachers, and school principals. The partners assisted CSU CEP to develop targeted programming, recruit program participants, and assist in program evaluations. Additionally, CSU CEP identifies groups by their specific missions that can benefit our 1890 Land-Grant program. For example, the Ohio Department of Agriculture, the Ohio Food and Agriculture Council and The Ohio State University Extension Service, etc., are groups that permits CSU CEP staff to establish networks, learn about government initiatives, and expand CSU CEP's influence among the citizens of Ohio.	
3.	**Methods for collecting stakeholder input and brief explanation.**	CSU CEP engaged stakeholders in face-to-face interviews and in surveys to obtain their input.
4.	**A Statement of how the input will be considered and brief explanation of what you learned from your stakeholders.**	Stakeholder input is used as one of a few driving forces to develop topics of Extension programming and delivery modes/delivery times/delivery locations. For example, urban stakeholders are showing interest in low-investment hydroponic/aquaponic systems. Correspondingly, CSU CEP is constructing an equivalent system for demonstration and training. Results of farmer meetings in hemp workshops showed priorities for future research projects at CSU and provided feedback to potential buyers of hemp, who used this information to design a tradeshow.

IV. Planned Program Table of Contents

No.	Program Name in order of appearance
1.	CSU CEP program in ANR: small and limited resource farms production, management, and marketing.
2.	CSU CEP program in ANR: forestry programs in Appalachian Ohio.
3.	CSU CEP program in 4-H: STEM and agriculture programs for children, youth, and families at risk (CYFAR)
4.	CSU CEP program in FCS for youth and adults
5.	CSU CEP program in Expanded Food and Nutrition Education Program (EFNEP) for youth and adults
6.	CSU CEP program in community and economic development: building sustainable individuals, communities, and small businesses

V. Planned Program Activities and Accomplishments

Please provide information for activities that represent the best work of your institution(s). See Section V of the Guidance for information on what to include in the qualitative outcomes or impact statements. Add additional rows to convey additional accomplishments. You may expand each row as needed.

No.	Title or Activity Description	Outcome/Impact Statement	Planned Program Name/No.
1.	**4-H CYFAR Agriculture programs in grade schools in socially disadvantaged and/or economically depressed communities in Ohio**	Students' knowledge increased in topics related to world population, renewable energy, and food insecurity. Students learned about solar energy, urban agriculture, robotics, healthy living, and water resources. Programming was conducted in Columbus, Dayton, and Xenia, Ohio. Impact: the 4-H program was very successful and laid the foundation for CSU CEP to successfully obtain a five-year USDA NIFA CYFAR project for $640,000.	CSU CEP program in 4-H: STEM and agriculture programs for children, youth, and families at risk (CYFAR)
2.	**4-H and youth summer programs**	A) Ag-STEM Institute (rising 6th, 7th and 8th graders). 82 accepted, 77 completed the program B) REAP (rising 9th, 10th, 11th and 12th graders) 30 accepted, 27 completed the program C) Discovery Day Camp (rising 3rd, 4th and 5th graders) CSU Xenia - 20 students per day for 4 days = 80 reached CSU Dayton – 18 students per day for 3 days = 54 reached	CSU CEP program in 4-H: STEM and agriculture programs for children, youth, and families at risk (CYFAR)
3.	**Summer teacher training program**	Thirty schoolteachers attended the Agraria Teacher Workshop that provided them with professional development in sustainable agriculture. The teachers originated from Springfield, Yellow Springs, Dayton and Xenia. (Elementary, Middle and High School).	CSU CEP program in 4-H: STEM and agriculture programs for children, youth, and families at risk (CYFAR)
4.	**Ready, Set, Grow program series**	The program led to training socially-disadvantaged communities in Cleveland and Xenia, Ohio, about 1) identifying customers/demand, 2)	CSU CEP program in community and economic development: building

		developing business plans, 3) the process of starting businesses in Ohio, and 4) obtaining access to capital.	sustainable individuals, communities, and small businesses
5.	**Hemp Inservice Training**	Conducted an inservice training for Ohio State University Extension educators/specialists about growing hemp. Included tour of hemp plots at CSU. The inservice resulted in an increased knowledge about hemp and greater awareness of CSU's 1890 Land-Grant Programs among Ohio State University Extension educators.	CSU CEP program in ANR: small and limited resource farms production, management, and marketing.
6.	**Name that Bug**	Residents of Trotwood, Montgomery County, Ohio, brought garden insects to the workshop and learned about pests and beneficial insects. The workshop resulted in an increased interest in home and community gardening in Trotwood.	CSU CEP program in ANR: small and limited resource farms production, management, and marketing
7.	**Hemp Field Day**	Local farmers learned about hemp production and CSU agricultural research initiative in hemp production.	CSU CEP program in ANR: small and limited resource farms production, management, and marketing
8.	**Farm Science Review, an annual agricultural conference and tradeshow for farmers, London, OH**	Provided outreach for CSU Extension in three displays at: General CSU Extension and Honeybee BMPs in Firebaugh Building, Forestry and Resource Management at the Gwynne Conservation Area, and Grower Information and BMPs for Hemp Production and Sulfur Deficiency Management in the Agronomy Team Area	CSU CEP program in ANR: small and limited resource farms production, management, and marketing
9.	**Eat smart, live strong**	Two adult FCS programs in Greene County provided participants with an increased knowledge about the benefits of fruit and vegetable consumption and physical activity. There were social and interactive sessions for adults age 55 and older. Total direct contacts in all adult FCS programs = 410.	CSU CEP program in FCS for youth and adults

10.	Diabetes Empowerment Education Program (DEEP)	The DEEP program educates the public about changing behaviors to delay the onset and or prevent complications of diabetes. Each session is 90 minutes and the series can range from 6 to 8 sessions. Topics discussed include Understanding the Human Body, Understanding Risk Factors for Diabetes, Monitoring Your Body, Get Up & Move! Diabetes & Physical Activity, Management of Diabetes through Meal Planning, Diabetes Complications: Identification and Prevention, Learning about Medications & Medical Care, and Living with Diabetes: Mobilizing Your Family. One series was conducted in Greene County, three series in Montgomery County and two series in Franklin County. Impacts: participants received an increased knowledge in diabetes prevention and mitigation skills. Total direct contacts in all adult FCS programs = 410.	CSU CEP program in FCS for youth and adults
11.	Money Smarts	Helped participants learn the differences between wants and needs to create a real-life budget and how to develop family budgets using real life scenarios. A two-session series was taught in Greene County. Impacts: participants learned how to budget family expenses and prepare for financial risk in families. Total direct contacts in all adult FCS programs = 410.	CSU CEP program in FCS for youth and adults
12.	Introduction to Computers	Helped seniors become acquainted with computer use, the Internet, and Email. Seniors were helped to overcome feelings of loneliness because of the new ways to communicate via email or video chats. Seniors also learned how to use technology for entertainment. The series was a two-session series taught in Greene County. Impacts: participants became less apprehensive of technology use. Total direct contacts in all adult FCS programs = 410.	CSU CEP program in FCS for youth and adults
13.	Healthy Happy Hour	Single parents attended this program, which helped them improve parent-child relationships and their nutrition. Topics included the amount of sugar that is consumed in a variety of beverages, the effects of eating fast food	CSU CEP program in FCS for youth and adults

		vs. preparing meals at home, and meal-time conversation. This was a three-session series, and one series was conducted in Franklin County. Total direct contacts in all adult FCS programs = 410.	
14.	**Living on Your Own**	Youth attendees learned about the costs associated with living on their own and challenges of living with roommates. Total direct contacts in all adult FCS programs = 274.	CSU CEP program in FCS for youth and adults
15.	**Life Skills**	At-risk high school students were recruited, and they learned problem-solving in real life scenarios, overcoming life's challenges, building character, and accepting responsibility at home and school. Outcomes: most of the participants went back to the road for high school graduation after this twenty-week series. Training was conducted in Franklin County. Total direct contacts in all adult FCS programs = 274.	CSU CEP program in FCS for youth and adults
16.	**Sugar Shockers**	Youth learned about the benefits of drinking water over soft drinks, and about the sugar content of popular drinks. They also learned about the connection of sugary drinks to Childhood Obesity and chronic illness. The participants learned how to make inexpensive smoothies as a healthy drink alternative to soft drinks. Five, single sessions were conducted in Franklin County. Total direct contacts in all adult FCS programs = 274.	CSU CEP program in FCS for youth and adults
17.	**CSU Community Market, Mobile Food Pantry**	CSU Extension partnered with the Dayton Foodbank to provide a mobile food pantry each month. Food insecurity is a huge problem on many college campuses, and CSU has almost 10% of its student body aging out of the foster care system, increasing the likelihood of homelessness and poverty. Significant food insecurity also exists in Greene County, OH, which is designated as a "pocket of poverty" by the Dayton foodbank. CSU CEP staff assisted with the food distribution. The pantry served between 120 to 150 people each month, comprising of students, staff, and community residents. The food recipients also received factsheets and	CSU CEP program in FCS for youth and adults

		programming information to fight malnutrition and obesity. Total served in the FY 2019 = 1,775.	
18.	**EFNEP programming to socially disadvantaged communities: Eating Smart Being Active**	Fifteen adult EFNEP classes were conducted during FY 2019 with 10 in Montgomery County, 4 in Cuyahoga County and 1 in Greene County, resulting in 668 direct contacts. Participants learned the importance of physical activity, how to start exercising and maintain consistency, planning meals, shopping smart for nutrition and savings, nutrition, and preparation of meals using more fruits and vegetables, incorporating whole grains in the diet, finding lean sources of protein and serving sizes, building strong bones, food safety, and understanding the impact of Fats, Sodium & Sugar consumption. All classes were in-person, and participants learned food preparation, and took part in physical activity. Of the 668 people who participated, 63% were African American females, 20% were white (non-Hispanic) females, and 12 % were males.	CSU CEP program in Expanded Food and Nutrition Education Program (EFNEP) for youth and adults
19.	**Youth EFNEP programming**	EFNEP nutrition conducted 45 youth programs in FY 2019: 16 in Montgomery County, 22 in Cuyahoga County, 2 in Greene County, and 5 in Franklin County. The programs resulted in 4,055 direct contacts. Programs were conducted in schools, in after-school programs and at summer camps. Curriculums used included: •Teen Cuisine – from Virginia State Extension Family Nutrition Program, students were taught the value of eating healthy. •Choose Food Fun and Fitness – from Cornell University Extension, Program regarding targeted behaviors that youth may engage in that may lead to obesity and chronic diseases. The program focused on processed foods, sugary drinks, fruits and vegetable, and physical activity. •MyPlate – This Program taught the importance of eating from all the five food groups, food safety through hand-washing, and food safety.	CSU CEP program in Expanded Food and Nutrition Education Program (EFNEP) for youth and adults

2019 Annual Report of Accomplishments and Results (AREERA)

Year: 2019		Extension			Research
	1862	1890	1862		1890
Plan		32.0			21.0
Actual		16.2			

VI. National Outcomes and Indicators

1. NIFA Selected Outcomes and Indicators

Enter data you've collected for one or more of the seven National Outcomes and Indicators listed below. Reporting of these data is voluntary. The full description of each of the Outcomes and Indicators listed below can be found at:
http://www.nifa.usda.gov/business/reporting/planrept/pdf/ntl_outcomes_nov_2012.pdf

Childhood Obesity (Outcome 1, Indicator 1.c)
    Number of children and youth who reported eating more of healthy foods.
 Central State University Extension served 4,055 youth in nutrition programs through their EFNEP curricula in FY 2019. Of these youth, 97% were African Americans. Program evaluation procedures revealed that 87% of the children and youth (3,527 individuals) improved their abilities to choose foods according to Federal Dietary Recommendations, 54% of the children and youth (2,189 individuals) improved their physical activity practices, and 63% of the children and youth (2,554 individuals) used safe food-handling practices more often or gained knowledge improving behavior.
Climate Change (Outcome 1, Indicator 4)
    Number of new crop varieties, animal breeds, and genotypes whit climate adaptive traits.
N/A
Global Food Security and Hunger (Outcome 1, Indicator 4.a)
    Number of participants adopting best practices and technologies resulting in increased yield, reduced inputs, increased efficiency, increased economic return, and/or conservation of resources.

N/A

Global Food Security and Hunger (Outcome 2, Indicator 1)

Number of new or improved innovations developed for food enterprises.

N/A

Food Safety (Outcome 1, Indicator 1)

Number of viable technologies developed or modified for the detection and characterization of food supply contamination from foodborne threats.

N/A

Sustainable Energy (Outcome 3, Indicator 2)

Number of farmers who adopted a dedicated bioenergy crop.

N/A

Sustainable Energy (Outcome 3, Indicator 4)

Tons of feedstocks delivered.

N/A

Research Successes

Planned Program: Climate Change

Outcome #1: Development of new knowledge and technologies

Outcome Definition: Development of new knowledge and new technologies in agricultural and forestry science and the transfer of these to clientele to address the effects of climate variability and change.

Indicators:

1. Number of current year citations of climate-related publications: **2**

2. Number of current year climate relevant educational and programs: **2___**

3. Number of current year climate relevant research programs: **5**

4. Number of new crop varieties and genotypes with climate adaptive traits____0_____

5. Number of new animal breeds and genotypes with climate adaptive traits____0_____

6. Number of new assessment and management tools developed, including models and measurements of greenhouse gas emissions: **1**

7. Number of climate relevant social media products, web-based products and communication tools (smart phone apps, facebook, twitter):
   1

8. Number of new climate relevant databases, monitoring systems, and inventories managed or under development: **2**

9. Of the 140 number of program participants, the number that increase knowledge of management practices under climate variability and change_____NA_____.

Outcome #2: Enhance adaptive capacity to climate change

Outcome Definition: Enhance adaptive capacity of production and natural systems to reduce exposure and vulnerability to climate variability and change

Indicators: 1. Of the 140 number of participants, the number that employ climate adaptation strategies in various production and natural ecosystems, including strategies for biodiversity: **N/A**
2. Number of acres under recommended adaptation strategies for production agriculture and natural resources management, including invasive species, pest management, pollutant loads and wetlands:- 13.6 million acres in Ohio

3. Of the 140 number of participants, the number that adopted recommended adaptation strategies for production agriculture and natural resources management, including invasive species, pest management, pollutant loads, wetlands: **N/A**

4. Number of new genotypes and varieties for climate adaptation in production agriculture and forestry: **N/A**

5. Number of acres planted with new recommended genotypes or varieties with climate adaptive traits: **N/A**

 6. Of the number of participants, the number who planted recommended genotypes or varieties with climate adaptive traits: **N/A**

7. Number of agencies/organizations/communities participating in the programs that incorporate climate-based management practices in community development____NA_____(for example: to address future rise in sea level, not building on the flood plain, etc.)

Outcome #3: Improve climate mitigation strategies and their adoption

Outcome Definition: Improve mitigation strategies for the reduction of greenhouse gas emissions and increase carbon sequestration in production and natural systems and communities

Indicators:

1. Of the N/A number of total program participants, the number who adopted recommended climate mitigation practices (in areas such as: water use efficiency, livestock production feeding practices, carbon sequestration, reducing carbon and energy footprint, etc.): **N/A**

2. Number of acres under recommended climate mitigation practices (in areas such as: water use efficiency, livestock production feeding practices, carbon sequestration, reducing carbon and energy footprint, etc.): **13.6 million acres**

3. Numbers of agencies/organizations/communities that adopted recommended climate mitigation practices and policies (for example: built bike paths, installed solar panels, applied water conservation policies, etc.): **N/A.**