

2017 Ohio State University Combined Research and Extension Annual Report of Accomplishments and Results

Status: Accepted

Date Accepted: 09/07/2018

I. Report Overview

1. Executive Summary

The Ohio State University's College of Food, Agricultural, and Environmental Sciences (CFAES) is a large and diverse college. It consists of the Ohio Agricultural Research and Development Center (OARDC) and Ohio State University Extension (OSUE) which serve as the research arm and the public interface that delivers research-based education to improve the lives, businesses, and communities of Ohioans, respectively.

In 2017 CFAES faced many challenges, including keeping up with rapid changes in agriculture and population shifts, managing perceptions of CFAES both internally and externally, and increasing efficiency so that we can do more with reduced resources. With 875 facilities across the state, almost 3,760 graduate and undergraduate students across two campuses, 421 faculty members and over 1,450 full-time employees, it is important that the college has a clear mission and focus guiding our research, teaching, and outreach to best serve our citizens.

On May 1, 2017, Dr. Cathann Kress became the new Vice President and Dean of CFAES.. Dean Kress has prioritized filling key leadership positions and restructuring reporting lines to increase efficiency. Key leadership changes are as follows: Graham Cochran was appointed as the Associate Dean for Operations, Kristina Boone became the new director of OSU Agricultural Technical Institute, and Adam Ward became the Director of Government Affairs.

In September 2017, Terry Niblack moved from her role as the chair of Plant Pathology to become the Senior Associate Dean. On September 8, 2017, Charles Goebel left his position as Interim Associate Dean for Research and Graduate Education. After a nationwide search, Gary Pierzynski was appointed to fill this position beginning July 1, 2018. Gary comes to Ohio State from Kansas State University where he is a University Distinguished Professor and Head of the Department of Agronomy.

In November 2017, Linda Martin left her position as Associate Dean for Academic Programs, leaving Steven Neal to serve in this role in the interim. The search to fill this position is currently underway. These leadership changes have helped move the college forward with its goal to better centralize its operations and improve efficiency across CFAES.

Throughout 2018, the College will be crafting the new strategic plan, using internal and external stakeholder feedback to improve our focus and better serve Ohioans. As such, CFAES is shifting its research focus from the previous three "Signature Areas" into four Grand Challenges that highlight the need for interdisciplinary, long-term research to solve some of society's most pressing issues. These four areas are:

- Food Security, Production, and Environmental Sustainability - Preserve the environment and water quality, and cultivate food production and security
- One Health - Protect and secure human, environmental and animal health
- Rural Urban Interface - Increase trust and communication between consumers and agriculture
- Preparing Future Scientists and Leaders - Prepare the future workforce for critical jobs in the agricultural sector

By refocusing our goals, we can maximize the talent of our personnel and will be better positioned to make quick, efficient decisions about future resource allocation.

In late 2016, the college underwent a peer review of the research enterprise by the National Council of University Research Administrators (NCURA). This review, similar in nature to an academic program review, was done to ensure that CFAES is appropriately organized to advance excellence in research and creative accomplishments. The review utilized National Standards developed by NCURA, indicating effective operations in the areas of:

- Proposal Services
- Award Acceptance and Initiation
- Award Management
- Research Ethics
- Organizational Structure and Staffing
- Communications, Outreach, and Education
- Compliance and Risk Assessment
- Electronic Research Administration

The NCURA recommendations were released in 2017, and some changes have already been made to improve certain areas. For example, one concern expressed was regarding a lack of information for faculty about how the Ohio State research enterprise works. In response, onboarding packets were created to inform new CFAES researchers of their responsibilities and required training, contacts for various offices, Ohio State research policies, and additional resources to be successful. To improve communications, the college's research newsletter and websites have been streamlined, making it easier to find information. Additionally, new faculty and staff trainings on topics such as research integrity and who does what at Ohio State (with regard to research administration) have been developed and presented to faculty and staff. As leadership roles continue to be filled and the strategic plan is developed, it is expected that more progress will be made toward these goals. This is just one of several reviews that have been done at the college in an attempt to provide the best service to our constituents.

Dean Kress has also continued the One College mission, with the goal of better integrating the "three campuses": Columbus, Wooster, and statewide. There are several large facilities projects currently underway, including a new science building on the Wooster Campus, costing roughly \$33 million. The building will have much needed modern research space, new teaching laboratories and classrooms for teaching and a new campus café. This building, along with a few other campus changes, will further the One College goal by better combining research, teaching and outreach at the Wooster Campus.

Also of note, the Waterman Farm in Columbus will be the new home of the Franklin County Extension office, offering unique opportunities for outreach on a research site. Currently, a task force is developing a new strategic plan for the Waterman Farm. Plans include development of a new multispecies facility for the Department of Animal Sciences that will include teaching, research and Extension work on cattle, poultry, swine and horses. Additionally, a new greenhouse complex to emphasize Controlled Environment Agriculture will allow produce to be grown for campus dining services, research on greenhouse environments, and aquaponics. Other facilities housed at the Waterman Farm include the Turfgrass Foundation Research & Education Facility, the Waterman Dairy Facility, the Rothenbuhler Honey Bee Research Lab, and the SENRL Woodlot and acres of irrigated and non-irrigated plots.

Additionally, OSUE is reorganizing its five regions into 22 multi-county and 2 single-county (urban; Franklin and Cuyahoga) administrative units (areas) to better serve communities and stakeholders. This is a part of designEXT, which outlines OSUE's goals for increasing support for county operations which include: improving mentoring of employees, simplifying processes, and increasing collaboration.

Not only is physical integration an important part of the One College goal, but integration of teaching, research, and outreach must become a priority. There are 81 faculty members who hold joint appointments at OARDC and OSUE, and most also have advising and teaching appointments in CFAES academic programs. There are 26 faculty members who hold dual appointments across with other Ohio State colleges, including Arts and Sciences, Education and Human Ecology, Engineering, and Veterinary Medicine. Giving dual appointments to faculty members and extension educators increases integration and encourages collaboration across the college and with other disciplines.

Since the initiation of the Discovery Themes program at Ohio State, 120 new faculty have been hired with

another 80 positions to be filled by 2020. In CFAES, 23 faculty have been hired with another 9 positions approved and waiting to be filled. These Discovery Theme positions are critical to CFAES because they promote interdisciplinary research internal and external to the college. To accommodate these new faculty, new facilities and renovations in current academic buildings are planned to provide modern research and teaching space on the Columbus and Wooster campuses.

Creation of interdisciplinary centers and programs in CFAES has also increased partnerships across the University. In 2017, the Center for Human-Animal Interactions Research and Education (CHAIRE) was established, which will encourage research, teaching, and outreach relating to the human-animal bond. The center will consist of faculty from CFAES, Veterinary Medicine, Public Health, Social Sciences, and Nursing to focus on research into conservation, animal welfare, and health benefits of having animals. CHAIRE is unique from other existing centers in that the animals and interactions examined expand beyond companion animals and equine to also include agricultural animals, wildlife, and exotic animals. Another important distinction of CHAIRE is the purposeful effort to consider all human-animal interactions from not only the human, but also the animal perspective.

The Soybean Research Center was launched in 2017 and is another way that CFAES is promoting interdisciplinary work. The center is comprised of 20 OSUE educators and CFAES faculty members in partnership with soybean industry stakeholders working to improve Ohio soybean production and utilization, enhance soybean producers' profitability, and position Ohio State as a recognized leader in soybean research and education in the US.

Additionally, the Plant and Animal Agrosecurity Research Facility (PAAR)-which was built in 2012-was approved by the USDA to perform BSL-3 and select agent work after being inspected in 2017. This will allow CFAES to research various infectious agents that were previously unauthorized. To date, over 20 faculty, staff, and students have been trained in biosafety, biosecurity, and incident response procedures required to work in a BSL-3 approved facility. Two BSL-3 projects are currently underway, including one project studying avian influenza and efficacy of vaccines, with another project studying Zika virus being planned for 2018. The PAAR facility will further increase collaborations across CFAES and the university, being a centerpiece for multidisciplinary work related to infectious diseases of animals and plants. This facility is also connected to another interdisciplinary group, the Infectious Disease Institute (IDI) that was formed in 2017 with various colleges, including CFAES. The IDI focuses on understanding and developing methods to mitigate human, animal and plant diseases.

CFAES is also home to the Agricultural Technical Institute (ATI), the nation's largest two-year degree program of its kind. ATI offers 26 Associate programs and three certification programs of study and is ranked number one in the nation among two-year schools awarding degrees in agriculture and related sciences. ATI added a new greenhouse range consisting of three new greenhouses with a computerized automation system, which can adjust the greenhouse environment depending on information received from an interconnected weather station. The new greenhouses are vital to the future direction of the greenhouse programs, preparing students for careers in an industry with evolving technology. The facilities especially complement ATI's new specialization in greenhouse engineering technology, which is filling a critical industry need.

This close collaboration among the three entities in CFAES (OARDC, OSUE and academic programs) results in seamless programs, such as our agronomic field days that are held annually at our outlying research stations. Typically, attendees get to tour the facility and then hear presentations by CFAES experts. The Muck Crops field day held in Willard, OH on July 27 hosted 50 attendees who heard presentations from CFAES researchers and extension educators as well as a horticulturalist from the USDA. Our partnerships with other entities at the university and across the state ensure that our programs are well rounded and provide the best scientific evidence for solutions to society's most pressing issues. Another important part of the One College process has been the rebranding of CFAES to refocus our identity across OARDC, OSUE, ATI and the state. Our communications team has updated and streamlined our college branding to improve CFAES recognition state and nationwide. This branding activity will provide a universal identify of CFAES to all citizens, stakeholders, and policymakers. Our main website was also redesigned to better showcase research and extension projects being done and to increase visibility of news and communications about the college. The Wooster Campus website is

currently being redesigned as well.

CFAES uses federal and state capacity funds to leverage additional support from a variety of competitive sources. During the 2017 fiscal year, CFAES received 351 extramural awards valued at over \$44 million.

The total portfolio of all active awards consists of 877 projects valued at over \$180 million. Some examples are listed below:

From the National Institute for Food and Agriculture

- \$9.8 M in competitive grants, research support, and cooperative agreements to support the research enterprise
- \$2.27 million to create a national network of universities, industry, and government agencies to support workforce development by preparing students to become bioeconomy leaders; Consortium for Advanced Bioeconomy Leadership Education (CABLE)
- \$0.5 million to improve biofuel production: A novel whole-plant corn based feedstock supply system

From the Ohio Soybean Council

- \$1.0 million to address soybean priority areas

Ohio Department of Jobs and Family Services

- \$10 M to support address food security

National Science Foundation

- \$1.2 Million to support Collaboration research: Dimensions: Secondary metabolites as drivers of fungal endophyte community diversity

CFAES has submitted an array of impacts for the 2017 reporting period that demonstrate how our research and outreach activities are helping to advance both science and society. In addition to research and outreach on food production, the college has expanded to include programs in renewable energy and manufacturing materials such as natural rubber, biogas, and ethanol. We are supporting a safer, healthier food supply that is more sustainable with a smaller environmental impact by researching plant and animal genetics in combination with food technologies, engineering, and plant and animal health research. These collaborative and interdisciplinary efforts involve researchers, extension professionals, business and industry partners, federal, state, and local agencies, and non-governmental organizations. CFAES continues to support the integration of cutting-edge research, innovative outreach programs, and development, creating interdisciplinary partnerships to address complex problems and issues that require broad thinking.

Programs such as Field to Faucet, Fertilizer Applicator trainings, and the countless research projects studying a variety of water-related issues show just how devoted CFAES is to improving water quality. In 2017, Dean Kress established the Water Quality Task Force, charged with identifying all of the CFAES work being done on water quality and finding a way to better coordinate the different CFAES groups working on this issue to create a College-led plan. Currently, the task force is compiling information from CFAES faculty and staff as well as external stakeholders and plan to have a proposal submitted by fall 2018.

In September 2017, OSUE hosted the second "State of Science: Understanding Algal Blooms Conference" in Toledo, OH. Over 300 scientists and agency officials attended the conference to discuss solutions to Harmful Algal Blooms in Lake Erie. Graduate students from around the state presented research posters and Paula Hicks-Hudson, the Mayor of Toledo, spoke about the importance of scientists and resource managers in preventing a future water crisis like the one in Toledo in 2014. The event was co-hosted by Ohio Sea Grant and the USDA-ARS in Columbus with speakers from Ohio State's colleges of Engineering, Public Health and FAES; Bowling Green State University; The National Weather Service; the Ohio Environmental Protection Agency; and Blanchard River Farms Demonstration Network.

CFAES is also working toward providing a sustainable food supply. One-third of the food harvested worldwide is wasted before it is eaten-enough food to feed two billion people a year, according to the Food and Agriculture Organization of the United Nations. CFAES researchers are working on ways to reduce

food waste to help feed a growing population. One program known as InFACT is pursuing holistic approaches to reduce food insecurity and ensure good food for all. Its work is based on collaboration across not only research and outreach, but also across the sciences, engineering and humanities, as well as the engagement of external partners in government and private industry. InFACT projects involve at least 76 Ohio State faculty and students, and 23 community partners.

Currently, InFACT is leading a campus-wide effort to acquire 40 percent of all food purchases from local and sustainable sources within 10 years. CFAES will work to secure resilient and sustainable food systems to assure the health and well-being of a growing world population in the face of unprecedented environmental change and constraints. Also a product of InFACT is the Food Waste Collaborative, which is a collection of researchers, practitioners, and students working together to promote the reduction and redirection of food waste as an integral part of a healthy and sustainable food system. In addition to conducting research, the Collaborative currently offers consultation on implementation and evaluation of projects focused on food waste reduction and redirection efforts at the consumer and household level within Ohio State University and across the state of Ohio. In 2017, the Food Waste Collaborative organized its second annual conference, focusing on food waste policy.

CFAES is highly committed to identifying and addressing critical issues as they emerge. In 2017, the opioid crisis was declared a national emergency. Ohio leads the nation in drug overdoses per capita-the death toll rose to over 5,000-an increase of 39%, which is roughly three times the national average. In 2017, the crisis became so bad, that some county morgues became full and could no longer handle the rapid increase in overdose deaths.

Ohio State is playing an essential role in combating this issue, bringing together stakeholders and collaborators, performing research, and utilizing OSUE to address issues on a local level. CFAES has been engaging researchers, educators, and external partners including the Governor's Cabinet Opiate Action Team, Mental Health and Addiction Services, and the Ohio Attorney General's Office to find ways to combat this highly complex issue. In 2016 and 2017, numerous lectures and forums were held at the university. One such program, "A Campus Conversation on the Opioid Crisis" was held in January 2017. This event brought stakeholders, researchers, and extension educators together to create an inventory of work already being done at Ohio State and to identify ways to collaborate and move forward.

In October 2017, the Ohio State Swank Program in Rural-Urban Policy released a report titled "Taking Measure of Ohio's Opioid Crisis," which aimed to examine the current state of the issue and provide policy recommendations. It was concluded that increasing access to opioid treatment - especially in underserved areas - and addressing the long-term root causes such as unemployment, over prescription of opioids, and lack of education, can assist in reducing the number of addicts and overdose deaths.

OSUE is uniquely positioned to respond to such issues, as field experts can respond to crises quickly. Many Extension educators are involved in local coalitions and task forces that are actively providing drug use and abuse education, resources for those in addiction recovery, and evolving ways to treat family issues caused by addiction. OSUE and Ohio State's College of Pharmacy are collaborating to expand utilization of the Generation Rx, a program to promote proper use and reduce misuse of prescription drugs, in communities across Ohio.

Members of 4-H created a traveling display to help educate Ohioans about the dangers of prescription drug abuse. This display has been used at fairs and the Farm Science Review and has proved to be an effective way to raise awareness and increase discussion of opioid use and abuse, particularly with teenagers.

OSUE is currently implementing a Community Assessment and Education to Promote Behavioral Health Planning and Evaluation (CAPE) grant to conduct Mental Health First Aid training for Extension staff and community members. This training focuses on identification of early warning signs of mental illness and making referrals for assistance. Close to 50% of OSUE educators are trained in first-aid, which can lead to faster help for those with drug addiction.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	562.0	0.0	306.0	0.0
Actual	659.9	0.0	257.3	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
- Combined External and Internal University Panel
- Combined External and Internal University External Non-University Panel
- Expert Peer Review

2. Brief Explanation

As CFAES continuously strives to be more relevant, make wiser use of limited resources, and maximize impact, program and publication review by stakeholders, internal and external peer review, and external specialists are more important than ever. To that end, the organization is committed to making use of both informal and formal reviews at all levels.

Over the years, the review process has been streamlined and we are seeing dramatic changes in quality, quantity, and timeliness of reviews. Throughout the year, internal and external stakeholder advisory committees are used for input on many topics including: annual reports; new facilities, and new dimensions for agbioscience initiatives.

In 2017 there were academic department reviews for 3 areas: Agricultural, Environmental, and Development Economics, International Programs, and Food Science and Technology. There was also an external review of the College's Secrest and Chadwick Arboretums.

CFAES published materials, ranging from traditional print to social media releases, are compiled and reviewed by panels with both technical and communication expertise. Most of these products also have some type of administrative review. Documents such as annual reports and one-page information sheets are sent for initial review by stakeholders who are both knowledgeable and vested in the subject matter. They are asked to provide feedback on content, relevance and presentation of the stories and impacts, which provides a high-quality final document for stakeholder use.

In 2016, the Dean of CFAES in collaboration with the Directors of OARDC and OSUE held meetings with internal and external stakeholders to discuss CFAES facilities planning. This ultimately led to the creation of the CFAES master plan, which provides data, principles, scenarios, and planning ideas that help create strategies for the college's future infrastructure.

OSUE implements several levels of advisory committees, tasked with identifying and prioritizing needs, connecting Extension with potential partners or those who could fill gaps in service, educating stakeholders on Extension's impacts, and advocating for Extension. In Ohio, there is one state Extension advisory committee, which advises the Director on statewide programmatic issues, county-level advisory

committees which provide feedback on county-level program issues, and program area advisory committees, which advise educators within the scope of their specific program area. Extension also has local, specialized / topical committees such as goat committee, sheep committee, and various others specific to commodities.

Given that all CFAES efforts are planned to benefit a specific group(s), we actively engage those groups at the beginning of the process, thus providing formative reviews. Stakeholders may be internal to the organization, or they may be found in other colleges and universities. Specialists from academic disciplines provide insight from personal research and published literature, while county Extension personnel provide insight from local communities. Program area personnel work together to identify key issues that cut across disciplines, and special task forces collaborate to identify priority program efforts to address these issues.

Our system provides flexibility for educators to maintain the ability to be responsive to unanticipated issues. Educators identify a subject matter specialization that relates to needs in their geographical area of the state. Educator specialization is a way for the system to provide subject matter expertise close to local communities. They receive additional training to remain on the cutting edge of their field, and they work with other educators to address local needs in a timely manner. In addition, educators remain linked to state specialists in the same discipline to enable the rapid dissemination of new information to address critical needs.

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 non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-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
- Survey specifically with non-traditional groups
- Survey specifically with non-traditional individuals
- Survey of selected individuals from the general public
- Other (focus groups, public information booths at local gatherings)

Brief explanation.

CFAES continually has wide support and active participation from our stakeholders. We use formal and informal methods to engage our stakeholders and encourage their participation. One method uses external advisory committees and stakeholder groups to discuss current programs and gather input for future direction and strategic planning. Electronic messaging, social media, webinars, and blogging, as well as interactive group messaging systems have continued to expand rapidly, allowing more stakeholders to participate using communication technologies.

Organizational and leadership changes are communicated at major College events (such as the annual Farm Science Review), to advisory groups, via the CFAES website, a weekly CFAES blog, and a weekly news release.

CFAES centers and programs, and their stakeholders participate in three annual meetings to discuss re-envisioning related to CFAES. We ask for stakeholder input for the annual report format

and content, as well as input on the direction of our research programs.

One example public-private collaboration is SEEDS: The CFAES Research Enhancement Competitive Grants Program, which promotes exploration and encourages connections across disciplines, with industry and other external partners. In 2017, the program was awarded roughly \$1M in funding, resulting in 21 faculty, 16 graduate, and 3 undergraduate awards. SEEDS research has produced over 900 publications, 14 U.S. patents, 26 invention disclosures, and 6 licensing agreements using results from initial findings, while facilitating collaborations with colleagues from 16 countries.

A report was done in 2017 to estimate the academic productivity of SEEDS projects by comparing the number of citations between different SEEDS competition areas and the agricultural science field as a whole. Results showed that the average citations per item for the SEEDS program as a whole (roughly 20 citations per item) and individual competitions (ranging 12-24), measure above average when compared to the agricultural science field as a whole (average of 7).

OSUE develops stakeholder-based strategic plans to inform the focus of statewide priority programs. The process is ongoing and involves collaboration with local advisory committees, reviews of demographic and other relevant data, and prioritization based on need and availability of resources. Some of the program teams include members from external organizations (e.g. state agencies, organizations, commodity groups) who can offer additional resources to enhance program outreach. County Extension Advisory Committees, as well as the State Extension Advisory Committee, are engaged in reviewing and prioritizing new interdisciplinary programs.

In late 2016, the Program Development and Evaluation team for OSUE led an asset-based approach to needs assessment session with 23 members of the "Extension in the City" team. A nine-page report resulted, which will be coupled with extensive market analysis, surveys, focus groups, and a review of secondary data. The results of the full examination will help to determine programmatic priorities in the future.

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
- Needs Assessments
- Use Surveys
- Other (one on one interactions with existing and new stakeholders)

Brief explanation.

CFAES continues to make targeted efforts to find and link with all stakeholder groups. We identify individual stakeholders and stakeholder groups by utilizing faculty and staff, associates from support organizations, traditional stakeholders, and political leaders.

Opportunities such as the CFAES Farm Science Review (FSR) are used to engage and garner stakeholder participation, feedback and support. FSR-Ohio's premiere agricultural event, and one of the largest in the nation-is dedicated to demonstrating the best agricultural research and best management practices with ready-access for our stakeholders.

In September 2017, FSR hosted approximately 114,000 visitors over a three-day period. One-on-one sessions at FSR, the state fair, local fairs, special events, and active participation by faculty and staff in community group processes and business/professional meetings have provided an opportunity to better connect with constituents. This process also provides a means to expand our

clientele list, knowledge of needs, and feedback on impacts and outputs. These contacts are logged and maintained.

The OARDC advisory committee is composed of a cross-section of members from the agricultural, natural resources and environmental sectors. Members serve a three-year term with no limits on reappointments to the committee. When a committee term expires, the committee recommends a new member from a similar area as the retiring member. Once the advisory committee approves the individual, the name is forwarded to the Director of the Ohio Experiment Station for final approval and appointment.

County Extension advisory committee members help in connecting to our traditional stakeholders and expanding the list of county officials that should be contacted. Extension advisory committees have guidelines that dictate how they should be composed. Diversity of membership is key, with additional guidelines for term length of membership, size of committee, meeting frequency, and membership rotation also exist. The membership of committees is reviewed during annual onsite and self-study diversity reviews to ensure that involvement is sought from the broadest array of constituents feasible. Extension educators are encouraged to reach out to new and underserved target audiences. Each team, or faculty and staff group, working on a project proposal or existing project will have a client partner list that is ever expanding. Likewise, all administrative units in CFAES have advisory committees that continually seek to be more representative and are constantly opening up new channels to new stakeholder individuals and groups.

Our future success in meeting needs and fulfilling our land-grant mission lies in our ability to maintain links with a representative cross-section of our stakeholders. These linkages aid in assessing research and Extension-related needs, extending information, growing human capital, opening opportunities for Ohio based products and services that we have helped to develop, and ensuring we have a feedback mechanism from our stakeholders.

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
- Survey of the general public
- Meeting specifically with non-traditional groups
- Survey specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Survey specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public
- Survey of selected individuals from the general public
- Other (focus group interviews, unobtrusive observation, qualitative data collection)

Brief explanation.

The methods noted above have all been utilized to a greater or lesser extent this reporting year at various levels of the organization to gather data from stakeholders. While there are some formal processes used to gather input, many of our efforts are informal. Our survey of various groups is often done in open forum interview/discussion settings that generate more qualitative data than quantitative. CFAES groups such as faculty and staff members, departments and schools, and various research and Extension groups within the institution use stakeholder lists that serve as their

foundational contact points. In turn, there are business and industrial partners, fellow research and Extension institutions, and support organizations that are on our contact list. Federal, state, regional, and local governments; agencies; advisory committees; commodity groups; as well as special interest groups also add to the list of stakeholders from whom we seek input in the initial planning and execution phases of our programs.

CFAES invites members of private and public industry from around the state of Ohio to participate as OARDC advisory committee members. This committee meets three times per year along with the OARDC Directors and other OARDC representatives to discuss current research, gather input for future direction and long-term initiatives, and address any other immediate priorities.

Additionally, CFAES has eight Outlying Research Station advisory committees that review research projects, impacts of research projects, budgets, and equipment and facilities needs for their respective locations each year. The Station Manager and the Assistant to the Director for Research Operations provide input and data to the committees. The committee uses this information to revise the five-year strategic plan at each location on an annual basis. Examples include: new vegetable crops or new varieties of vegetable crops produced at a research station; changes in pesticide use due to new pests discovered by producers or research personnel; and new recommendations for nitrogen and phosphorus management on agronomic crops.

All of these stakeholders are continually being re-engaged as we move forward. The ultimate aim is to have 'meaningful engagement' that will yield meaningful data, both quantitative and qualitative, and that interpretation and internalization of that data will help lead the organization to meaningful partnerships that will help foster real impacts.

3. A statement of how the input will be considered

- In the Budget Process
- To Identify Emerging Issues
- Redirect Extension Programs
- Redirect Research Programs
- In the Staff Hiring Process
- In the Action Plans
- To Set Priorities
- Other (Business management practices, culture of organization)

Brief explanation.

CFAES promotes both basic and applied research, and builds and tests advanced models for Extension programming that meets clientele needs. CFAES has continued stakeholder engagement activities that reinforce our client-centered organizational culture. With each important decision, our organization has sought to weigh stakeholder input against demand for our science and programs, and our capacity to deliver. While there are often competing and conflicting demands, input from our stakeholders is strongly reflected in what we do. Meeting client requests is the key to fulfilling the land-grant mission and demonstrating that stakeholder support exists for programs that fulfill their needs and contribute to national well-being.

It is the field-level interactions among stakeholders, researchers, and Extension specialists where the majority of emerging issues are identified. While strong, theoretical insight is critical, food, agricultural, and environmental issues most often manifest themselves in our clients' daily work and social lives. Needs and issues originating from producers, processors, manufacturers, distributors, consumers and special interest groups will continue to inform Extension and research programs. It is this input filtered through our academic knowledge base that provides our scientists with relevant study questions. Once answered, the response is framed for the clients as well as other interested parties. This approach has and will continue to influence hiring, shifts in priorities and resource

allocation, and strategic planning.

Stakeholder input is considered at many levels of the organization. The Administrative Cabinet of OSUE reviews input from surveys and strategic planning processes to determine funding and staffing needs. The State Extension Advisory Committee and the OARDC Advisory Committee have met multiple times to provide input on programmatic needs and proposed priorities. Cooperative Extension administrators and others with statewide program leadership responsibility have initiated a departmental accountability process with all campus units receiving Extension funding. This process involves meetings to discuss surveys of internal and external stakeholders about their satisfaction with the content and expertise delivered from that unit and review of documented impacts. Locally, Extension Advisory Committees and other programmatic committees assist educators in prioritizing programs annually. They review information about local needs and Extension's capacity to deliver programs and guide the overall programmatic vision.

Across all levels of administration and programs, stakeholder input proves to be highly valuable. CFAES is extensively engaged with federal, state, and local officials, as well as business, industry, and special interest groups. The stakeholders' voices and needs are central to setting our institution's agendas and fulfilling our collective land-grant mission. Throughout 2018, the College will use internal and external feedback to craft the new strategic plan. It is vital that stakeholder input is used to draft a relevant and efficient strategic plan that addresses the critical issues of our time.

Brief Explanation of what you learned from your Stakeholders

The individuals, groups, organizations, and businesses that are vested in CFAES' research and Extension activities provide a level of input that is central to our success. The primary information learned in these interactions is that:

- The stakeholder perspective is not always as we assume; thus, it is imperative that we listen intently, communicate broadly, and stay engaged. This has been a strong recommendation from a number of stakeholders who have noted that periodic mailings and webpage updates do not equate to staying engaged.

- Our science and services are highly valued. Our research and Extension work has both quantitative and qualitative positive social, economic, ecological, and ethical impacts, both across the state, including individuals, families, groups, communities, businesses and industry.

- CFAES does not have the resources and personnel to meet all demands, or to take advantage of all opportunities that present themselves. The breath of demand is so wide and the quantities so great that the organization must be engaged in constant planning to garner and optimize resources, invest them in targeted programs, and generate impacts in a timely manner. We also must clearly articulate to the full array of stakeholders what we have the capacity and resources to accomplish. In November 2017, CFAES released a revised report on The Economic Contribution of Agricultural and Food Production to the Ohio Economy. This report involved many meetings involving internal and external stakeholders over several months to revise the methods used to calculate the economic contribution of food and agriculture in the state. The report concluded that the agricultural and food sectors employed over 400,000 Ohioans and contributed \$33 billion in value added to Ohio's Gross State Product in 2015. These results offer insight into development opportunities in rural communities as well as raise many questions about the impact of changes in the agricultural and food sectors in Ohio. The feedback from these stakeholder meetings allowed researchers to fine tune the economic contribution calculation methods, giving the most accurate assessment of agricultural and food production for the state.

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	9470990	0	6588555	0
Actual Matching	9470990	0	17949470	0
Actual All Other	0	0	0	0
Total Actual Expended	18941980	0	24538025	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	5327630	0	0	0

V. Planned Program Table of Content

S. No.	PROGRAM NAME
1	Climate Change
2	Sustainable Energy
3	Childhood Obesity
4	Food Safety
5	Global Food Security and Hunger
6	Soil, Air and Water (OARDC Led)
7	Natural Resources and Environmental Systems (OARDC Led)
8	Plants Systems (OARDC Led)
9	Food, Agricultural, and Biological Engineering Systems (OARDC Led)
10	Animals Systems (OARDC Led)
11	Economics and Social Dimensions (OARDC Led)
12	Human Health (OARDC Led)
13	Advancing Employment and Income Opportunities (Extension)
14	Enhancing Agriculture and the Environment (Extension)
15	Preparing Youth for Success (Extension)
16	Strengthening Families & Communities (Extension)

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Climate Change

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
132	Weather and Climate	0%		40%	
133	Pollution Prevention and Mitigation	100%		0%	
605	Natural Resource and Environmental Economics	0%		60%	
	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	2.0	0.0	1.0	0.0
Actual Paid	4.0	0.0	0.7	0.0
Actual Volunteer	0.4	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
183902	0	113351	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
183902	0	266709	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Translational/applied climate change research;
- Laboratories, pilot plants, a feedstock processing plant, greenhouses, and research plots and stations will all be used for relevant experiments;
- Infrastructure and facilities will be improved over time as program needs warrant;
- Educational programming offered;
- One-on-one consultations;
- Webinars.

2. Brief description of the target audience

Targeted audiences in the Climate Change planned program include, but are not limited to:

- Businesses and industries that have expressed a need for climate change information that resulted from new research, extracted from on-going research, or mined from the scientific literature;
- Fellow academic units that partner with program scientists to create systems and processes needed to support research and the adoption of the research findings by industrial partners;
- Ag producers and farmers;
- Federal, state or local agencies or support organizations who will not only use the information but will also be brokers for embedding it into other groups to encourage change;
- Populations who have not requested the information but will likely benefit from that information;
- Other scientists and scientific groups;
- Political entities;
- Other education, outreach, and extension personnel;
- Students from elementary school to post doctorate studies;
- News organizations.

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	60865	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	31	31

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of participants attending educational programs

Year	Actual
2017	60865

Output #2

Output Measure

- number of webinars / online educational and research sessions
Not reporting on this Output for this Annual Report

Output #3

Output Measure

- number of acres impacted as a result of educational events on the management of natural resources
Not reporting on this Output for this Annual Report

Output #4

Output Measure

- number of individuals receiving one-on-one consultation or assistance
Not reporting on this Output for this Annual Report

Output #5

Output Measure

- number of people completing non-formal educational events on water quality and quality of surface water and groundwater supplies (OSUE)

Year	Actual
2017	13900

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Create strategies / technology within our program mission to reduce atmospheric pollution that can contribute to global climate change (OARDC)
2	Proportion of climate webinar participants who indicate they have learned new information and would share their new knowledge with others (OSUE)
3	Advance knowledge of how climate change affects crops, including wildlife (OARDC)
4	Number of participants who indicated they improved their knowledge of nutrient management (OSUE)

Outcome #1

1. Outcome Measures

Create strategies / technology within our program mission to reduce atmospheric pollution that can contribute to global climate change (OARDC)

2. Associated Institution Types

- 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)

Rural communities throughout eastern and southern Ohio have been affected by shale energy development and are particularly vulnerable to long-term economic fluctuations experienced by natural resource dependent economies. Smaller, rural communities have fewer opportunities to collaborate between business and the workforce, leaving a need to develop and encourage sustainable planning efforts that build capacity and improve communication between regional partners and businesses.

It is important to develop models that assist officials to make the best decisions for their communities while keeping in mind both short and long term impacts and sustainability.

What has been done

CFAES researchers used survey data from over 1,500 manufacturers, in addition to other public and private data sources, to empirically examine social and economic changes as a result of shale energy development in Ohio. The research team worked closely with OSU Extension educators to create fact sheets, policy briefs, presentations, and various other materials in order to educate staff, community leaders, residents, elected officials and other stakeholders about the impacts of energy development in their communities.

Results

As a result of the analysis and industry capacity assessment, a technical report titled "Building Sustainable Communities in Ohio's Shale Region: Leveraging Manufacturing Clusters and Local Assets with Strategic Planning" was published, summarizing the economic impacts of the current oil and gas boom on 25 counties in eastern Ohio. The report identified five industrial sectors as being most relevant to the expansion of oil and gas manufacturing activities in the region: energy, chemicals & chemical based products, metals manufacturing, forest and wood products, and machinery manufacturing. In addition, a 6-part series of fact sheets and short videos were created

summarizing the key results of this report. This information can be used to inform community stakeholders about likely areas of future growth. The team also designed marketing folders to disseminate policy reports and fact sheets during outreach events. To date, over 125 folders have been distributed to program participants and partners. Using current information and ongoing collaboration, communities can update their strategies to reflect the continuous changes occurring in their region, promoting long-term sustainability and economic diversity.

4. Associated Knowledge Areas

KA Code	Knowledge Area
605	Natural Resource and Environmental Economics

Outcome #2

1. Outcome Measures

Proportion of climate webinar participants who indicate they have learned new information and would share their new knowledge with others (OSUE)

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Advance knowledge of how climate change affects crops, including wildlife (OARDC)

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Number of participants who indicated they improved their knowledge of nutrient management (OSUE)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	4832

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Nutrient stewardship impacts everyone. Fertilizer is essential to crop production; but if nutrient applications are not managed, farm field nitrogen and phosphorus can be lost into water resources and can promote hazardous algal blooms. Ohio has had problems with water quality ? Lake Erie and Grand Lake St. Marys are two examples of massive algal blooms which have greatly impacted Ohio water quality.

What has been done

OSU Extension continues to offer the ?Nutrient Stewardship for Cleaner Water? program, which was designed to improve water quality by helping growers lessen the use of nitrogen and phosphorus while maximizing the amount kept on the fields, which will ultimately result in increased farm yields and profits, as well as cleaner waterways. The program encompasses fertilizer application and certification and pesticide application programming. Fertilizer Applicator Certification Training (FACT) emphasizes the optimization of the efficiency of fertilizer use by incorporating the 4R concept: the Right fertilizer source, at the Right rate, at the Right time, and in the Right place.

OSU Educators identified fields with high nutrient risk loss. The implementation of appropriate cost effective best management practices on these fields will be studied for effectiveness of reduction in nutrient loss.

It is projected that nearly 20,000 people will complete the FACT program by the end of 2018. Participants must complete re-certification every three years to maintain the certificate.

Results

OSU Extension educators report that 93% of clientele have adopted soil testing, and 69% are following the Tri-State fertilizer recommendations for agronomic and other crops and are using organic and inorganic nutrient sources for optimal crop production. Livestock producers in Western Ohio are now using livestock manure as a nutrient source for top-dressing wheat and side-dressing corn. They know that applying the manure to a growing crop will be more beneficial to them and is environmentally sound.

A total of 5,196 certifications were issued and evaluations collected for 2017 'Nutrient Stewardship' events. {evaluation data} - 76% of participants either indicated 'agree' or 'strongly agree' on a 5-point scale that farm field P loss is a significant problem to our water resources. 93% (n=4832) indicated either 'agree' or 'strongly agree' that they have improved their knowledge about nutrient management. 82% indicated they plan to review soil test and phosphorus recommendations as a result of the education.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation

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
- Competing Programmatic Challenges
- Other (Social Acceptance of the issue)

Brief Explanation

Limited resources require choices and it is possible that resources currently devoted to this program and planned for the future could be re-directed, should a more compelling issue surface. Likewise, natural disasters and climactic extremes may shift the focus of some programming efforts back towards issues regarding climate change. Additionally, climate change continues to be a contentious issue, sometimes making it more challenging to perform and disseminate research results.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Climate change is a global problem, but specific subsets of challenges are already affecting the Great Lakes region. Climate change can: affect the safety of drinking water, increase the number of droughts and floods, cause changes in precipitation and higher mean temperatures, and cause a decrease in crop yield dramatically over time, and impact species migration. Various CFAES research and extension projects are tackling issues related to climate change.

For example, in 2017 a research paper titled "Risk of multiple interacting tipping points should encourage rapid CO₂ emission reduction" was published that identified five "tipping risks" that could accelerate climate change and cause irreversible or abrupt damage to the natural system. These risks are:

1. Meltdown of the Greenland ice sheet,
2. Collapse of the West Antarctic ice sheet
3. Collapse of Atlantic Meridional Overturning Circulation (AMOC)
4. Dieback of the Amazon forest
5. Shift to a more persistent El Nino regime

Research such as this, in combination with publications and presentations confirm that CFAES is making progress in the area of climate change research.

Key Items of Evaluation

OSU Extension educators report that a total of 5,196 certifications were issued and evaluations collected for 2017 'Nutrient Stewardship for Cleaner Water' events. {evaluation data} - 76% of participants either indicated 'agree' or 'strongly agree' on a 5-point scale that farm field P loss is a significant problem to our water resources. 93% (n=4832) indicated either 'agree' or 'strongly agree' that they have improved their knowledge about

nutrient management. 82% indicated they plan to review soil test and phosphorus recommendations as a result of the education.

V(A). Planned Program (Summary)**Program # 2****1. Name of the Planned Program**

Sustainable Energy

 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
511	New and Improved Non-Food Products and Processes	10%		93%	
608	Community Resource Planning and Development	90%		7%	
	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	1.5	0.0	2.0	0.0
Actual Paid	2.0	0.0	1.7	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
91951	0	220977	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
91951	0	447708	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)**1. Brief description of the Activity**

Throughout the planning period, research and Extension activities will inform sustainable energy programs. Laboratories for experiments, pilot plants, a feedstock processing plant, greenhouses, and research plots and stations throughout the state will support this program. All functional laboratories and sites will be improved over time as program needs warrant. OSU Extension provides renewable energy programs to advance knowledge, promote adoption and change, develop human capital, support economic development, and create sustainable energy planning activities. The outreach from community-scale renewable energy education is planned to continue into the future, while new program development is underway for on-farm solar energy applications. CFAES faculty and staff will engage in appropriate levels of outreach and consultation, with both internal and external stakeholders, to ensure the research has the greatest chance of effecting change within society.

2. Brief description of the target audience

Targeted audiences include, but are not limited to:

- Businesses, industries, and residents that have expressed a need for sustainable energy and advanced materials information that resulted from new and on-going research, or mined from the scientific literature;
- Other stakeholders, with particular focus on consumers;
- Fellow academic units that partner with program scientists to create systems and processes needed to support research and the adoption of research findings by industrial partners;
- Federal, state and local agencies or support organizations who will not only use the information but will also be brokers for embedding it into other groups to encourage change;
- Populations who have not requested the information but will likely benefit from the knowledge, e.g. community leaders, general public;
- Other scientists and scientific groups;
- Political entities;
- Other education, outreach, and Extension personnel;
- Students from pre-school to post doctorate studies;
- News organizations.

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	1556	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	9	9

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- number of educational workshops / seminars on "Sustainable Energy" topics (OSUE)

Year	Actual
2017	51

Output #2

Output Measure

- number of visitor sessions to the "Energize Ohio" website (OSUE)
Not reporting on this Output for this Annual Report

Output #3

Output Measure

- number of educational programs focusing on the topic of renewable energy

Year	Actual
2017	35

Output #4

Output Measure

- number of educational programs focusing on the topic of shale energy

Year	Actual
2017	4

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Annually the program will report, in conjunction with industrial partners, non-proprietary research gains made to the consuming public to garner interest in adoption of new products and processes when released.
2	By 2018, the program will contribute at least two alternatives to a petroleum-based product or process that meets client needs with an acceptable point of purchase price.
3	increased understanding of energy alternatives, resources and project support (OSUE)
4	implement change in energy behavior by workshop participants (OSUE)
5	complete installation of alternative energy activity (OSUE)
6	complete plan for community, business, or farm energy activity (OSUE)
7	The program will build scientist/stakeholder cores to guide/provide biological, chemical, physical, engineering, and social research necessary to create new and improved processes and products commensurate with demand. (OARDC)

Outcome #1

1. Outcome Measures

Annually the program will report, in conjunction with industrial partners, non-proprietary research gains made to the consuming public to garner interest in adoption of new products and processes when released.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

By 2018, the program will contribute at least two alternatives to a petroleum-based product or process that meets client needs with an acceptable point of purchase price.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

increased understanding of energy alternatives, resources and project support (OSUE)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	600

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The cost of photovoltaic (PV) solar systems continues to fall. As such, many agricultural producers are considering investments in PV systems to power their farms. Decisions involve consideration of system costs, design, tax impacts, value of energy production, and ongoing annual costs.

What has been done

. To help evaluate investment decisions, the Solar Energy in Agriculture: Considerations for

Investing in Photovoltaic Solar Systems program was designed. To support this program, Extension professionals from the Ohio State University and the University of Wyoming created a six-part bulletin series titled, Solar Electric Investment Analysis. In partnership with Virginia Tech Cooperative Extension, Michigan State University Extension, University of Nebraska Extension, and the U.S. Department of Energy, the materials have been most recently shared via a series of Zoom webinars which have reached 80 participants 16 states and three countries. Since 2015, this program has been offered over 48 times in Ohio, engaging more than 2,400 participants.

Results

Feedback from Ohio program participants (n=600) in 2017 indicates the program materials and software modeling support is extremely valuable, guiding informed decisions on major solar investment projects throughout the state.

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes
608	Community Resource Planning and Development

Outcome #4

1. Outcome Measures

implement change in energy behavior by workshop participants (OSUE)

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

complete installation of alternative energy activity (OSUE)

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

complete plan for community, business, or farm energy activity (OSUE)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	30

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Current energy concerns in Ohio include increasing populations, the desire to minimize foreign dependency for oil, and environmental concerns. Ohio has an abundance of natural resources and open spaces, which gives them the opportunity to play a role in addressing energy concerns.

What has been done

In 2017, Educators provided outreach on shale research at 4 programs reaching 74 participants, including state, regional and local elected officers, practitioners and academia in venues throughout Ohio. Participants included representatives and board members from four Economic Development Districts (EDDs) who, with research provided by Educators, developed shale development strategies for inclusion in their Community Economic Development Strategic Plans (CEDSPs).

Results

Among the over 30 strategies developed, strategies that are known to have been implemented include the following:

- ? The Ohio Mid-Eastern Governments Association region helped to implement a workforce readiness program by partnering with local and regional educational institutions.
- ? The Buckeye Hills Regional Council implemented a strategy to provide ongoing statistical analysis and tracking of clusters services identified by OSU to surrounding regions. Using GIS, they also provide tracking and visualization of horizontal well permits in eastern and southeastern Ohio.
- ? The Eastgate Regional Council of Governments developed an analysis of relevant oil and gas downstream segments including basic chemicals manufacturing and several other sectors.
- ? The Northeast Ohio Four County Regional Planning and Development Organization provides current information to local governments to assist them with addressing environmental concerns associated with the shale development industry.

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes
608	Community Resource Planning and Development

Outcome #7

1. Outcome Measures

The program will build scientist/stakeholder cores to guide/provide biological, chemical, physical, engineering, and social research necessary to create new and improved processes and products commensurate with demand. (OARDC)

2. Associated Institution Types

- 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)

Anaerobic digestion is a process by which microorganisms break down biodegradable material in the absence of oxygen, reducing wastes and generating bioenergy. Integrated anaerobic digestion (iAD) is an Ohio State University patent technology that combines solid state anaerobic digestion (SS-AD) with commercially available liquid anaerobic digestion (L-AD) improving efficiency, reducing cost, increasing overall biogas production, and reducing technical challenges associated with each alone. However, pilot tests are needed to validate lab-scale results and provide the critical data necessary to convince industrial collaborators to move this technology into the next stage of commercialization.

What has been done

CFAES researchers used lab and field studies, feedstock logistics modeling, process modeling, and life cycle analysis to compare the technical, economic, environmental and social impacts of bioenergy and biofuel production with iADs and biogas-to-liquid creation from different feedstocks. Lignocellulosic biomass ? dry plant matter ? such as corn stover and Miscanthus was harvested, transported, and then fed into the SS-AD reactor. Once processed, the remaining material, or digestate, was applied to various lands and soil quality was studied. The sustainability of farm land soils with application of SS-AD digestate and corn stover collection for biogas production was studied, as well as soil restorative effects of Miscanthus production with SS-AD digestate on otherwise unproductive lands. With the innovative pretreatment technology for SS-AD feedstocks and the advanced design of the iADs process, substantial increases in methane yield and productivity were achieved.

Results

This project significantly increased knowledge on lignocellulosic feedstocks and SS-AD. Models were developed to optimize biogas plant locations, estimate delivery costs of feedstock to AD

plants, and predict yield and water quality impacts of Miscanthus grown on strip mined land. Corn stover and wheat straw were identified as the most promising lignocellulosic feedstocks for SS-AD, however food waste was the most promising feedstock for co-digestion and increased methane yield by up to 150%. A primary benefit of co-digestion is that it uses existing infrastructure and expertise to divert food waste for the purpose of biogas production. These results will be used to improve and enhance the performance and sustainability of iAD technology, with the goal of industry adoption. Furthermore, to understand the sustainability potential of each proposed technology, this work will design optimum networks of technological and ecological systems to mimic nature and close all material cycles. iAD technology, when proven economically feasible, will provide methods to improve the value of certain feedstocks for producers and provide an alternative to landfill waste disposal.

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes

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
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)
- Other (Supply and cost of crude oil)

Brief Explanation

Economy: Volatile oil prices greatly influence the exploration and development of shale formations in Ohio. Shale development creates jobs, increases the demand for retail and other services, which results in the stimulation of the local economy. The challenge is to ensure that many of the new jobs benefit the local labor force. Workforce development becomes an important strategy to build local economic sustainability.

Public Policy Changes: The following policies all influence the development of distributed renewable energy systems:

- Ohio State Bill 221
- Ohio State Bill 310
- Consolidated Appropriations Act (40% ITC)
- Clean Power Plan

V(I). Planned Program (Evaluation Studies)

Evaluation Results

CFAES is devoted to increasing sustainable energy throughout Ohio and the nation. We

show this by developing new, sustainable energy methods and improving upon current ones, while increasing outreach to Ohioans about how they can adopt more sustainable methods in their households and businesses.

Every other year, CFAES hosts the Scarlet, Gray, and Green Fair, which is a festival celebrating sustainability and green living. More than 50 exhibitors and vendors featuring alternative energy, composting, gardening, local foods, green homes, and farming are typically present, and a Renewable Energy Workshops are offered to teach attendees about renewable solar energy for homes and businesses and financial assistance for sustainable energy systems for rural small businesses.

Additionally, the first Energy Impacts Symposium was held in July 2017 in Columbus, Ohio. This multi-disciplinary, multi-energy conference provided a forum for energy-related social science experts to present, collaborate, and review research from across energy regimes. The two-day conference brought together over 140 researchers from the U.S, Canada, Mexico, and Europe to present research findings, exhibit posters, and engage in panel discussions; with specific events and opportunities targeting underrepresented groups, new researchers, and students.

Key Items of Evaluation

Outcomes of the Economic Impacts of Shale Energy Development programming, included the following:

- Increased relationships and collaborations with four Economic Development Districts and other local and regional key stakeholders.
- Improved understanding of economic, social and environmental changes occurring in shale-impacted areas.
- Economic development plans in place that include strategies to address energy development.
- Increased workforce training and employment opportunities.
- Linkages created between shale related businesses and area workforce.
- More resources available for local and regional partners.
- Increased participation by shale-related businesses.
- Increased sustainable planning efforts.

Extension Educators have gained significant capacity in the teaching and outreach of shale and energy-related issues and trends for the benefit of stakeholders throughout Ohio. Capacity-building has subsequently been expanded through train-the-trainer efforts beyond the "core team" to include an expanded multi-disciplined team of county-based Educators and other Extension personnel.

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Childhood Obesity

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
702	Requirements and Function of Nutrients and Other Food Components	0%		94%	
703	Nutrition Education and Behavior	50%		6%	
724	Healthy Lifestyle	50%		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	9.0	0.0	0.5	0.0
Actual Paid	1.0	0.0	0.4	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
45976	0	63310	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
45976	0	396771	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Obesity research includes food science, plant sciences, and consumer research related to human health and obesity. Parallel Extension programs that address health and wellness, life styles, and consumer choice are included in this planned program as well. Given the complex nature of obesity as a subject, the area is broadly supported in scientific areas ranging from genetics for breeding plants and animals that can be processed into healthier food products, to education of school children about eating healthy. Thus, not all impacts relating to obesity are found in this planned program. CFAES advances programs that ensure nutritious foods are affordable and available, and provide guidance so that individuals and families are able to make informed, science-based decisions about their health and well-being.

2. Brief description of the target audience

Related research and Extension information will be derived through new and on-going research or will be extracted from the scientific literature. Within the 'Childhood Obesity' planned program, such research will be shared with targeted audiences including, but not limited to:

- Business, industry, and residents that have expressed a need for information that resulted from new research, extracted from on-going research, or mined from scientific literature;
- Other stakeholders, with particular focus on consumers;
- Fellow academic units that partner with program scientists to create systems and processes needed to support research and the adoption of research findings by industrial partners;
- Federal, state or local agencies or support organizations who will not only use the information but will also be brokers for embedding it into other groups to encourage change;
- Populations who have not requested the information but will likely benefit from the knowledge, e.g. community leaders, general public;
- Other scientists and scientific groups;
- Political entities;
- Other education, outreach, and Extension personnel;
- Students from pre-school to post doctorate studies;
- News organizations;
- Businesses concerned about obesity in their workforce;
- Industry groups or producers of foods and food additives that can help reduce obesity and its side effects.

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	431	110000	1096	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 educational sessions held
Not reporting on this Output for this Annual Report

Output #2

Output Measure

- number of participants attending educational events related to 'Childhood Obesity' that can be defined as under-served (i.e. individuals whose needs have not been addressed in past events)
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	To better understand human decision making; specifically with reference to how individuals make food consumption decisions.
2	Apply new knowledge to programs at the field level with a goal of significant long term weight loss and overall improvement of health in those who participate.
3	To identify research activities such as new data sources, improved techniques for data analysis, and improved hypotheses for obesity research questions.
4	Number of participants who learned new information from this program. (OSUE)
5	Number of participants who plan to increase their level of daily physical activity. (OSUE)
6	Number of participants who plan to increase their consumption of fruits and vegetables (OSUE)
7	number of participants in this event / project who actually adopted one or more recommended nutritional practices that reduce the risk of chronic disease (OSUE)

Outcome #1

1. Outcome Measures

To better understand human decision making; specifically with reference to how individuals make food consumption decisions.

2. Associated Institution Types

- 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)

In response to rising childhood obesity rates, many states have implemented new laws to ensure access to healthy foods at school. One such act, the Healthy Hungry-Free Kids Act of 2010, implemented new standards for school lunches across the nation, including nutrition standards for meals and a requirement that children must have water available at no charge during lunch. Many schools will need to change their lunch offerings to abide by this new law ? for example, offering fewer unhealthy a-la-carte items. It is uncertain how these lunch changes may affect school lunch consumption by students, and lunch profitability for the schools. Research needs to be done to determine the most important factors in this decision-making process.

What has been done

Empirical analysis of school lunch sales data and daily meal production records in addition to online survey data (from surveys sent to parents of children in two Ohio public schools) were used to determine the most important factors determining school lunch choice. Controlling for effects such as day of the week and protein source, researchers estimated how calorie content of a meal affects the total number of meals served in that day.

Results

Although the perceived health of food items was an influence affecting school lunch choice, the palatability of food was the most important factor in student food choices. Chicken and mixed meat offerings yield higher sales than beef or vegetarian offerings, though chicken's popularity declined significantly over the time period studied. Data also suggested that daily sales increased by 2.5% for each additional 100 calories in a meal. It was concluded that alteration in school lunch calorie content enabled by the Healthy Hungry-Free Kids Act will have only a modest impact on the profitability of school foodservice operations. These results and conclusions were shown to school district administrators and parents through a detailed report and executive summary via presentations to the school's health and wellness committee and school board.

Ultimately this data will inform school officials, administrators, and parents how new policies may affect school budgets and children's health while guiding schools to be more efficient with lunch offerings provided to students.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior

Outcome #2

1. Outcome Measures

Apply new knowledge to programs at the field level with a goal of significant long term weight loss and overall improvement of health in those who participate.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

To identify research activities such as new data sources, improved techniques for data analysis, and improved hypotheses for obesity research questions.

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Number of participants who learned new information from this program. (OSUE)

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Number of participants who plan to increase their level of daily physical activity. (OSUE)

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Number of participants who plan to increase their consumption of fruits and vegetables (OSUE)

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

number of participants in this event / project who actually adopted one or more recommended nutritional practices that reduce the risk of chronic disease (OSUE)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	645

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Unhealthy dietary and physical activity behaviors emerge during childhood and adolescence. This is cause for concern, because unhealthy practices established in childhood lead to chronic diseases in adulthood. Although the 2015-2020 Dietary Guidelines for Americans recommend eating more fruits and vegetables, consuming fat-free or low-fat dairy products, and limiting calories from added sugar, many Americans do not meet these guidelines. Middle school- and high school-aged children are especially lacking in fruits and vegetables. Research also indicates that sugar-sweetened beverages are the single largest source of added sugars in adolescents? diets and young people consume two to three times the recommended daily limit for added sugars. In addition, many children and adolescents do not get the recommended amount of daily physical activity. Childhood obesity has more than tripled in the past 30 years, with more than 30% of children and adolescents in Ohio classified as overweight or obese.

What has been done

As an organization, Ohio 4-H is uniquely positioned to make a difference in the health of its members.

Ohio 4-H uses multiple approaches to teach about nutrition and physical activity, including engagement in individual study projects as 4-H members; participation in after-school programs,

camps, and other special interest programs; and participation in in-school classroom programs. 4-H members annually engage in more than 7,300 food, nutrition, and health projects that provide them with hands-on learning experiences about these topics.

As an organization, Ohio 4-H is uniquely positioned to make a difference in the health of its members.

Ohio 4-H uses multiple approaches to teach about nutrition and physical activity, including engagement in individual study projects as 4-H members; participation in after-school programs, camps, and other special interest programs; and participation in in-school classroom programs. 4-H members annually engage in more than 7,300 food, nutrition, and health projects that provide them with hands-on learning experiences about these topics.

As an organization, Ohio 4-H is uniquely positioned to make a difference in the health of its members.

Ohio 4-H uses multiple approaches to teach about nutrition and physical activity, including engagement in individual study projects as 4-H members; participation in after-school programs, camps, and other special interest programs; and participation in in-school classroom programs. 4-H members annually engage in more than 7,300 food, nutrition, and health projects that provide them with hands-on learning experiences about these topics.

In 2017, total of 77 clubs, reaching 1,098 members in 41 counties participated in the '4th H for Health' challenge by drinking water, offering fruit and vegetable snacks, doing 15 minutes of physical activity, and doing an activity to promote social and emotional health at 4-H club meetings.

Results

In 2017, 750 youth who participated in 4-H food and nutrition programs completed an evaluation of food and nutrition knowledge, attitudes, and practices. The vast majority of these participants possess positive attitudes toward physical activity and report knowledge gained about making healthy food choices. Youth reported that because of their participation, they were drinking more water and eating more fruits and vegetables (82%), followed by eating more whole grains (70%) and eating less junk food (66%). They report doing moderate physical activity (86%), with 6 in 10 exercising the recommended 60 minutes a day.

4. Associated Knowledge Areas

KA Code	Knowledge Area
702	Requirements and Function of Nutrients and Other Food Components
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
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)
- Other (Support in schools for programs)

Brief Explanation

Obesity is a complex topic to address, in that it encompasses a range of variables, including food quality, access to healthy foods, economics, and the decisions of individuals in food choice. Shifts in these variables impact all aspects of people's lives - psychologically, socially, and physically. Recent research shows that obesity outcomes for individuals are somewhat determined by the time children reach kindergarten. Reaching individuals with effective education and prevention measures at such a young age presents challenges to researchers and extension personnel as they consider new curriculum and delivery methods.

Within this program area, public monies and the fluctuations in appropriations have had a dramatic effect (both positive and negative) on human well-being, as have levels of government support for obesity education. The varying level of importance placed on social science research impacts our ability to compete for limited dollars, and thus impacts the extent to which research can be carried out. Factors such as the availability of base funding to ensure a core faculty and staff, availability of extramural funds, and excessive programmatic demands can affect outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

CFAES has partnered with over 40 local organizations to develop the Growing Healthy Kids Columbus Coalition, which networks and collaborates on childhood obesity prevention efforts. By making small changes throughout the Columbus area, the coalition is starting to see a big difference with the way children are eating. OSUE has assisted in this coalition by developing a Literacy and Eating activity for early childhood education centers that targets Pre-K through 3rd graders. Additionally, 110,000 people participated in the Great Apple Crunch, which encourages children (and adults) to eat locally grown Ohio apples. Not only does this encourage healthy eating, but it also supports the local food economy.

Key Items of Evaluation

In 2017, 750 youth who participated in 4-H food and nutrition programs completed an evaluation of food and nutrition knowledge, attitudes, and practices. The vast majority of

these participants possess positive attitudes toward physical activity and report knowledge gained about making healthy food choices. Youth reported that because of their participation, they were drinking more water and eating more fruits and vegetables (82%), followed by eating more whole grains (70%) and eating less junk food (66%). They report doing moderate physical activity (86%), with 6 in 10 exercising the recommended 60 minutes a day.

V(A). Planned Program (Summary)

Program # 4

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
502	New and Improved Food Products	0%		39%	
703	Nutrition Education and Behavior	80%		2%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	20%		59%	
	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	1.5	0.0
Actual Paid	4.0	0.0	1.6	0.0
Actual Volunteer	0.3	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
183903	0	240254	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
183903	0	642110	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

CFAES includes both basic and applied research for advancing broad food safety goals. Research will range from microbial studies to food processing to packaging for food safety and preservation. Laboratories, pilot plants, farms, and multiple business sites will all be available throughout Ohio to permit data gathering and to continue long-term experiments. All functional laboratories and sites will be improved over time as program needs warrant.

Parallel OSU Extension food safety programs will be developed based on client demand and food safety standards set by both the industry and regulators. Food safety programs to reduce the incidence of foodborne illness and provide a safer food supply by addressing and eliminating causes of contamination will continue to be a primary program goal of CFAES.

Specific activities of food safety education for consumers will include:

- Conducting food safety education classes;
- Conducting ServSafe classes with food establishment managers and employees;
- Conducting Safe Food Handling for Occasional Quantity Cooks classes with volunteer food preparers;
- Providing research-based information to consumers through various forms of media, including phone calls, fact sheets, social media, news releases, and web pages.

2. Brief description of the target audience

Targeted audiences within our food safety program will include, but are not limited to:

- Individuals or groups who have expressed a need for food safety research and Extension information that resulted from new research, extracted from on-going research, or mined from scientific literature;
- Fellow academic units that partner with food scientists to create systems and processes needed to support research and the adoption of research findings by stakeholders;
- Federal, state or local agencies or support organizations who will not only use the information but will also be brokers for embedding it into other groups to encourage change;
- Populations who have not requested the information but will likely benefit from that information, e.g. persons who engage in home canning of food;
- Other scientists and scientific groups;
- Political entities;
- Students from pre-school to post-doctorate studies;
- News organizations;
- Businesses and industrial groups;
- Food establishment managers (ServSafe manager training; food service employees ServeSafe training);
- Volunteer food preparers (general population) (Occasional Quantity Cook program);
- General consumers (via both formal or informal education).

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	6686	0	5225	0

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

Year: 2017
 Actual: 1

Patents listed
 Thermal Simulator

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	52	52

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of educational sessions held

Year	Actual
2017	335

Output #2

Output Measure

- Individual instruction on food safety through phone calls

Year	Actual
2017	2036

V(G). State Defined Outcomes**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Contribute to the advancement of knowledge about food packaging technologies, e.g. ultrasonic sealing, controlled environment packaging, to the extent that, annually, the risk of contamination due to packaging is reduced measurably.
2	Expand the knowledge base for contamination detection within packaged foods by developing or refining technologies such as magnetic resonance or infrared spectroscopy that will, within ten years, eliminate the problem.
3	Reduce food borne pathogens in the food supply chain.
4	Number of participants who learned new information from this program. (OSUE)
5	Number of participants who plan to adopt one or more recommended practices. (OSUE)
6	Reduce health risk by releasing at least one major study every five years demonstrating nutritional health benefits, e.g. carotenoids and cataracts, anthocyanins and colon cancer or as a substitute for artificial dyes (OARDC).
7	number of ServSafe® Level 1 attendees who indicated they plan to use the information learned in the educational program (OSUE)
8	Number of ServSafe® Level 2 attendees that answered "Agree" or "Strongly Agree" when presented with the statement, "I am comfortable talking with coworkers about increasing the safety of food in my establishment." (OSUE)
9	number of 'Food Preservation' participants who indicated that they will follow current OSUE and USDA canning and freezing recommendations after attending an educational event (OSUE)
10	number of participants who gained knowledge from Good Agricultural Practices educational events
11	percentage of food preservation participants who plan to make behavior changes as a result of educational intervention (OSUE)

Outcome #1

1. Outcome Measures

Contribute to the advancement of knowledge about food packaging technologies, e.g. ultrasonic sealing, controlled environment packaging, to the extent that, annually, the risk of contamination due to packaging is reduced measurably.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Expand the knowledge base for contamination detection within packaged foods by developing or refining technologies such as magnetic resonance or infrared spectroscopy that will, within ten years, eliminate the problem.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Reduce food borne pathogens in the food supply chain.

2. Associated Institution Types

- 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)

It is known that livestock and poultry are frequently colonized with microorganisms and contaminate the farm environment. Some of these microorganisms cause zoonoses, which are diseases that can be transferred from animals to humans. The daily practices associated with farm work provide frequent opportunities for workers to be exposed to pathogenic bacteria from animals and the environment.

The knowledge of these risks and ways to prevent infections are not well known among farm

laborers and are infrequently communicated to individuals in rural communities. There is a clear need to increase educational resources to educate those working on farm sites so they are aware of possible risks, and ways to reduce these risks.

What has been done

CFAES researchers developed and delivered zoonoses prevention clinical resources and educational materials specifically designed for public health and healthcare professionals (physicians, nurses, and veterinarians) in rural Ohio. Webinars, conference presentations, and on-line resources were used to transfer knowledge through stakeholder-partner networks. These materials provide much needed information to an important group of professionals providing services to rural residents.

Results

A culturally-targeted, bilingual disease prevention comic book titled "Working with Farm Animals: Keeping Yourself, Your Family, and Your Community Healthy" was developed, pilot-tested, and distributed for public health officials to use in their educational campaigns amongst rural audiences. Additionally, workshops on zoonoses were delivered to County public health departments in rural Ohio.

A continuing education webcast on zoonosis prevention among farm workers was also created and posted online for medical and public health professionals to use into the future: <https://ccme.osu.edu/WebCastDetail.aspx?ID=679>. Creating these educational materials will give health professionals the appropriate educational materials to educate underserved rural populations about zoonotic diseases, particularly those who may not speak English as a first

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

Number of participants who learned new information from this program. (OSUE)

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Number of participants who plan to adopt one or more recommended practices. (OSUE)

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Reduce health risk by releasing at least one major study every five years demonstrating nutritional health benefits, e.g. carotenoids and cataracts, anthocyanins and colon cancer or as a substitute for artificial dyes (OARDC).

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

number of ServSafe® Level 1 attendees who indicated they plan to use the information learned in the educational program (OSUE)

Not Reporting on this Outcome Measure

Outcome #8

1. Outcome Measures

Number of ServSafe® Level 2 attendees that answered "Agree" or "Strongly Agree" when presented with the statement, "I am comfortable talking with coworkers about increasing the safety of food in my establishment." (OSUE)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	339

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The manner in which people handle and prepare food is a major reason why food-borne illness occurs. The CDC estimates that approximately 1 in 6 Americans (or about 48 million people) get sick each year due to food-borne pathogens. Of those that become ill from food, about 128,000 are hospitalized, and 3,000 die each year.

What has been done

OSU Extension offers the ServSafe® program to help food service industry professionals learn more about how to protect food from contamination with pathogens, and teaches them best practice skills for food preparation and handling. The program is a nationally recognized food safety training and certification program, which was established by the National Restaurant Association. Nearly over 500 food service industry managers completed the ServSafe® Level 2 program in 2017 through OSU Extension educators. 537 post-session evaluation instruments were collected from 2017 participants.

Results

Post-session evaluation ? % experiencing positive change: have a good understanding of bacteria, viruses, parasites, fungi, and their impact on the development of food-borne illness (89.3%); comfortable talking with coworkers about increasing safety of food in establishment (72%); clearly understand ways that food can become cross-contaminated with non-food sources (78.5%);

When asked what new thing(s) were learned in the program: 'How easily you can run a quality operation if you follow the established guidelines'; 'A lot of the things we weren't doing on a regular basis so it was helpful to know.'

4. Associated Knowledge Areas

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

Outcome #9

1. Outcome Measures

number of 'Food Preservation' participants who indicated that they will follow current OSUE and USDA canning and freezing recommendations after attending an educational event (OSUE)

Not Reporting on this Outcome Measure

Outcome #10

1. Outcome Measures

number of participants who gained knowledge from Good Agricultural Practices educational events

Not Reporting on this Outcome Measure

Outcome #11

1. Outcome Measures

percentage of food preservation participants who plan to make behavior changes as a result of educational intervention (OSUE)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	75

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A renewed interest in home gardening and purchasing of local foods across Ohio has revived consumer interest in preserving food at home through canning, freezing, and drying. However, there are areas of potential concern related to food safety in preservation and storage processes. There are an estimated 76 million cases of foodborne illnesses causing more than 5,000 deaths annually in the United States (based on 2015 CDC statistics). The USDA and US Extension services have been the recognized authority on home canning recommendations and educational materials for many years.

What has been done

OSU Extension offers Food Preservation curriculum to Ohio citizens, with the aim of teaching participants how to preserve food safely through a variety of methods, following USDA recommended safe food handling procedures. Learning objectives include: rules for good personal hygiene; use sanitary practices for food preparation areas; select and use safe food preparation practices and equipment; recognize the factors that lead to foodborne illness; recognize the impact foodborne illness could have on a quantity food event; how to keep food safe during purchasing and transport; how to safely store leftover food; use a thermometer to check for proper cooking and holding temperatures; use safe thawing methods; and select and use safe food preparation practices / equipment. Classes covered some or all of the following preservation topics, depending on location and need: canning, freezing, drying, and pickling or fermenting.

Results

Using a post-session retrospective evaluation, the following percentages of people experienced positive changes in intended behaviors from before the program to after participating in the program ? will acidify tomatoes with lemon juice or citric acid (69.3%); use the correct headspace when filling jars (58.2%); use current OSU Extension and USDA canning and freezing recommendations (74.1%);. Evaluation data revealed that most individuals are getting the produce they can or freeze from their backyard garden or the farmer?s market, with other fairly common answers including the grocery store or CSAs. Common motivations for preserving foods included: saving money, controlling ingredients for health, and preserving excess garden harvest. Participants' most common preservation methods: freezing (34%), water bath canning (27%), pressure canning (14.6%), pickling (11.7%), drying (10.8%). Comments: 'Thank you. Not afraid to use the pressure canner now. Great time to have this and thank you for testing too.' and 'Almost 70 still learning.'

4. Associated Knowledge Areas

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

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
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)
- Other (National Security Threats)

Brief Explanation

Food Safety is impacted by all sectors of agbioscience: physical, chemical, biological, social, economic, and environmental. Climactic extremes impact food safety by fostering the growth and dispersion of pests and pathogens. Climactic extremes that are now occurring throughout the world impact the quantity and quality of food supplied as well as the timely distribution of food before contamination is an issue.

Economic shifts, such as the cost of processing equipment or production costs, public policy shifts, new regulations, and changes in demand will impact outcomes. Food trends, food advertising agendas, new biological and chemical threats, and public health-related issues are also external factors that affect outcomes. All of these place greater demands on the land-grant system. Factors such as the availability of base funding to ensure a core faculty and staff, availability of extramural funds, and programmatic demands that exceed resources may affect outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

OSU Extension addressed food safety-related educational needs in a variety of ways in 2017. Education was delivered to farmers, growers, producers, and food industry workers through Good Agricultural Practices (GAP) programming and ServSafe. In 2017, OSU Extension partnered with TAP Series to offer an online ServSafe course which meets all requirements and replaces the 15 hour (2 day) classroom study requirement. The total cost is only \$120 (for the online course and examination). This will allow more people to take the course who may not have been able to attend the in person due to time or distance constraints.

The general public received education through home preservation educational programming, which teaches safe canning and preserving methods for fruits and

vegetables. All programs documented educational gains through pre-post or retrospective assessments.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 5

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
501	New and Improved Food Processing Technologies	0%		25%	
503	Quality Maintenance in Storing and Marketing Food Products	35%		3%	
504	Home and Commercial Food Service	0%		2%	
701	Nutrient Composition of Food	0%		22%	
702	Requirements and Function of Nutrients and Other Food Components	0%		11%	
703	Nutrition Education and Behavior	25%		1%	
704	Nutrition and Hunger in the Population	40%		2%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	0%		8%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	0%		26%	
	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	5.0	0.0	4.0	0.0
Actual Paid	7.0	0.0	3.5	0.0
Actual Volunteer	1.5	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
321830	0	544629	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
321830	0	1619144	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

This planned program will advance broad global food security goals and will include both basic and applied research with associated outreach and Extension programs. Research will include microbial studies, packaging and shelf life, food taste tests, and analyses of consumer preferences and behavior. Laboratories, pilot plants, farms, and multiple business sites will be available throughout Ohio to permit data gathering and to continue long-term experiments. All functional laboratories and sites will be improved over time as program needs warrant. Extension will continue to have the capacity to advance knowledge acquisition, promote adoption strategies, and help build human capital to promote global food security and reduce hunger worldwide. CFAES faculty and staff will engage in appropriate levels of outreach, engagement, and consultation with both internal and external stakeholders.

2. Brief description of the target audience

Targeted audiences for global food security research and extension include, but are not limited to:

- Individuals or groups who have expressed a need for food-related information that resulted from new research, extracted from on-going research, or mined from scientific literature;
- Fellow academic units that partner with food scientists to create systems and processes needed to support research and the adoption of research findings by stakeholders;
- Federal, state or local agencies or support organizations who will not only use the information but will also be brokers for embedding the information into other groups to encourage change;
- Populations who have not requested the information but will likely benefit from that information, e.g. persons who engage in home canning of food;
 - Other scientists and scientific groups;
 - Political entities;
 - Other extension personnel;
 - Students from pre-school to post doctorate studies;
 - News organizations;
 - Business and industrial groups.

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	38315	0	200	0

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

Patent Applications Submitted

Year: 2017

Actual: 2

Patents listed

Formation of pyranoanthocyanins, a more stable natural colorant derived from fruit and vegetable pigments, with enhanced resistance to bleaching for food applications;
 Black Goji Anthocyanins for Natural Blue Colorant

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	115	115

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- total number of participants attending educational programs of one teaching hour or more on food security (Quality Assurance, Plant / Animal Healthy System Management, Local Foods, Farm to School, Marketing, etc) (OSUE)

Year	Actual
2017	38515

Output #2

Output Measure

- Total number of workshops offered to producers and agribusiness leaders on topics related to global food security and hunger (OSUE)

Year	Actual
2017	662

Output #3

Output Measure

- Total number of volunteers and participants in the planning and implementation of events related to global food security and hunger (OSUE)

Year	Actual
2017	1102

Output #4

Output Measure

- number of food animal producers that completed 'Livestock Mortality Composting' training (OSUE)
Not reporting on this Output for this Annual Report

Output #5

Output Measure

- number of participants in 'Local Foods' related events (OSUE)

Year	Actual
2017	40037

Output #6

Output Measure

- number of new garden sites (OSUE)
Not reporting on this Output for this Annual Report

Output #7

Output Measure

- number of youth participating in 'Assuring Quality Care for Animals' educational programming (OSUE)
Not reporting on this Output for this Annual Report

Output #8

Output Measure

- number of Local Foods-related educational events (OSUE)

Year	Actual
2017	4660

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Advance processing techniques, e.g. electrostatic coating, to achieve the desired traits requested by industrial partners, that are manifested in consumer demand studies, or that are novel technologies that may meet latent needs.
2	Processing technology research will improve and optimize equipment and processing of food in such manner as meet consumer demand as or before that demand emerges.
3	Advance and document improvements in quality and quantity of food stocks to meet global food security and hunger goals.
4	Participate in the creation of a standardized model and protocols for studying functional foods for the purpose of providing consumers with more informed functional choices that are currently available (OARDC).
5	Reduce through research and development the negative processing impacts on physio-chemical or molecular properties of food within varying parameters to make foods more acceptable and higher quality commensurate with demand. (OARDC)
6	number of individuals who received certification to conduct livestock mortality composting on their farm
7	number of youth participants who increased their knowledge of producing quality and safe animal products for consumers through responsible animal handling, care, and welfare (OSUE: Assuring Quality Care for Animals)
8	number of teens trained to be leaders in Local Foods awareness with their peers
9	number of individuals experiencing increased awareness of local foods issues
10	Increase knowledge of food security and nutrition in underserved populations (OARDC)

Outcome #1

1. Outcome Measures

Advance processing techniques, e.g. electrostatic coating, to achieve the desired traits requested by industrial partners, that are manifested in consumer demand studies, or that are novel technologies that may meet latent needs.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Processing technology research will improve and optimize equipment and processing of food in such manner as meet consumer demand as or before that demand emerges.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Advance and document improvements in quality and quantity of food stocks to meet global food security and hunger goals.

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Participate in the creation of a standardized model and protocols for studying functional foods for the purpose of providing consumers with more informed functional choices that are currently available (OARDC).

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Reduce through research and development the negative processing impacts on physio-chemical or molecular properties of food within varying parameters to make foods more acceptable and higher quality commensurate with demand. (OARDC)

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

number of individuals who received certification to conduct livestock mortality composting on their farm

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

number of youth participants who increased their knowledge of producing quality and safe animal products for consumers through responsible animal handling, care, and welfare (OSUE: Assuring Quality Care for Animals)

Not Reporting on this Outcome Measure

Outcome #8

1. Outcome Measures

number of teens trained to be leaders in Local Foods awareness with their peers

Not Reporting on this Outcome Measure

Outcome #9

1. Outcome Measures

number of individuals experiencing increased awareness of local foods issues

Not Reporting on this Outcome Measure

Outcome #10

1. Outcome Measures

Increase knowledge of food security and nutrition in underserved populations (OARDC)

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	162

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The importance of food in maintaining human health and well-being is clear, however the specific ways in which food systems contribute to individual and community health are not well understood. In order to improve health outcomes, such a complex issue requires improving food systems as well as changing mindsets and behaviors of individuals within the food system. There is a need to increase understanding of food and nutrition practices and systems, and to facilitate food-related institutional, community, family, and individual behavioral changes that can improve health and well-being.

What has been done

Various methods, including focus groups, surveys, and health indices were used to obtain nutritional, physical, and mental health data on homeless youth in rural Ohio. This information was compared to data on other vulnerable populations (i.e. children, elderly, low income, immigrant, minority). This information was used to assess and address nutrition, health, and wellness challenges facing these populations and determine the extent to which these affect food choice, dietary intake, diet quality, and health outcomes. Once this is completed, researchers will work with the local homeless youth population to develop and test interventions that enhance their nutritional health and subsequently their physical and mental wellbeing.

Results

During the past year, 162 homeless youth were recruited for this project. Study findings have been disseminated to state and local policy makers working with homeless populations as well as the research and academic communities through presentations at national and international research conferences. A manuscript of the study’s findings is currently under review for publication. One presentation titled “Food Availability and Diet Quality of a Vulnerable Population of Homeless Youth at a Drop-in Center” was given at the Food and Nutrition Expo conference in Chicago, Illinois. Six students were also able to present their work at international academic conferences. Continuing work will expand the scope of the study to include the food environment of homeless youth and the effect of substance use on food access and intake. Future goals include involving local public and private food assistance programs and local drop-in centers in developing strategies to improve the homeless youth food environment. These centers are critical to the success of interventions among homeless youth as they are the main system that provides services to them.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior

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
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)
- Other (World conflict and terrorism)

Brief Explanation

Research and extension programs are dramatically improving strategies for feeding the world. However, there are major limitations that affect outcomes including the cost of supply, distribution, and storage of food - both raw and processed. Climatic extremes may also impact growth and supply. Additionally, economic shifts such as the cost of processing equipment or production costs, public policy shifts, regulations, and shifts in demand are also affecting outcomes.

In developing countries, technologies, availability of basics such as seeds or livestock, soil and water for farming, labor, and a secure farming environment are limiting factors. While each of the limiting factors also presents an opportunity for research and extension programming, the availability of base funding to ensure a core faculty and staff, availability of extramural funds, and programmatic demands that exceed resources may affect outcomes.

V(I). Planned Program (Evaluation Studies)**Evaluation Results**

CFAES researchers are working on ways to reduce food waste to help feed a growing population. One program known as InFACT is pursuing holistic approaches to reduce food insecurity and ensure good food for all. InFACT projects involve at least 76 Ohio State faculty and students, and 23 community partners.

Currently, InFACT is leading a campus-wide effort to acquire 40 percent of all food purchases from local and sustainable sources within 10 years. Also a product of InFACT is the Food Waste Collaborative, which is a collection of researchers, practitioners, and students working together to promote the reduction and redirection of food waste as an integral part of a healthy and sustainable food system. In addition to conducting research, the Collaborative currently offers consultation on implementation and evaluation of projects focused on food waste reduction and redirection efforts at the consumer and household level within Ohio State University and across the state of Ohio. In 2017, the Food Waste Collaborative organized its second annual conference, focusing on food waste policy. At the national level, individuals from the OSU Food Waste Collaborative have provided their

expertise to the USDA as they try to improve data collection and reporting associated with food waste.

In combination with the Food Waste Collaborative, one student teamed up with her peers to formulate a plan for a composting project that would take place in North Campus residence halls at Ohio State University. This pilot project was able to divert 367 pounds of food from landfills, and projections indicated that if the project were to expand to all on-campus residence halls, 13 tons of food could be diverted from landfills over two semesters.

This is just a small sample of the ongoing CFAES research and extension work being done to combat food security and hunger.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Soil, Air and Water (OARDC Led)

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
101	Appraisal of Soil Resources	0%		26%	
102	Soil, Plant, Water, Nutrient Relationships	0%		60%	
111	Conservation and Efficient Use of Water	0%		6%	
133	Pollution Prevention and Mitigation	0%		8%	
	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	0.0	0.0	4.0	0.0
Actual Paid	0.0	0.0	3.7	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	558922	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	1233948	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

On-going CFAES research activities in this program area encompass a full range of basic and applied agbioscience. Both laboratory and multiple field sites/research stations are available throughout the state to permit data gathering and to continue long-term experiments, such as the Triplett-van Doren no-till plots established in 1962. On-farm research takes place, including current studies to evaluate the effect of field-scale management practices on phosphorus loss to surface runoff and tile drainage in the Western Lake Erie Basin. National and international studies are also conducted through programs such as the Carbon Management and Sequestration Center. All functional laboratories and sites controlled by CFAES will continue to be improved over time as program needs and resources warrant. CFAES faculty and staff engage in appropriate levels of outreach and consultation with both internal and external stakeholders.

2. Brief description of the target audience

The targeted audiences for this Planned Program include, but are not limited to:

- Individuals or groups who have expressed a need for certain information that resulted from new or on-going research, or is extracted from the scientific literature. Often these requests are communicated to CFAES by an intermediary such as a staffer at the Ohio Department of Agriculture or a county Extension agent;
- Federal, state or local agencies or support organizations that will not only use the information but will also be brokers of that information, including embedding it into groups to encourage change;
- Populations who have not requested the information but will likely benefit from access, e.g. immigrant populations;
- Other scientists and scientific groups;
- Political entities;
- Extension personnel;
- Students from pre-school to post doctorate studies;
- News organizations;
- Business groups such as chambers of commerce and community coalitions.

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	0	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	56	56

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of graduate students completed
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	Expand watershed and ecosystem level modeling to the extent that scientific data and watershed management protocols can bring all streams effected by agriculture and natural resource runoff into compliance with Ohio EPA standards.
2	Through the provisioning of watershed specific data, support the creation of and conservation action of community-based watershed networks in each major watershed in Ohio.
3	Advance the basic knowledge contribution so that Ohio continues to be viewed as a center of excellence in terms of soils and water sciences, and associated Extension programming.
4	Provide the necessary soil, air, weather/climate, and water research, in conjunction with actions in other planned programs KA (e.g. IPM), to permit continued adoption of conservation tillage practices in the face of problems such as climatic changes, pest, etc.
5	Provide the necessary research finding (scientific knowledge and techniques) to support stakeholder compliance with Ohio and federal EPA regulations, and future regulations, regarding odors and other air quality issues in ag production and processing.

Outcome #1

1. Outcome Measures

Expand watershed and ecosystem level modeling to the extent that scientific data and watershed management protocols can bring all streams effected by agriculture and natural resource runoff into compliance with Ohio EPA standards.

2. Associated Institution Types

- 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)

Sulfur is increasingly becoming a limiting nutrient in some parts of U.S. farmlands. Both alfalfa and corn require large amounts of sulfur in order to grow, meaning that farmers will often amend soils with sulfur fertilizer. However, farmers lack a reliable way to make informed decisions about sulfur fertilization for their crops. Existing diagnostic soil or plant testing methods vary in their effectiveness of predicting any potential sulfur deficiency that the crops might be facing during the growing season, and laboratory methods are generally cost prohibitive and time consuming. There is a need for an improved model to quickly assess sulfur availability across the varying agricultural landscapes in the US.

What has been done

CFAES researchers have developed a new model that can predict sulfur deficiency in US landscapes under current and future climate scenarios. This model uses soil characteristics, climate projection data, precipitation, and geographical data in order to create a location-specific model. Researchers are now in the process of collecting data from university and on-farm trials to validate the model using empirical data. This step is imperative to further refine and improve model predictions. The sulfur deficiency maps generated from the model will be used to develop a web tool to assist growers in determining sulfur availability in their fields. This web-based tool will be publicly available and will assist farmers in making informed decisions regarding sulfur fertilizer.

Results

Project development and goals have been shared with growers and other stakeholders at more than 4 extension and outreach meetings across the state, including include the Ohio Corn Board Meeting and the Ohio Soybean Council Board Meeting. In addition to these in-person outreach activities, newsletters were posted online (<https://agcrops.osu.edu/newsletter/corn->

newsletter/2016-33/2017-farm-fertilizer-trials-corn-soybean-and-wheat) communicating the request for participation in on-farm research trials. Currently, a prototype of the planned web application can be accessed here: <http://cura-gis-web.asc.ohio-state.edu/sam.htm>. Once the web-based tool is fully functioning, the tool can be used by growers, crop advisors, and extension personnel across the country for training, consulting, and educational purposes. This results of this project will significantly contribute to sustaining agricultural productivity, increasing farmer profitability, adapting to climate change and consequently ensuring domestic and global food security.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships

Outcome #2

1. Outcome Measures

Through the provisioning of watershed specific data, support the creation of and conservation action of community-based watershed networks in each major watershed in Ohio.

2. Associated Institution Types

- 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)

{No Data Entered}

What has been done

{No Data Entered}

Results

{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
133	Pollution Prevention and Mitigation

Outcome #3

1. Outcome Measures

Advance the basic knowledge contribution so that Ohio continues to be viewed as a center of excellence in terms of soils and water sciences, and associated Extension programming.

2. Associated Institution Types

- 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
102	Soil, Plant, Water, Nutrient Relationships
133	Pollution Prevention and Mitigation

Outcome #4

1. Outcome Measures

Provide the necessary soil, air, weather/climate, and water research, in conjunction with actions in other planned programs KA (e.g. IPM), to permit continued adoption of conservation tillage practices in the face of problems such as climatic changes, pest, etc.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Provide the necessary research finding (scientific knowledge and techniques) to support stakeholder compliance with Ohio and federal EPA regulations, and future regulations, regarding odors and other air quality issues in ag production and processing.

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
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)
- Other (extramural funding)

Brief Explanation

Climatic extremes, coupled with the introduction of pests and diseases that are often climate related, can impact outcomes. As the soil-dependent food, fiber, and environmental economies adjust to the global marketplace, outcomes are impacted in conjunction with public policy shifts, new regulations, and shifts in demand. The availability of productive soils is a limiting factor worldwide. In addition, the availability of base funding to ensure a core faculty and staff, availability of extramural funds, and programmatic demands that exceed available personnel and resources can affect outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Programs such as Field to Faucet, Fertilizer Applicator trainings, and the countless research projects studying a variety of water-related issues show just how devoted CFAES is to improving soil, air, and water. In September 2017, OSUE hosted the second "State of

Science: Understanding Algal Blooms Conference" in Toledo, OH. Over 300 scientists and agency officials attended the conference to discuss solutions to Harmful Algal Blooms in Lake Erie. Graduate students from around the state presented research posters and Paula Hicks-Hudson, the Mayor of Toledo, spoke about the importance of scientists and resource managers in preventing a future water crisis like the one in Toledo in 2014. The event was co-hosted by Ohio Sea Grant and the USDA-ARS in Columbus with speakers from OSU's colleges of Engineering, Public Health and FAES; Bowling Green State University; The National Weather Service; the Ohio Environmental Protection Agency; and Blanchard River Farms Demonstration Network.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Natural Resources and Environmental Systems (OARDC Led)

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
134	Outdoor Recreation	0%		30%	
136	Conservation of Biological Diversity	0%		70%	
	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	0.0	0.0	1.5	0.0
Actual Paid	0.0	0.0	0.7	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	70422	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	113169	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The natural resources and environmental systems program includes both basic and applied research. Both laboratories and multiple field sites are available throughout the state to permit data gathering and to

continue long-term experiments, such as human-wildlife interaction studies. Extensive, in-state research takes place, as do national and international studies, such as those conducted through the CFAES Terrestrial Wildlife Ecology Program. Close working relationships with organizations such as the Ohio Department of Natural Resources and the USDA will continue to greatly enhance program capacity and impacts. For example, cooperative studies have identified small numbers of native ash trees that are resistant to the invasive emerald ash borer, and these trees are now being evaluated as a source of native germplasm for use in breeding programs. All functional laboratories and sites are improved over time as program needs and available resources warrant. CFAES faculty and staff engage in appropriate levels of outreach and consultation with both internal and external stakeholders.

2. Brief description of the target audience

CFAES targeted audiences include, but are not limited to:

- Individuals or groups who have expressed a need for natural resources and environmental research knowledge that resulted from new or on-going research, or is extracted from the scientific literature. Often these requests are communicated to CFAES by an intermediary such as a staffer at USDA, the Ohio Department of Natural Resources, or a county Extension agent;
- Federal, state or local agencies or support organizations who will not only use the information but will also be brokers of that information, including embedding it into groups to encourage change, e.g. fish and wildlife clubs;
- Populations who have not requested the information but will likely benefit from access; e.g. people who fish for recreation;
- Other scientists and scientific groups;
- Political entities;
- Extension personnel;
- Students from pre-school to post doctorate studies;
- News organizations;
- Business groups such as Ohio Farm Bureau;
- Community groups such as watershed coalitions.

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	0	0	0	0

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

Year: 2017
 Actual: 1

Patents listed

Herbicide Resistant Taraxacum Kok-Saghyz and Taraxacum Brevicorniculatum

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	87	87

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of graduate students completed

Year	Actual
2017	33

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increase the scientific understanding necessary to maintain flow of environmental goods and services through conservation actions commensurate with regional demand, i.e. Buffer zones in forest riparian zones, reforestation, CREP, carbon sequestration in forests and grassland biomass, outdoor recreation opportunities, urban forest zones.
2	Advance research knowledge, both basic and applied, in the areas of silviculture and horticulture to existing and emerging industry and consumer demand regarding forest genetics, forest biology, seed production, nutrition, and related topics.
3	Meet ODNR, USDA, USDI, local, commodity groups, community, and other stakeholder demands for scientific knowledge to inform existing and emerging issues/practices in aquatic and terrestrial wildlife including human wildlife use/conflicts, and human to human conflicts related to wildlife and use.
4	To contribute to the theoretical knowledge base within this planned program to ensure that where possible all applied research can be grounded in the best science and evaluation available in all knowledge areas selected.
5	Improve the biodiversity and utilization of land use in rural and urban environments.

Outcome #1

1. Outcome Measures

Increase the scientific understanding necessary to maintain flow of environmental goods and services through conservation actions commensurate with regional demand, i.e. Buffer zones in forest riparian zones, reforestation, CREP, carbon sequestration in forests and grassland biomass, outdoor recreation opportunities, urban forest zones.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Advance research knowledge, both basic and applied, in the areas of silviculture and horticulture to existing and emerging industry and consumer demand regarding forest genetics, forest biology, seed production, nutrition, and related topics.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Meet ODNR, USDA, USDI, local, commodity groups, community, and other stakeholder demands for scientific knowledge to inform existing and emerging issues/practices in aquatic and terrestrial wildlife including human wildlife use/conflicts, and human to human conflicts related to wildlife and use.

2. Associated Institution Types

- 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)

Natural resource management agencies are experiencing changes that affect their ability to effectively manage and conserve public resources. For example, increases in the human population with associated rural development and urbanization can result in dramatically altered

landscapes. On top of this, ongoing changes in recreational preferences may affect state, federal, and/ or private funding. These factors combined with increased need for conservation makes it increasingly difficult to manage natural resources. In order to make informed decisions and use resources most efficiently, these agencies need to understand the preferences of the populations that they are serving.

What has been done

Using cross-sectional surveys, interviews, and focus groups, CFAES researchers are developing a model to predict participation in various recreational activities and better understand the factors affecting conservation attitudes and behaviors. This information will be provided to conservation and community leaders so they can make educated decisions based on citizen's conservation and recreation preferences, as well as understand what factors may affect these attitudes and beliefs.

Results

Some preliminary results from this project suggest that attitudes toward large, mammalian carnivores and historically stigmatized species, such as coyotes, have improved significantly over the last four decades. Additionally, Ohioans belief in the intrinsic value of wildlife helps explain their judgments concerning lethal control of wildlife populations. Such information may help wildlife officials create management plans that are sensitive to ecological needs as well as citizen's beliefs. In addition to presentations and publications stemming from this project, one team member assisted a University of Michigan faculty member in the development of testimony concerning the endangered status of wolves in the U.S., which was presented on July 10, 2017 to the U.S. Senate Committee on Environment and Public Works. Final results will provide direct benefits to natural resource management agencies and the general public by allowing agencies to better understand the thought process of constituent groups and incorporate this information into decision-making processes related to best management practices for public recreational sites. This knowledge will also assist in the development of educational and outreach materials to address gaps in public knowledge, allowing agencies to more effectively communicate with the public.

4. Associated Knowledge Areas

KA Code	Knowledge Area
134	Outdoor Recreation
136	Conservation of Biological Diversity

Outcome #4

1. Outcome Measures

To contribute to the theoretical knowledge base within this planned program to ensure that where possible all applied research can be grounded in the best science and evaluation available in all knowledge areas selected.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Improve the biodiversity and utilization of land use in rural and urban environments.

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
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)
- Other (Public opinion)

Brief Explanation

Changes in public policies, new regulations and laws, and shifts in demand continue to impact outcomes. Climatic variations, coupled with pests and diseases that are often climate related, are also impacting outcomes. Exotic invasive species, such as the Emerald Ash Borer, represent significant external factors, especially in terms of forest ecosystem management. Factors such as the availability of state and federal base funding to ensure a core faculty and staff, availability of extramural funds, and programmatic demands that are exceeding resources can affect outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

For 2017, CFAES has conducted no formal studies regarding evaluation of our research program. Surrogate evaluation metrics that are considered indicators of research success are:

- Research contracts and awards received/ongoing/completed (over \$180 million in active projects during 2017);
- Number of referred publications reported elsewhere in this report;
- Number of businesses, industries and groups engaged in CFAES' research programs;
- Number of patents received;
- Economic impact of the college's research program as reported elsewhere in this report;
- The level of base funding from USDA-NIFA and the State of Ohio in 2017;
- Impacts submitted in this report, and the continued robustness of CFAES' research program throughout 2017, both in terms of breadth of programs and depth of new

knowledge generated and applied.

The research reported herein is also supported by an informal yet effective formative evaluation. Very little research is conducted at CFAES without early engagement of businesses, industries, commodity groups, special interest groups, or other interested parties. These are the individuals who have the need for and will be the adopters of our research output/impacts. Even in the case of very theoretical research, fellow researchers in industry, government, and academic institutions are consulted (formative evaluation/needs assessment) in the formulation of studies.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 8

1. Name of the Planned Program

Plants Systems (OARDC Led)

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
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		22%	
202	Plant Genetic Resources	0%		10%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		7%	
204	Plant Product Quality and Utility (Preharvest)	0%		3%	
205	Plant Management Systems	0%		15%	
206	Basic Plant Biology	0%		2%	
211	Insects, Mites, and Other Arthropods Affecting Plants	0%		2%	
212	Pathogens and Nematodes Affecting Plants	0%		18%	
213	Weeds Affecting Plants	0%		4%	
216	Integrated Pest Management Systems	0%		15%	
512	Quality Maintenance in Storing and Marketing Non-Food Products	0%		2%	
	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	0.0	0.0	22.5	0.0
Actual Paid	0.0	0.0	21.9	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	2849057	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	8349863	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The goals of our on-going research activities to advance plant systems include both basic and applied research. Both laboratory and multiple field sites/research stations are available throughout Ohio to permit data gathering and to continue long-term experiments, such as commodity yield trials and public breeding programs. Computational science and information technology are being used in a complementary fashion to improve our ability to analyze and utilize giant sets of molecular and genomic data. Bioemergent materials research is focused on the discovery, manipulation, and utilization of unique crops as alternatives to synthetic materials. On-farm research takes place, as do national and international studies. All functional laboratories and field sites are improved over time as program needs and available resources warrant. CFAES faculty and staff engage in appropriate levels of outreach and consultation, with both internal and external stakeholders.

2. Brief description of the target audience

The targeted audiences include, but are not limited to:

- Individuals or groups who have expressed a need for plant systems information that resulted from new or on-going research, or is extracted from the scientific literature. Often, these requests are communicated to CFAES by an intermediary such as a staffer at a USDA office, the Ohio Department of Agriculture, or a county Extension agent;
 - Federal, state or local agencies or support organizations who will not only use the information but will also be brokers of that information, including embedding it into groups to encourage change;
 - Populations who have not requested the information but will likely benefit from access, e.g. home gardeners;
 - Other scientists and scientific groups;
 - Political entities;
 - Extension personnel;
 - Students from pre-school to post doctorate studies;
 - News organizations.

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	0	0	0	0

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

Patent Applications Submitted

Year: 2017
 Actual: 3

Patents listed

Novel Small Molecule Antimicrobials;
 Use of sesquiterpenes and their analogs as green insecticides for controlling disease vectors and plant pests;
 Low Inoculum, Long Co-Culture Agrobacterium-Mediated Transformation of Plants

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	76	76

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of graduate students completed

Year	Actual
2017	30

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Meet or exceed the demand of fellow scientists and stakeholders within the next ten years for materials relating to plant genetics and plant breeding technologies, including identification of molecular markers for elite germplasms.
2	Enrich the gene pool and knowledge thereof in disease/pest resistance, and gene recombination and interaction studies
3	Enrich the gene pool and knowledge thereof in the areas of molecular studies to better understand how immune systems in plants inhibit diseases and how bacteria perturb the immune system.
4	Develop cultivars and crop management strategies that limit the potential negative impacts of weather variations on crop yields.
5	Increase knowledge of crop/ pest interactions to inform best practices

Outcome #1

1. Outcome Measures

Meet or exceed the demand of fellow scientists and stakeholders within the next ten years for materials relating to plant genetics and plant breeding technologies, including identification of molecular markers for elite germplasms.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Enrich the gene pool and knowledge thereof in disease/pest resistance, and gene recombination and interaction studies

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Enrich the gene pool and knowledge thereof in the areas of molecular studies to better understand how immune systems in plants inhibit diseases and how bacteria perturb the immune system.

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Develop cultivars and crop management strategies that limit the potential negative impacts of weather variations on crop yields.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Increase knowledge of crop/ pest interactions to inform best practices

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Fresh fruits and vegetables are intensively-managed to maximize crop productivity and minimize pest damage. Practices such as tilling, mowing, spraying chemicals, and planting a small variety of crops all take a toll on the quality of the environment and its ability to function over the long term. Many times efforts to manage pests impose unintended harm to the environment or beneficial insects. In addition, heavy reliance on pesticides is not sustainable if pests become resistant or if the chemicals pose greater long-term risk to the environment. Therefore, there's a continued need to evaluate the impacts of pest management strategies on the long-term health of agricultural systems so that we can understand potential consequences for insect services such as pest and disease reduction, and pollination of crops.

What has been done

CFAES researchers are improving pest management strategies by evaluating how current management methods impact insect communities and the natural services they provide, specifically in grape and vegetable crop systems. Using a variety of insect trapping and sampling techniques, researchers are monitoring the numbers of pests and beneficial insects throughout the season, how much damage these pests cause, and evaluating how certain strategies impact insect populations, crop production, and environmental integrity. Additionally, researchers are studying insect behaviors as they relate to different crops and their associated microbes to contribute to new or alternative pest management strategies.

Results

So far, several pest trapping/monitoring strategies have been successful. In specialty vegetable systems for example, passive wooden traps baited with carrots were successful in monitoring the activity of the carrot weevil. By placing these traps out before the crops germinated from the soil, hundreds of adult carrot weevils were removed. Attract-and-kill traps were successful in monitoring populations of pepper weevils, which feed on peppers and sometimes eggplant. In vineyard systems, two invasive insect pests were also successfully monitored using baited traps: the brown marmorated stink bug and spotted wing drosophila.

These efforts are part of an ongoing statewide monitoring network developed and led by OSU Extension and OSU Entomology. Monitoring of the first appearance of insect pests in high-value commodities and year-to-year changes in population greatly inform and influence management decisions. Ultimately, understanding the impacts of pest management strategies will help producers, local officials, and other stakeholders make informed decisions about productive and sustainable pest management.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

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
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Pests, pathogens, weeds, and climate change, among other factors, can impact outcomes within plant systems. As the food, fiber, and environmental related economies adjust to the global marketplace in conjunction with public policy changes, new regulations, and shifts in demand, outcomes will be impacted. Production agriculture is highly sensitive to these shifts. Research that is conducted well before its outcomes are needed may be critical to reduce future crop failures. Formative evaluations to identify opportunities and problems can yield returns throughout the life of a program. Factors such as the availability of base funding to ensure a core faculty and staff, the availability of extramural funds, and programmatic demands exceeding resources can affect outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

CFAES has conducted no formal studies regarding evaluation of our research program in 2017. Surrogate evaluation metrics that are considered indicators of research success are:

- Research contracts and awards received/ongoing/completed (\$180 million plus in active projects during 2017);
- Number of referred publications reported elsewhere in this report;
- Number of businesses, industries and groups engaged in CFAES' research programs;
- Number of patents received;
- Economic impact of the college's research program as reported elsewhere in this report;
- The level of base funding from USDA-NIFA and the State of Ohio in 2017;
- Impacts submitted in this report, and the continued robustness of CFAES' research program throughout 2017, both in terms of breadth of programs and depth of new knowledge generated and applied.

The research reported herein is also supported by an informal yet effective formative evaluation. Very little research is conducted at CFAES without early engagement of businesses, industries, commodity groups, special interest groups, or other interested

parties. These are the individuals who have the need for and will be the adopters of our research output/impacts. Even in the case of very theoretical research, fellow researchers in industry, government, and academic institutions are consulted (formative evaluation/needs assessment) in the formulation of studies.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 9

1. Name of the Planned Program

Food, Agricultural, and Biological Engineering Systems (OARDC Led)

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
402	Engineering Systems and Equipment	0%		48%	
403	Waste Disposal, Recycling, and Reuse	0%		27%	
404	Instrumentation and Control Systems	0%		11%	
405	Drainage and Irrigation Systems and Facilities	0%		11%	
723	Hazards to Human Health and Safety	0%		3%	
	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	0.0	0.0	1.5	0.0
Actual Paid	0.0	0.0	1.4	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	178482	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	469529	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Engineering research activities to advance CFAES goals includes both basic and applied research. For example, CFAES scientists are working with farmers, industry groups, and government agencies to improve access to field data gathered from new-generation farm machinery and remote-sensing tools to better support real-time management decisions by producers. Laboratories, construction sites, farms, and multiple field sites/research stations are also available throughout Ohio to permit data gathering and to continue long-term activities. All functional laboratories and field sites are improved over time, as program needs warrant. CFAES faculty and staff engage in appropriate levels of outreach and consultation with both internal and external stakeholders.

2. Brief description of the target audience

The targeted audiences include, but are not limited to:

- Individuals or groups who have expressed a need for engineering information that resulted from new and on-going research, or is extracted from the scientific literature. Often these requests are communicated to CFAES by an intermediary such as a staffer at a USDA office, the Ohio Department of Agriculture, Soil and Water Conservation Districts, or a county Extension agent;
- Fellow academic units that rely on engineers to create systems and processes needed to support their research and the adoption of research findings by stakeholders;
- Federal, state or local agencies or support groups who not only use information but broker that information by embedding it into clientele groups supportive of change;
- Populations who have not requested the information but will likely benefit from access, e.g. recreational animal owners;
- Other scientists and scientific groups;
- Political entities;
- Extension personnel;
- Students from pre-school to post doctorate studies;
- News organizations;
- Business groups such as small town administrators, county commissioners, or commodity groups.

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	0	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	48	48

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of graduate students completed

Year	Actual
2017	18

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Provide appropriate facilities design and engineering processes commensurate with stakeholders demand, including fellow research units demands, to the extent that they have all the information necessary for making adoption decisions
2	Develop enhanced systems to support integrated plant growth systems that will annually result in increased productivity at reduced costs for the industry
3	Improve mechanical devices and instrumentation needed by stakeholders
4	Advance development of state of the art integrated waste management systems to the extent that OARDC and Ohio are viewed as one of the top ten programs/states in this area nationally
5	Advance the knowledge of ecological based engineered systems for waste management to the extent that, where cost effective and appropriate, they will be adopted over mechanical systems
6	Develop improved systems to aid in meeting new or yet to emerge or novel needs

Outcome #1

1. Outcome Measures

Provide appropriate facilities design and engineering processes commensurate with stakeholders demand, including fellow research units demands, to the extent that they have all the information necessary for making adoption decisions

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Develop enhanced systems to support integrated plant growth systems that will annually result in increased productivity at reduced costs for the industry

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Improve mechanical devices and instrumentation needed by stakeholders

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Advance development of state of the art integrated waste management systems to the extent that OARDC and Ohio are viewed as one of the top ten programs/states in this area nationally

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In 1972, the Federal Water Pollution Control Act established a goal of eliminating the discharge of water pollutants, leading industries, cities, states and the federal government to invest heavily in waste water treatment to make this goal a reality. Food processing plants face unique challenges in treating wastewater. For example, meat processing plant wastewater is five times stronger than domestic wastewater, sometimes with a high salt content as well. Food processors are then required to use expensive pre-treatment processes and pay a surcharge to the city treatment facility, so they can recover the cost of treating wastewater containing a high amount of organic matter. Novel technologies are needed that can meet wastewater requirements and are cost effective for owners of food processing facilities.

What has been done

CFAES researchers have developed two onsite wastewater treatment systems. The first, a sand bioreactor, is effective at processing the high-strength and high-fat content wastewater discharged from a meat processing plant. The sand creates a place for proliferation of microbes that consume the wastewater pollutants, while providing pathways for the air and wastewater to flow through the bioreactor. Another system uses hydroponic floating beds to provide a simple and reliable way to lower wastewater ammonium, nitrate, and phosphate. In addition, plants could be harvested from these systems and used as forage or compost material for a potential economic return.

Results

Sand bioreactors were able to treat high strength, high salinity wastewater (up to 0.6%). One meat processing plant in Ohio has constructed its own sand bioreactor wastewater treatment system on-site, using locally available materials and labor. With the addition of an ion-exchange system to remove ammonium in cold weather, the sand bioreactor can meet all regulation requirements and has reduced water treatment costs to roughly \$3.90 per 1,000 gal (versus the \$10.19/ 1,000 gal charged by the city wastewater treatment plant). The cooperation between industry, the university and Ohio regulatory agencies has protected a high-quality, recreational river while saving money and jobs.

Additionally, one workshop and three field days were conducted in 2017 for installer, designers and regulators in the onsite wastewater treatment community. These results are part of a larger project determining best treatments for various types of wastewater from residential and industrial systems.

4. Associated Knowledge Areas

KA Code	Knowledge Area
403	Waste Disposal, Recycling, and Reuse

Outcome #5

1. Outcome Measures

Advance the knowledge of ecological based engineered systems for waste management to the extent that, where cost effective and appropriate, they will be adopted over mechanical systems

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Develop improved systems to aid in meeting new or yet to emerge or novel needs

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
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Economic shifts such as changes in interest rates to borrow money for facilities, public policy shifts, new regulations, shifts in demand, and issues such as climate change are impacting outcomes. Human values and conflicts, e.g. urban-rural interface issues and environmental sensitivities to agricultural processes and facilities, are also external factors that affect outcomes. Climate change may dictate new and different types of structures, equipment, and processes. Factors such as the availability of base funding to ensure a core research and extension faculty and staff, availability of extramural funds, and programmatic demands that often exceed resources can affect outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

CFAES has conducted no formal studies regarding evaluation of our research program in 2017. Surrogate evaluation metrics that are considered indicators of research success are:

- Research contracts and awards received/ongoing/completed (\$180 million plus in active projects during 2017);
- Number of referred publications reported elsewhere in this report;
- Number of businesses, industries and groups engaged in CFAES' research programs;
- Number of patents received;
- Economic impact of the college's research program as reported elsewhere in this report;
- The level of base funding from USDA-NIFA and the State of Ohio in 2017;
- Impacts submitted in this report, and the continued robustness of CFAES' research program throughout 2017, both in terms of breadth of programs and depth of new knowledge generated and applied.

The research reported herein is also supported by an informal yet effective formative evaluation. Very little research is conducted a CFAES without early engagement of businesses, industries, commodity groups, special interest groups, or other interested parties. These are the individuals who have the need for and will be the adopters of our research output/impacts. Even in the case of very theoretical research, fellow researchers in industry, government, and academic institutions are consulted (formative evaluation/needs assessment) in the formulation of studies.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 10

1. Name of the Planned Program

Animals Systems (OARDC Led)

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
302	Nutrient Utilization in Animals	0%		16%	
303	Genetic Improvement of Animals	0%		1%	
304	Animal Genome	0%		1%	
305	Animal Physiological Processes	0%		25%	
307	Animal Management Systems	0%		5%	
308	Improved Animal Products (Before Harvest)	0%		1%	
311	Animal Diseases	0%		45%	
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals	0%		5%	
315	Animal Welfare/Well-Being and Protection	0%		1%	
	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	0.0	0.0	9.5	0.0
Actual Paid	0.0	0.0	8.4	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	1161212	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	2774070	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

CFAES researchers seek to advance global food security by integrating animal agriculture into food production systems. Both basic and applied agbioscience research is conducted throughout Ohio to permit data gathering and to continue long-term experiments, such as fish genetic improvement research in the aquaculture facilities at South Centers in Piketon, OH. Ohio on-farm research is conducted as part of this program as are national and international studies. Effective research requires a mixture of laboratory, animal enclosure, and on-farm research to maximize knowledge. Emerging disease threats now require more advanced facilities, such as the CFAES bio-security lab, which is particularly useful for studies of infectious animal diseases, such as the recent outbreak of avian flu that has seriously impacted the nation's poultry industry. Our biosecurity lab has been fully functional throughout this planning period. All functional laboratories and sites are improved over time, as program needs and available resources warrant. CFAES faculty and staff engage in appropriate levels of outreach and consultation with both internal and external stakeholders.

2. Brief description of the target audience

The targeted audiences include, but are not limited to:

- Individuals or groups who have expressed a need for food animal systems information that resulted from new and on-going research, or extracted from the scientific literature. Often, these requests are communicated to CFAES by an intermediary such as a staffer at a USDA office, the Ohio Department of Agriculture, or a county Extension agent;
 - Federal, state or local agencies or support organizations who will not only use the information but will also be brokers of that information, including embedding it into groups to encourage change;
 - Populations who have not requested the information but will likely benefit from access, e.g. small or recreational farmers;
 - Other scientists and scientific groups;
 - Political entities;
 - Extension personnel;
 - Students from pre-school to post doctorate studies;
 - News organizations;
 - Business groups such as the Ohio Farm Bureau or commodity groups.

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	0	0	0	0

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

Patent Applications Submitted

Year: 2017
 Actual: 5

Patents listed

Compositions and methods related to viral vaccines;
 Methods and compositions related to an infectious clone of porcine epidemic diarrhea virus (PEDV);
 Novel Antimicrobials to Control Campylobacter;
 Paramyxovirus Immunogens and Related Materials and Methods;
 Compositions and Methods for Preventing Porcine Reproduction and Respiratory Syndrome

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	28	28

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of graduate students completed

Year	Actual
2017	20

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Improve reproduction efficiency and enhanced application of new technologies over the next five years to fully meet the competitive demands faced by OARDC's stakeholders in areas such as early maturation, estrus, fertility, and ovulation
2	Increase dietary research and nutrition utilization for the purpose of increased growth and quality of products commensurate with consumer demand.
3	Meet the demand of fellow scientists and stakeholders within ten years for materials relating to genetics and breeding, including id of molecular markers for improved animal health and reproductively, and increased quality and quantity of products
4	Improve management for multiple animal farm types, including organics, that will produce higher yields for and lower costs to the producer and consumer
5	Animal disease researchers will provide the necessary research to inform producers in a timely manner how to protect against known and present diseases, e.g. bovine mastitis
6	Animal disease researchers will advance the research frontiers in emerging disease investigations to the extent that OARDC continues to serve as a center for excellence.

Outcome #1

1. Outcome Measures

Improve reproduction efficiency and enhanced application of new technologies over the next five years to fully meet the competitive demands faced by OARDC's stakeholders in areas such as early maturation, estrus, fertility, and ovulation

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Increase dietary research and nutrition utilization for the purpose of increased growth and quality of products commensurate with consumer demand.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

U.S. dairy farmers are struggling as milk prices have continued to decline. Since one of the largest costs in milk production is animal feed, it is critically important that feed costs are minimized in order to maintain farm profitability. Combined with the fact that on average, 35% of the energy consumed by a cow is excreted as waste, there is an opportunity to reduce costs by improving feed efficiency. Improving digestibility of feeds can reduce the amount of waste produced and decrease total costs, while nutrition supplementation may reduce some common infections, improving cow health. Research is needed to determine the most effective diet formulations to maximize profitability and animal health.

What has been done

First, researchers improved the accuracy of methods that estimate the energy value of feed. In order to optimize feeding efficiency, various diet formulations, including those with distillers grains (a byproduct of ethanol production that can be used as cheaper feed), were fed to cows as milk production and energy efficiency were measured. Researchers also studied how nutrition supplements can reduce certain diseases that are common in dairy cows. For example, approximately 50% of all dairy cows suffer from low concentration of blood calcium after calving,

which can lead to disorders such as mastitis (inflammation of mammary glands). However, supplementing feed with vitamin D may increase calcium absorption, therefore reducing the incidence of mastitis.

Results

Feeding cows high protein diets for a short time after calving had positive effects on milk production that lasted several months. Not only can this reduce overall feed costs since the increased production continues after diet supplementation stops, but it also decreases the amount of nitrogen in cow waste, as high protein is only fed for a short period. Researchers also determined that supplemental potassium carbonate can partially alleviate negative effects from a distillers grains diet. Typically, diets high in distillers grains cause reduced protein and fat content in milk. Fat and protein content are two important factors determining the value of milk, therefore, this potassium supplementation can reduce the potential for decreased milk value, while taking advantage of a less expensive feed substitute such as distillers grains.

There were no significant effects on immune function observed using various vitamin D supplements. However, one vitamin D metabolite was shown to increase blood calcium concentration in some cows, which may become a useful tool to improve cow health. Improving feed efficiency is critical, as it can improve animal health and lower environmental concerns, all while increasing producers' profits.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals

Outcome #3

1. Outcome Measures

Meet the demand of fellow scientists and stakeholders within ten years for materials relating to genetics and breeding, including id of molecular markers for improved animal health and reproductively, and increased quality and quantity of products

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Improve management for multiple animal farm types, including organics, that will produce higher yields for and lower costs to the producer and consumer

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Animal disease researchers will provide the necessary research to inform producers in a timely manner how to protect against known and present diseases, e.g. bovine mastitis

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Animal disease researchers will advance the research frontiers in emerging disease investigations to the extent that OARDC continues to serve as a center for excellence.

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
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Animal diseases coupled with abnormal weather patterns often impact outcomes. Public policy shifts, new regulations, and shifts in demand for animal products continue to impact outcomes. Human values and environmental sensitivities of the population to animal production and processing are also external factors that influence results. Formative evaluations relating to animal care norms and protocols can be effective in informing the process; however, uncertainty is a constant factor in the animal industry. Factors such as the availability of base funding to ensure a core research faculty and staff, availability of extramural research funds, and programmatic demands that exceed resources can affect outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

CFAES has conducted no formal studies regarding evaluation of our research program in 2017. Surrogate evaluation metrics that are considered indicators of research success are:

- Research contracts and awards received/ongoing/completed (\$180 million plus in active projects during 2017);

- Number of referred publications reported elsewhere in this report;
- Number of businesses, industries and groups engaged in CFAES' research programs;
- Number of patents received;
- Economic impact of the college's research program as reported elsewhere in this report;
- The level of base funding from USDA-NIFA and the State of Ohio in 2017;
- Impacts submitted in this report, and the continued robustness of CFAES' research program throughout 2017, both in terms of breadth of programs and depth of new knowledge generated and applied.

The research reported herein is also supported by an informal yet effective formative evaluation. Very little research is conducted at CFAES without early engagement of businesses, industries, commodity groups, special interest groups, or other interested parties. These are the individuals who have the need for and will be the adopters of our research output/impacts. Even in the case of very theoretical research, fellow researchers in industry, government, and academic institutions are consulted (formative evaluation/needs assessment) in the formulation of studies.

Key Items of Evaluation

V(A). Planned Program (Summary)**Program # 11****1. Name of the Planned Program**

Economics and Social Dimensions (OARDC Led)

 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
601	Economics of Agricultural Production and Farm Management	0%		13%	
602	Business Management, Finance, and Taxation	0%		4%	
603	Market Economics	0%		13%	
604	Marketing and Distribution Practices	0%		2%	
605	Natural Resource and Environmental Economics	0%		16%	
606	International Trade and Development	0%		19%	
607	Consumer Economics	0%		3%	
608	Community Resource Planning and Development	0%		4%	
609	Economic Theory and Methods	0%		15%	
610	Domestic Policy Analysis	0%		9%	
611	Foreign Policy and Programs	0%		2%	
	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	0.0	0.0	7.0	0.0
Actual Paid	0.0	0.0	3.2	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	425785	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	1088193	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

To fulfill the goals of the Economics and Social Dimensions Program, CFAES supports both basic and applied research initiatives. Extensive in-state research occurs, as well as national and international cooperative studies. For example, the Agro-ecosystems Management Program is working with colleagues in many other states to harness the power of social media to help agricultural entrepreneurs map assets, find potential supply chain connections, and launch cooperative networks of businesses supplying food, energy, and bio-based products. Close working relationships with multiple industries and organizations will continue to provide real-world settings and data, greatly enhancing the program's capacity and its impacts. CFAES faculty and staff supporting this program engage in appropriate levels of outreach and consultation with both internal and external stakeholders.

2. Brief description of the target audience

The targeted audiences include, but are not limited to:

- Individuals or groups who have expressed a need for social, educational, and economic findings related to some aspect of human capital that resulted from new or on-going research, or is extracted from the scientific literature;
- Fellow academic units that depend on scientists in this program for support information and for the approaches/measures they generate;
- Federal, state or local agencies or support organizations who will not only use the economic information but will also extend that information;
- Populations who have not requested the information but will likely benefit from access;
- Other scientists and scientific groups;
- Political entities;
- Extension personnel;
- Students from junior high school to post doctorate studies;
- News organizations;
- Business and industry groups.

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	0	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	75	75

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of graduate students completed

Year	Actual
2017	47

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Business management knowledge, including policy analysis, in targeted areas, e.g. risk management, weather insurance, impacts of land use shifts, grant management that are necessary for and result in increased profitability for stakeholders.
2	Market economies and efficiencies studies relating to factors such as pricing, finance, supply and demand, exchange rates, trade policies, etc. ensuring that stakeholders are informed and their identified needs.
3	Advance basic and theoretical knowledge in sociological, educational, and human capital dimensions related to food, agriculture and environment topics
4	Advance human capital and sociological studies that will inform strategies for expanding and strengthening individual and family well-being, community stability, and agricultural workforce leading to improved quality and quantity of life.
5	Study rural education systems relative to educational resources, curriculum, instructional delivery, and student learning to the extent necessary to inform decision-makers how to improve rural education systems as requested.
6	New knowledge of production variations in markets, including vertical markets, that help producers, processors, and distributors have requisite information for enhanced decision making leading to decreased costs of inputs and an increase in profits/outputs.

Outcome #1

1. Outcome Measures

Business management knowledge, including policy analysis, in targeted areas, e.g. risk management, weather insurance, impacts of land use shifts, grant management that are necessary for and result in increased profitability for stakeholders.

2. Associated Institution Types

- 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)

Financial constraints and risk often loom large for smallholder farmers in developing countries due to poverty, high exposure to adverse weather events, and a lack of functioning institutions.

Therefore, developing sustainable financial products that can help mitigate these constraints can have important consequences for the welfare of farmers. In particular, microfinance has proven quite effective at reducing liquidity constraints; however, more research is needed to better understand how such contracts can be better tailored to both borrowers and lenders. Moreover, while index-based crop insurance has been viewed by some as the solution to the problem of systematic risk in agriculture, most existing index insurance contracts are of poor quality, leaving significant residual risk with the farmer. Hence, there is a need to develop higher-quality contracts, which could lead to better protection for farmers and higher uptake.

What has been done

Theoretical, experimental, and empirical methods were used to investigate how three different financial contracts affect the behavior of farmers and their overall welfare. First, we study the effect of adding a collateral requirement to a joint liability contract by developing a simple theoretical framework and conducting a framed field experiment among active credit group members in Tanzania. Next, we use similar methods to analyze the effect of insurance-backed contingent credit (insured loans) on risk-taking and demand in Tanzania. Finally, we use simulations methods and survey data to analyze the welfare effects of a hypothetical index insurance contract, which combines a satellite based index with the potential for a second-stage audit.

Results

The first field experiment demonstrated that a modest (20%) collateral requirement reduces credit defaults by 15-20%. Moreover, while the fraction of the population willing to borrow decreases by

7% overall with a collateral requirement, it increases for group members who are highly socially connected.

The second experiment shows that insurance-backed contingent credit increases demand for credit and increases high-return investments significantly. We demonstrate that these effects hold under both individual and joint liability loan contracts and increase in borrowers' degree of risk aversion. This could lead farmers to adopt more profitable crops, increasing household income. Finally, the analysis of the satellite-based failsafe insurance contract shows that demand for this contract would exceed that of an area yield contract and a pure satellite contract under reasonable loading cost assumptions.

Overall, these various contracts offer ways to increase the welfare of smallholder farmers in the developing world. Based on findings of the full project, a set of financial products are expected to be developed that will help expand access of microcredit and index insurance to millions of smallholder farmers in the developing world.

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
611	Foreign Policy and Programs

Outcome #2

1. Outcome Measures

Market economies and efficiencies studies relating to factors such as pricing, finance, supply and demand, exchange rates, trade policies, etc. ensuring that stakeholders are informed and their identified needs.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Advance basic and theoretical knowledge in sociological, educational, and human capital dimensions related to food, agriculture and environment topics

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Advance human capital and sociological studies that will inform strategies for expanding and strengthening individual and family well-being, community stability, and agricultural workforce leading to improved quality and quantity of life.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Most policymakers acknowledge that one key to eradicating poverty in Africa is through the active mobilization and participation of smallholder farmers who constitute the vast majority of Africa's population. This has led to investments in participation, integration, and capacity building of smallholder farmers. It is becoming increasingly clear that communication professionals are needed to bring information on new technologies to the farming community, which they can adopt to increase productivity and ultimately, household income. However, there are several challenges facing the operationalization of a Communication for Development (C4D) approach, such as a lack of trained C4D professionals and a need for a pilot project to demonstrate how C4D impacts development.

What has been done

Currently, CFAES researchers are conducting baseline and capacity analysis studies of farmers and extension workers in Africa and other parts of the developing world, which will reveal existing knowledge gaps. Various strategies will be used to determine the best methods to involve youth, women, and smallholder farms in development programming.

Researchers will also test how improvements in communication can increase smallholder farm yields in Pakistan over time. This data will inform the creation of professional development training activities, graduate programs, and other materials to support the C4D approach in developing countries.

Results

An inaugural ceremony and workshop were conducted to explain the nature of this project to members of the communities of interest. Following the ceremony, workshops were used to obtain input from over 100 extension, research, and university personnel who attended. Similar presentations have also been given in Rwanda, Uganda, Tanzania, Ethiopia and Ghana. In response to this project, the lead investigator was requested to assist Addis Ababa University and the Ethiopia Ministry of Agricultural and Rural Development in establishing a graduate degree program in Communication for Development and to promote communication training for extension workers. Utilizing the agricultural extension model will promote economic development and increase the welfare of Africa's farmers.

Many of the problems afflicting global development, such as the need for participation, integration and capacity building, can best be addressed through a communication approach to development. Lessons learned from the Pakistan experiment can have widespread application in Africa and the rest of the developing world. Utilizing the agricultural extension model looks to be a promising way to promote economic development and increase the welfare of Africa's farmers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
609	Economic Theory and Methods
611	Foreign Policy and Programs

Outcome #5

1. Outcome Measures

Study rural education systems relative to educational resources, curriculum, instructional delivery, and student learning to the extent necessary to inform decision-makers how to improve rural education systems as requested.

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

New knowledge of production variations in markets, including vertical markets, that help producers, processors, and distributors have requisite information for enhanced decision making leading to decreased costs of inputs and an increase in profits/outputs.

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
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Shifts in economic dimensions impact all aspects of people's lives. Within this program area, public monies, and fluctuations in the appropriations of such, can have either positive or negative effects on human well-being, as do levels of government regulation. Likewise,

public policies, societal priorities and perceptions, popular culture, education, and family norms are major external factors impacting this program in its research and extension efforts. Factors such as the availability of base funding to ensure a core faculty and staff, availability of extramural funds, and programmatic demands that exceed available resources can affect outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

CFAES has conducted no formal studies regarding evaluation of our research program in 2017. Surrogate evaluation metrics that are considered indicators of research success are:

- Research contracts and awards received/ongoing/completed (\$180 million plus in active projects during 2017);
- Number of referred publications reported elsewhere in this report;
- Number of businesses, industries and groups engaged in CFAES' research programs;
- Number of patents received;
- Economic impact of the college's research program as reported elsewhere in this report;
- The level of base funding from USDA-NIFA and the State of Ohio in 2017;
- Impacts submitted in this report, and the continued robustness of CFAES' research program throughout 2017, both in terms of breadth of programs and depth of new knowledge generated and applied.

The research reported herein is also supported by an informal yet effective formative evaluation. Very little research is conducted at CFAES without early engagement of businesses, industries, commodity groups, special interest groups, or other interested parties. These are the individuals who have the need for and will be the adopters of our research output/impacts. Even in the case of very theoretical research, fellow researchers in industry, government, and academic institutions are consulted (formative evaluation/needs assessment) in the formulation of studies.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 12

1. Name of the Planned Program

Human Health (OARDC Led)

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
502	New and Improved Food Products	0%		58%	
703	Nutrition Education and Behavior	0%		3%	
721	Insects and Other Pests Affecting Humans	0%		22%	
722	Zoonotic Diseases and Parasites Affecting Humans	0%		13%	
723	Hazards to Human Health and Safety	0%		4%	
	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	0.0	0.0	1.5	0.0
Actual Paid	0.0	0.0	1.3	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	162154	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	548256	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

On-going research activities to advance human health and societal well-being include both basic and applied research, such as that conducted through the Center for Advanced Functional Foods Research and Entrepreneurship (CAFFRE). Examples include the identification, extraction and commercialization of natural, cancer-fighting food dyes from berries. Effective food science research requires a mixture of laboratory and gathering places for human subjects to undergo sensory evaluations of experimental food products. Emerging health threats now require more advanced facilities--such as bio-security labs--particularly needed in the study of infectious animal, plant and insect-vector-borne diseases that may directly impact humans. All functional laboratories and sites are improved over time, as program needs warrant. CFAES faculty and staff engage in appropriate levels of outreach and consultation with both internal and external stakeholders.

2. Brief description of the target audience

The targeted audiences include, but are not limited to:

- Individuals or groups who have expressed a need for health, obesity, and safety information that resulted from new or on-going research, or is extracted from the scientific literature;
- Fellow academic units that depend on scientists in this program for support information and for new health and safety technologies and approaches;
- Federal, state or local agencies or support organizations who will not only use the information, but will also extend that information;
- Populations who have not requested the information but will likely benefit from access;
- Other scientists and scientific groups;
- Health workers/organizations;
- Political entities;
- Extension personnel;
- Students from pre-school to post doctorate studies;
- News organizations;
- Business and industrial groups.

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	0	0	0	0

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

Patent Applications Submitted

Year: 2017
Actual: 1

Patents listed

Novel use of deodorizing compounds as mosquito repellents

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	49	49

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of graduate students completed
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	Release studies on insects, ticks, and mites to protect human health that will provide a set of alternatives leading to health gains with lowered risks, and within economic realities, for the affected populations.
2	Advance the understanding of means and methods related to transmission of zoonotic diseases to humans, including prevention, that meets consumer demand/health threat, as or before such emerges.
3	Reduce through research, development, and outreach the exposure to biohazards, pathogens, and similar to the extent that annually such are reduced per capita with an overall time and economic savings to those who may be affected.
4	Create a growing base of knowledge that supports improving human health as it relates to food, environment, and lifestyle
5	Expand utilization of products with known functionality or nutraceutical value and give consumers greater informed choices, including the bioavailability of the desired substance in food, than they presently have.

Outcome #1

1. Outcome Measures

Release studies on insects, ticks, and mites to protect human health that will provide a set of alternatives leading to health gains with lowered risks, and within economic realities, for the affected populations.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Advance the understanding of means and methods related to transmission of zoonotic diseases to humans, including prevention, that meets consumer demand/health threat, as or before such emerges.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Reduce through research, development, and outreach the exposure to biohazards, pathogens, and similar to the extent that annually such are reduced per capita with an overall time and economic savings to those who may be affected.

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Create a growing base of knowledge that supports improving human health as it relates to food, environment, and lifestyle

2. Associated Institution Types

- 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)

In spite of improved medical care, aging Americans are still experiencing a high prevalence of chronic diseases such as cancer, diabetes, and Alzheimer's. Ongoing research suggests that the development of chronic degenerative diseases could be reduced using certain food compounds. Functional foods combine food items with bioactive ingredients - those that contain health-promoting factors - in a manner that is both acceptable and attractive to the consumer. However, research must be done to determine the stability and concentration of bioactives, quality of the food, and efficiency of the delivery system in order to create effective functional foods.

What has been done

Using a multidisciplinary approach, various functional foods were studied, including a soy-tomato drink, strawberry and black raspberry confections, and soy bread. The formulation of each functional food is determined by the bioactive ingredient being used and the specific purpose for which it is being used. During food formulation and processing, the bioactive compound stability and efficiency of delivery are measured using a variety of techniques and in-vitro methods. The food is also subjected to human sensory analysis - examining qualities such as taste and texture - and is reformulated as necessary to assure the product meets quality and acceptability standards. The final step requires conducting a human clinical trial and verifying the effectiveness of the functional food.

Results

Multiple functional foods were formulated, analyzed, and effectively utilized in human clinical trials, including 3 forms of a black raspberry confection that were shown to be effective vehicles for black raspberry bioactives. It was determined that the "gummy" version allowed the greatest bioactive absorption, as it remained in the mouth for a longer period of time. Black raspberry compounds, especially antioxidants, have been studied for various health-promoting effects, such as cancer prevention. So while broccoli and spinach are also good cancer fighting foods, it may be more enjoyable to eat the candy.

Using a systematic approach to study functional foods has proven to be more scientifically sound and relevant compared to traditional means. Future work will continue to develop novel functional foods, specifically looking at those containing blueberries. Developing functional foods may prove to be a simple and effective way to prevent against and reduce prevalence of certain chronic diseases.

4. Associated Knowledge Areas

KA Code	Knowledge Area
502	New and Improved Food Products

Outcome #5

1. Outcome Measures

Expand utilization of products with known functionality or nutraceutical value and give consumers greater informed choices, including the bioavailability of the desired substance in food, than they presently have.

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
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Multiple factors, including climate change and weather conditions, play a major role in encouraging the growth and spread of pests and diseases that can be transmitted to humans. Shifts in the economy can impact the government's ability to address human health concerns. Access to healthcare and education regarding healthy lifestyles also affects outcomes. Within this program area public monies, and fluctuations in the appropriations of such, can have dramatic effects on human health, as do the levels of regulation. Likewise, public policy and the public's priorities and perceptions, especially regarding risks, are major external factors impacting this program.

Research priorities, limited research dollars, and the resulting competition impact the extent of research that can be carried out. Items such as potential levels of public exposure to certain zoonotic diseases are major external influence. Likewise, public willingness to learn safety procedures to contain pests and mitigate zoonotic disease threats may impact research outcomes. Willingness of consumers to pay for additional food safety is also an external factor. Factors such as the availability of base funding to ensure a core faculty and staff, availability of extramural funds, and programmatic demands that exceed available resources can affect outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

CFAES has conducted no formal studies regarding evaluation of our research program in 2017. Surrogate evaluation metrics that are considered indicators of research success are:

- Research contracts and awards received/ongoing/completed (\$180 million plus in active projects during 2017);
- Number of referred publications reported elsewhere in this report;
- Number of businesses, industries and groups engaged in CFAES' research programs;
- Number of patents received;
- Economic impact of the college's research program as reported elsewhere in this report;
- The level of base funding from USDA-NIFA and the State of Ohio in 2017;
- Impacts submitted in this report, and the continued robustness of CFAES' research

program throughout 2017, both in terms of breadth of programs and depth of new knowledge generated and applied.

The research reported herein is also supported by an informal yet effective formative evaluation. Very little research is conducted a CFAES without early engagement of businesses, industries, commodity groups, special interest groups, or other interested parties. These are the individuals who have the need for and will be the adopters of our research output/impacts. Even in the case of very theoretical research, fellow researchers in industry, government, and academic institutions are consulted (formative evaluation/needs assessment) in the formulation of studies.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 13

1. Name of the Planned Program

Advancing Employment and Income Opportunities (Extension)

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
602	Business Management, Finance, and Taxation	50%		0%	
608	Community Resource Planning and Development	50%		0%	
Total		100%		0%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	5.5	0.0	0.0	0.0
Actual Paid	4.0	0.0	0.0	0.0
Actual Volunteer	10.4	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
183903	0	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
183903	0	0	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- On-site workshops
- Meetings
- Curriculum development and maintenance
- Educational programming
- Development and maintenance of online resources
- Establishment of collaborative partnerships
- One-on-one client consultations
- Volunteer organizational efforts
- Conduct tax education workshops for practitioners, attorneys, CPAs, CFPs

2. Brief description of the target audience

- Community leaders
- Economic development professionals
- Community residents (families and individuals)
- Business owners/operators
- Professional economic developers
- Extension partners
- Attorneys
- Certified public attorneys
- Certified financial planners
- Enrolled agents with the Internal Revenue Service
- Tax return preparers

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	9607	99747	6381	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 people participating in 'Business Retention and Expansion' programming

Year	Actual
2017	200

Output #2

Output Measure

- number of formal 'Business Retention and Expansion' presentations of findings to communities

Year	Actual
2017	18

Output #3

Output Measure

- number of multi-state partnerships for 'Business Retention and Expansion' programming efforts

Year	Actual
2017	18

Output #4

Output Measure

- number of formal training workshops
Not reporting on this Output for this Annual Report

Output #5

Output Measure

- number of program planning and implementation volunteer hours donated

Year	Actual
2017	21606

Output #6

Output Measure

- number of companies visited (to discuss opportunities for growth or possible hindrances to growth)
Not reporting on this Output for this Annual Report

Output #7

Output Measure

- number of in-person, two-day OSU Income Tax School events offered
Not reporting on this Output for this Annual Report

Output #8

Output Measure

- number of participants in OSU Income Tax school in-person events (single day)
Not reporting on this Output for this Annual Report

Output #9

Output Measure

- number of two-hour "Ethics" webinars offered through the OSU Income Tax School program
Not reporting on this Output for this Annual Report

Output #10

Output Measure

- number of participants in "Ethics" webinars offered through the OSU Income Tax School program
Not reporting on this Output for this Annual Report

Output #11

Output Measure

- number of five-hour "Agriculture and Natural Resource Tax Issues" webinars offered
Not reporting on this Output for this Annual Report

Output #12

Output Measure

- number of participants in "Agriculture and Natural Resources Tax Issues" webinars offered through the OSU Income Tax School program
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 community plans developed and adopted
2	number of local leaders and community residents that have indicated they are using knowledge gained from 'Business Retention and Expansion' programming to make better informed community decisions
3	number of participants in OSU Income Tax School educational sessions who experienced an increase in knowledge on at least one subject as a result of attending an educational program
4	number of local government leaders reporting a gain in knowledge as a result of OSUE leadership training
5	Number of youth increasing their knowledge in community leadership development thru the new OSUE signature program 'LOOK to Ohio'.

Outcome #1

1. Outcome Measures

number of community plans developed and adopted

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

number of local leaders and community residents that have indicated they are using knowledge gained from 'Business Retention and Expansion' programming to make better informed community decisions

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	129

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Business Retention and Expansion (BR&E) program has been positively impacting communities for more than 30 years as a structured approach to assessing and addressing business needs. The program helps to inform community leadership about their economy and assist in decision making. Local community leaders in Ohio frequently lack an understanding of issues related to their economy.

What has been done

In 2017, 200 individuals participated in BR&E programming. Through a community engagement process, local community socio-economic data and resident input have been collected and compiled by OSU Extension professionals in community plan / report formats that can be referenced to better inform local decision making. BR&E sessions are hosted as either one-on-one individual instruction or as a small group workshop.

Results

Program participants are demonstrating improved working relationships; county and city officials are now meeting once a month to discuss community and economic development issues. While

not all participants were evaluated on the effectiveness of the BR&E program, of those evaluated, 48 indicated that they now better appreciate the need to understand existing businesses, and 129 are now aware of the roles they can play in the development of their community's economy.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
608	Community Resource Planning and Development

Outcome #3

1. Outcome Measures

number of participants in OSU Income Tax School educational sessions who experienced an increase in knowledge on at least one subject as a result of attending an educational program

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

number of local government leaders reporting a gain in knowledge as a result of OSUE leadership training

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	129

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Business Retention and Expansion (BR&E) program has been positively impacting communities for more than 30 years as a structured approach to assessing and addressing business needs. The program helps to inform community leadership about their economy and assist in decision making. Local community leaders in Ohio frequently lack an understanding of issues related to their economy.

Local officials lack knowledge of existing business needs and resulting expansion and growth strategies. Relations among community stakeholders (businesses, residents, local leaders

/officials) are often fragmented, challenging communities even more. The goals of BR&E programming are: 1) to assist businesses in solving local problems and working with local government; 2) to assist businesses in using state and federal development programs; 3) to develop a database for local economic strategic planning to improve the community's climate for growth; and 4) to establish an early warning system for plant closures, allowing the community to prevent or ease such situations when possible.

What has been done

In 2017, 200 individuals participated in BR&E programming. Through a community engagement process, local community socio-economic data and resident input have been collected and compiled by OSU Extension professionals in community plan / report formats that can be referenced to better inform local decision making. BR&E sessions are hosted as either one-on-one individual instruction or as a small group workshop.

Results

Program participants are demonstrating improved working relationships; county and city officials are now meeting once a month to discuss community and economic development issues. While not all participants were evaluated on the effectiveness of the BR&E program, of those evaluated, 48 indicated that they now better appreciate the need to understand existing businesses, and 129 are now aware of the roles they can play in the development of their community's economy.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development

Outcome #5

1. Outcome Measures

Number of youth increasing their knowledge in community leadership development thru the new OSUE signature program 'LOOK to Ohio'.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	124

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

LOOK (Leadership Opportunities for Organizational Knowledge) is a place-based teen leadership program developed to meet the demand to prepare youth for the workforce and leadership roles today and into the future. There are three components to the LOOK program, place-based education, leadership courses, and service learning. LOOK encompasses the motto 'preparing tomorrows leaders today' through multiple youth leadership development programs for high school students.

What has been done

The primary, LOOK to Ohio classic, ten- monthly themed program days at sites throughout a county. The second, LOOK Summer Leadership Experience, a five-day leadership retreat. The third, LOOK In-School Pilot program, which partners with local high schools throughout the county to provide students with on-site leadership training. Partnerships and collaborations are the ?trademark? of the LOOK program. Instructors include county- based educators: Family and Consumer Sciences, 4-H Youth Development, Agriculture and Natural Resources, and Community Development. The LOOK program leadership course is based on main campus and department personnel collaborate on learning strategies. Each of the sessions include local leaders involved in guided, experiential instruction based on locally identified topics that encompass the six impacts of community leadership development: personal growth and efficacy, community commitment, shared future and purpose, community knowledge, civic engagement, social cohesion, (Pigg, 2015)

Results

The program connects local businesses, leaders within the community and youth which fosters community awareness, networking and the development of transferable workforce preparation skills. The program is delivered utilizing a variety of teaching and learning styles including hands-on experiential learning, individualized and team learning, interface with local business and entrepreneurs, panel discussions, service learning projects and online distance learning. LOOK graduates are invited back throughout the program to 'talk about personal leadership experiences post high school'. These testimonials demonstrate personal impact. Evidence supports that OSU Extension is recognized by county government officials and business leaders as a valuable community resource that makes a local difference.

STUDENT EVALUATION EXAMPLES:

What leadership lessons have you learned today?

? Importance of shared vision that everyone has input on

? Communication is essential to achieving goals

? We should be open to future changes and adapting our leadership styles accordingly

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Business Retention and Expansion programming competes with other economic initiatives on the local level as leadership decides how to best allocate limited dollars.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

For the 'Advancing Employment and Income Opportunities' planned program, OSUE faculty and staff work in communities around the state, helping local leaders and officials to:

- investigate, evaluate, and plan for stronger local economies;
- manage and leverage resources;
- implement action plan strategies;
- learn how to operate a sustainable community economy;
- make better decisions based on sound information;
- and evaluate progress

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 14

1. Name of the Planned Program

Enhancing Agriculture and the Environment (Extension)

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	10%		0%	
112	Watershed Protection and Management	15%		0%	
123	Management and Sustainability of Forest Resources	5%		0%	
133	Pollution Prevention and Mitigation	10%		0%	
205	Plant Management Systems	10%		0%	
216	Integrated Pest Management Systems	15%		0%	
307	Animal Management Systems	10%		0%	
601	Economics of Agricultural Production and Farm Management	5%		0%	
602	Business Management, Finance, and Taxation	10%		0%	
723	Hazards to Human Health and Safety	10%		0%	
	Total	100%		0%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	60.0	0.0	0.0	0.0
Actual Paid	62.0	0.0	0.0	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
2850492	0	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
2850492	0	0	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Maintain educational websites on related topics (e.g., Crop Observation and Recommendation Network; PestEd and Nutrient Stewardship for Cleaner Water websites);
- Create and distribute educational materials / information (via fact sheets, field guides, manuals, webinars, tv spots, radio broadcasts, conference presentations, etc);
- Enhance the adaptation of production techniques through utilization of on-farm research to work directly with producers to evaluate practices to enhance productivity and profitability;
- Organize and conduct workshops and educational activities targeting 4R Nutrient Management ("Nutrient Stewardship for Cleaner Water") and Ohio's waterways in response to phosphorus water quality concerns
- Organize and conduct 'Women in Agriculture' / 'Annie's Project' seminars;
- Extend the reach of OSUE programming by organize and conduct educational workshops, training sessions, and seminars for Master Gardener Volunteers;
- Conduct education on fertilizer and for private and commercial pesticide application best practices (including potential certification);
- Organize / host / present at conferences, such as Farm Science Review, the Conservation Tillage Conference, Small Farm Conference, Women in Agriculture Conference, etc;
- Educate Ohioans on forestry stewardship best management practices;
- Provide agricultural emergency management training for first responders and farm operators;
- Promote independence for Ohio farm families who have family members with disabilities that impact their ability to function in farm operations;
- Organize and conduct 'Transitioning Your Farm Business to the Next Generation' workshops;

2. Brief description of the target audience

The target audience for efforts under the 'Enhancing Agriculture and the Environment' programs include:

- Ohio farm families;
- Commercial green-industry companies;
- Consumer horticulture advocates;
- Commodity/farm advocacy groups;
- Federal / state and agricultural / environmental agencies;
- State-wide consumer groups;
- Volunteer groups;
- Community leaders;

- Business leaders;
- Elected and appointed officials;
- Non-government organizations;
- Female agricultural or agricultural-related business owners / partners;
- Pesticide application license holders.

Included in the reporting of the NIFA planned program, 'Enhancing Agriculture and the Environment', OSU Extension has a number of programs that have more specific audiences, which are detailed separately below.

The target audience for programs which seek to increase profitable crop yields:

- Grain producers
- Fertilizer chemical retailers
- Input company representatives
- Crop advisory, agency and soil water conservation districts
- Natural Resources Conservation Service
- Ohio Department of Agriculture
- Environmental Protection Agency

The OSU Extension 'Ohio Volunteer Master Gardener Program' targets the following audiences:

- Ohio citizens;
- Community leaders and officials;
- Master gardeners.

"Ask a Master Gardener" targets the following audiences:

- New and beginning gardeners;
- Gardeners with distressed gardens, plants, new / unusual problems with plants and / or diseases.

The 'Ohio Certified Volunteer Naturalist' program targets the following individuals:

- Ohio citizens
- Community leaders and officials
- Certified naturalists

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	86280	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 volunteers involved in delivery and implementation of the 'Ohio Master Gardeners' and 'Certified Volunteer Natural Program' programming
 Not reporting on this Output for this Annual Report

Output #2

Output Measure

- number of multi-state partnerships in agriculture, horticulture, and natural resources

Year	Actual
2017	106

Output #3

Output Measure

- number of subscribers to the 'Crop Observation and Recommendation Network' (CORN)
 Not reporting on this Output for this Annual Report

Output #4

Output Measure

- number of people completing the 'Transitioning Your Farm / Agricultural Business to the Next Generation' workshops
 Not reporting on this Output for this Annual Report

Output #5

Output Measure

- number of hits to the "Crop Observation and Recommendation Network" (CORN) website
Not reporting on this Output for this Annual Report

Output #6

Output Measure

- number of people attending 'New and Small Farm College' events
Not reporting on this Output for this Annual Report

Output #7

Output Measure

- number of people attending the 'Small Farm Conference and Trade Show'
Not reporting on this Output for this Annual Report

Output #8

Output Measure

- number of new Master Gardener Volunteers

Year	Actual
2017	1299

Output #9

Output Measure

- number of people attending the 'Farm Science Review' event

Year	Actual
2017	120000

Output #10

Output Measure

- number of Certified Crop Advisers (CCAs) certified to provide consulting in Ohio
Not reporting on this Output for this Annual Report

Output #11

Output Measure

- number of attendees at the 'Conservation Tillage and Technology Conference'
Not reporting on this Output for this Annual Report

Output #12

Output Measure

- number of individuals participating in nutrient stewardship educational programming
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	total number of people indicating an increased knowledge of current practices and emerging technology in conservation tillage as a result of attending the Conservation Tillage Conference
2	number of female farm operators or partners completing the Annie's Project course, where they gained knowledge about issues related to women in agriculture
3	number of attendees at Ohio Women in Agriculture conferences who indicated the intent to implement at least one skill learned during the conference
4	number of Ohioans who learned new information about forestry / woodland stewardship
5	number of individuals attending commercial pesticide applicator training (PAT) who learned new information
6	number of participants in 'Nutrient Stewardship for Cleaner Water' programming who indicated they have improved their knowledge about nutrient management as a result of attending an OSUE educational event on fertilizer application
7	number of participants in Agricultural Emergency Management programming who experienced knowledge gains as a result of educational programming
8	number of Ohio youth and adults gaining knowledge on topics related to agricultural safety and health
9	number of individuals gaining information on assistive technology and other disability services to aid in farm operations
10	number of individuals gaining knowledge of farm processes and practices
11	number of individuals gaining knowledge on best management practices to treat nonpoint source pollution before it reaches Ohio's waterways
12	number of participants in private pesticide applicator training (PAT) programming who indicated they have improved practices to protect the environment as a result of attending an OSUE educational event
13	number of new or small farmer operators receiving education that can help improve their: production practices, land use choices, assessment of personal and natural resources, or identification of marketing alternative
14	Savings / acre using manure instead of synthetic fertilizer (in dollars/acre)
15	Number of attendees at Farm Science Review who visit 'The Gwynne' Conservation area and increase their knowledge of forestry and wildlife, grasslands, aquatics, watersheds, and soils
16	Percent return on investment for every dollar spent on constructed wetlands to improve water quality (in percent).

Outcome #1

1. Outcome Measures

total number of people indicating an increased knowledge of current practices and emerging technology in conservation tillage as a result of attending the Conservation Tillage Conference

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

number of female farm operators or partners completing the Annie's Project course, where they gained knowledge about issues related to women in agriculture

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

number of attendees at Ohio Women in Agriculture conferences who indicated the intent to implement at least one skill learned during the conference

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

number of Ohioans who learned new information about forestry / woodland stewardship

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

number of individuals attending commercial pesticide applicator training (PAT) who learned new information

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

number of participants in 'Nutrient Stewardship for Cleaner Water' programming who indicated they have improved their knowledge about nutrient management as a result of attending an OSUE educational event on fertilizer application

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

number of participants in Agricultural Emergency Management programming who experienced knowledge gains as a result of educational programming

Not Reporting on this Outcome Measure

Outcome #8

1. Outcome Measures

number of Ohio youth and adults gaining knowledge on topics related to agricultural safety and health

Not Reporting on this Outcome Measure

Outcome #9

1. Outcome Measures

number of individuals gaining information on assistive technology and other disability services to aid in farm operations

Not Reporting on this Outcome Measure

Outcome #10

1. Outcome Measures

number of individuals gaining knowledge of farm processes and practices

Not Reporting on this Outcome Measure

Outcome #11

1. Outcome Measures

number of individuals gaining knowledge on best management practices to treat nonpoint source pollution before it reaches Ohio's waterways

Not Reporting on this Outcome Measure

Outcome #12

1. Outcome Measures

number of participants in private pesticide applicator training (PAT) programming who indicated they have improved practices to protect the environment as a result of attending an OSUE educational event

Not Reporting on this Outcome Measure

Outcome #13

1. Outcome Measures

number of new or small farmer operators receiving education that can help improve their: production practices, land use choices, assessment of personal and natural resources, or identification of marketing alternative

Not Reporting on this Outcome Measure

Outcome #14

1. Outcome Measures

Savings / acre using manure instead of synthetic fertilizer (in dollars/acre)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	80

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Farmers are always looking for ways to boost yields and reduce nutrient losses. The manure of pigs and cattle is typically applied to the surface of fields in the fall, after harvest. However, without a crop to absorb the nutrients, much of the nitrogen in the manure is wasted, either running off the field or percolating down through the soil, uncaptured. However, a growing crop will reach out and soak up the nitrogen. As one OSU Extension educator explained, 'By capturing more of the nitrogen in the manure, the farmer can reduce the need to purchase commercial fertilizer and make a bigger profit.'

What has been done

Two OSU Extension employees worked with an equipment manufacturing company to design a metal toolbar which can be attached to a tractor. The toolbar receives waste pumped through a hose from a livestock facility manure pit. The manure is fed through the toolbar, which injects the waste three to five inches into the soil between rows of growing corn, then covers the manure with soil. For the last three years, the manure sidedress toolbar has been tested on fields in Darke County, Ohio. Darke County annually produces the second highest number of hogs across the state (and therefore a whole lot of manure). The process of draglining manure is not a new concept, BUT applying manure through this method to growing crops IS new. Initially, farmers were concerned that running machinery over newly growing crops could crush the corn and compact the soil, leaving less space for easy flow of water, air, and nutrients.

Results

The Darke County fields which were sidedressed with manure produced 13 more bushels of corn per acre than fields where synthetic fertilizers were applied. This also translates to a savings of about \$80 an acre on fertilizer costs. A potential savings of \$250 million if the 3.1 million acres of corn (planted for grain) across the state adopted the method. The research from Darke County shows that the dragline technique on emerging crops is not detrimental to the growth. Initially, the corn might appear to be bent over after the dragline goes across the field, but in about a week's time, the crops were standing back upright again. Farmers who are interested in the manure sidedress tool can contact OSU Extension, and can view more about the tool via a video at <https://go.osu.edu/manureapplicator>

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation
205	Plant Management Systems
307	Animal Management Systems
601	Economics of Agricultural Production and Farm Management

Outcome #15

1. Outcome Measures

Number of attendees at Farm Science Review who visit The Gwynne' Conservation area and increase their knowledge of forestry and wildlife, grasslands, aquatics, watersheds, and soils

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	4000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Farm Science Review (FSR) is one of the nation's premier agricultural trade and education shows. FSR offers landowners, farmers, and conservationists the opportunity to learn about the latest agricultural innovations in research. The premier event at the Gwynne (the conservation area at FSR) takes place during FSR held each September at the Molly Caren Agricultural Center.

What has been done

2017 was the 55th year for FSR. New for 2017, a mobile app allowed visitors to "map your show". The app featured an interactive map, and a search feature for finding specific exhibitors or product categories. The 2017 show featured over 4,000 product lines exhibited by 640 exhibitors. Educational presentations, demonstrations, and displays were ongoing during the review. Show goers could also partake in research tours on water quality and nutrient management. Demonstrations were offered on topics including, but not limited to, drainage installations, unmanned aerial vehicles, and cornstalk baling.

The FSR site recently started two new projects on a 67-acre area (which is part of the FSR site) called "The Gwynne." The first project is designed to diversify the prairie plantings on the Gwynne; the second project is designed to protect the banks of Deer Creek, which flows through FSR grounds. Both projects will improve the Gwynne lands and will demonstrate to FSR-goers practices which can be taken home and used. The Gwynne will also now feature a section of land where OSU Extension educators can demonstrate Christmas tree farming. A seven year plan is in place so that more trees can be planted each year

Results

In 2017, more than 4,000 FSR attendees participated in programs at the Gwynne Conservation area and increased their knowledge of forestry and wildlife, grasslands, aquatics, watersheds, and soils.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
133	Pollution Prevention and Mitigation

Outcome #16

1. Outcome Measures

Percent return on investment for every dollar spent on constructed wetlands to improve water quality (in percent).

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	292

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Ohio has worked on improving water quality in its rivers and large streams. There exist a finite stock of wetlands, thus legitimizing the consideration of constructive wetlands. Wetlands are increasingly effective against eutrophication, the excessive richness of nutrients from runoff. A comprehensive approach to nutrient reduction and water quality is necessary in Ohio to increase the percentage of lakes, rivers and streams meeting designated aquatic life goals.

What has been done

Faculty and researchers in CFAES' Department of Agricultural, Environmental, and Developmental Economics completed a study concluding that constructed wetlands are a viable solution to improve water quality. A grant from the Ohio Environment Council (OEC) funded efforts to determine if constructed wetlands were a viable method to improve water quality and meet aquatic life goals. Using water quality data collected on 24 inland lakes, data on population, housing prices and incomes from the U.S. Census, and information on recreational visitors, they calculated the total cost of creating and operating free surface water wetlands to improve water quality by 10 percent through the removal of phosphorous. Additionally, the study derives the willingness-to-pay for a 10 percent water

quality improvement by both homeowners and recreation users.

Results

The purpose of water quality standards and the federal Clean Water Act is to establish minimum water quality requirements for all surface waters of Ohio, thereby protecting public health and to enhance, improve and maintain water quality. This study puts a dollar amount on the value to Ohio residents place on being able to continue to enjoy use of lakes, rivers and streams and to maintain and improve the value of their land and homes. It shows that a comprehensive approach to nutrient reduction and water quality can be achieved with existing wetlands and through the construction of additional wetlands. The conservative estimate of the lifetime cost to benefit ratio for constructed wetlands is a \$2.92 return for every \$1 invested. Nearby residents benefit from improved water quality through higher house prices while recreation users value the changes in water quality through an expansion of possible outdoor opportunities. This valuable research has been shared with The Ohio Environmental Council and 88 OSU Extension educators working across the state who have specifically requested information and research on water quality issues in Ohio.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation

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
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

- Ohio's agricultural nutrient certification law (Senate Bill 150) requires growers to meet certain criteria to attend certification training.
 - Ohio regulations affecting the western basin of Lake Erie have been important to communicate to this audience in counties that are affected (House Bill 1)
 - OSUE educators continue to offer fertilizer applicator training at the same time as other programming (greater time commitment, due to the increased demand for programming)
 - Understaffed to meet the needs for programming in the areas of forest management / wildlife management / invasive species

V(I). Planned Program (Evaluation Studies)

Evaluation Results

See 'results' sections from outcomes reported.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 15

1. Name of the Planned Program

Preparing Youth for Success (Extension)

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%		0%	
	Total	100%		0%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	87.0	0.0	0.0	0.0
Actual Paid	90.0	0.0	0.0	0.0
Actual Volunteer	71.0	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
4137811	0	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
4137811	0	0	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Conduct workshops
- Face to face and virtual meetings

- Develop curriculum
- Provide training to professionals, volunteers and youth
- Media and web site creations
- Partnering with businesses and other organizations
- Fair (county and state)
- Camping
- Conduct educational programs with youth
- Conduct in-school and after-school enrichment

2. Brief description of the target audience

- Youth: infants through 18 years of age (with a special focus on new and underserved audiences)
- Parents of youth
- Volunteers working with youth audiences
- Teachers / educators working with youth audiences
- Families
- Youth development professional staff
- Community leaders involved in subject specific areas
- Youth (8-18 years), parents of youth, and volunteers working with youth; all with association with animal projects
 - General public who have interest in animals

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	16074	0	503826	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 youth enrolled/engaged in organized community 4-H clubs

Year	Actual
2017	70766

Output #2

Output Measure

- number of youth enrolled/engaged in after school 4-H programs
Not reporting on this Output for this Annual Report

Output #3

Output Measure

- number of youth participating in special interest and short-term programs

Year	Actual
2017	33581

Output #4

Output Measure

- number of youth participating in school enrichment programs

Year	Actual
2017	61991

Output #5

Output Measure

- number of youth participating in 4-H overnight camping programs

Year	Actual
2017	12612

Output #6

Output Measure

- number of youth participating in 4-H day camping programs

Year	Actual
2017	4601

Output #7

Output Measure

- number of adult volunteers contributing to 4-H programming and events

Year	Actual
2017	16074

Output #8

Output Measure

- number of teen volunteers contributing to 4-H programming and events

Year	Actual
2017	6793

Output #9

Output Measure

- number of adult volunteers contributing to the planning and implementation of the 'Real Money. Real World.' financial literacy program

Year	Actual
2017	754

Output #10

Output Measure

- Number of youth participating in the "STEM Pathways" signature program

Year	Actual
2017	2176

Output #11

Output Measure

- number of youth participating in 'Real Money Real World' youth financial literacy programming

Year	Actual
-------------	---------------

2017 11130

Output #12

Output Measure

- number of youth participating in the 4-H CARTEENS ("Caution and Responsibility" teen safe driving) research project

Year	Actual
2017	12000

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	number of youth indicating an increase in understanding of decision making processes
2	number of youth who have indicated an increased knowledge of the educational topic being presented
3	number of youth who have demonstrated decision making and problem solving skills
4	number of youth who have indicated the intention to practice improved basic life skills
5	number of youth who have participated in 4-H programs and indicated that they now possess transferable workforce skills
6	number of participants who increased awareness about what it costs to maintain a household (RMRW)
7	number of participants who increased feeling of importance about waiting to have children until financially ready (RMRW)
8	number of participants who indicated their likeliness to make changes relative to getting more education or training after high school (RMRW)
9	number of participants who indicated they will think through how every spending decision affects other spending opportunities and choices (RMRW)
10	number of participants who increased awareness about how the type of job they have affects how much money they will make / their earning potential (RMRW)
11	number of participants who indicated their likeliness that they have a plan for spending that includes both wants and needs (RMRW)
12	number of youth participants who indicated the likelihood of considering how their spending decisions affect / impact other people (RMRW)
13	number of youth participating in the 4-H CARTEENS ("Caution and Responsibility" Teens safe driving program) research project who increased their knowledge, attitudes, and / or skills relative to safe automobile driving habits
14	number of Ohio youth who increased their STEM knowledge / skills
15	Percent of youth participants demonstrating confidence in their STEM skills and knowledge during a program that used a weather balloon to capture the eclipse on August 21, 2017

Outcome #1

1. Outcome Measures

number of youth indicating an increase in understanding of decision making processes

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

number of youth who have indicated an increased knowledge of the educational topic being presented

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

number of youth who have demonstrated decision making and problem solving skills

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

number of youth who have indicated the intention to practice improved basic life skills

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

number of youth who have participated in 4-H programs and indicated that they now possess transferable workforce skills

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

number of participants who increased awareness about what it costs to maintain a household (RMRW)

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

number of participants who increased feeling of importance about waiting to have children until financially ready (RMRW)

Not Reporting on this Outcome Measure

Outcome #8

1. Outcome Measures

number of participants who indicated their likeliness to make changes relative to getting more education or training after high school (RMRW)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	9908

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Teachers, parents, and employers should see benefits from youth wanting to receive training or more education after high school. If students stay in school and continue training after high school, the chances of better employment opportunities and higher salaries increase.

What has been done

In 2017, 14,499 youth participated in 'Real Money. Real World' simulation (role play) and made decisions on what to purchase based on a salary received, simulating the real world. If students did not have adequate training or education after high school, they were able to see first-hand

how this affected how much they could purchase on a limited salary.

Results

Of the participants, 70.3% (n=9908) indicated they planned to get more education or training after high school.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #9

1. Outcome Measures

number of participants who indicated they will think through how every spending decision affects other spending opportunities and choices (RMRW)

Not Reporting on this Outcome Measure

Outcome #10

1. Outcome Measures

number of participants who increased awareness about how the type of job they have affects how much money they will make / their earning potential (RMRW)

Not Reporting on this Outcome Measure

Outcome #11

1. Outcome Measures

number of participants who indicated their likeliness that they have a plan for spending that includes both wants and needs (RMRW)

Not Reporting on this Outcome Measure

Outcome #12

1. Outcome Measures

number of youth participants who indicated the likelihood of considering how their spending decisions affect / impact other people (RMRW)

Not Reporting on this Outcome Measure

Outcome #13

1. Outcome Measures

number of youth participating in the 4-H CARTEENS ("Caution and Responsibility" Teens safe driving program) research project who increased their knowledge, attitudes, and / or skills relative to safe automobile driving habits

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	4230

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The United States is a highly vehicle-dependent society, with a long tradition of allowing driver licensing at age 16 or younger in most states. With that dependence, inexperienced adolescent drivers often demonstrate risky driving behaviors that put themselves, their passengers, and other motorists and personal property at risk. 4-H CARTEENS is a traffic safety program for juvenile traffic offenders, conducted by 4-H teen leaders and their program partners. The "CAR" in CARTEENS stands for "Caution and Responsibility", and the "TEENS" refers to the teenagers who help prepare and present the program. CARTEENS program topics include excessive speed, driving under the influence, seat belt safety use, consequences of unsafe decisions, dealing with peer pressure, understanding traffic laws, and recognizing and reacting to traffic signs and signals.

What has been done

Depending on the county, either monthly or bi-monthly educational programs are conducted for first-time teen traffic offenders in the 4-H CARTEENS counties. Teens are assigned to the 4-H CARTEENS program through local court systems. CARTEENS is currently offered in 57 of the 88 Ohio counties (5 new counties started in 2017). The goals of the program are to reduce the number of repeat juvenile offenders, decrease the number of teen traffic offenders, and increase teen awareness of traffic / vehicular safety.

In 2017, 317 teens completed retrospective pre-post program evaluations, with parental consent and assented to be in the research study. Of the teens completing evaluations, a summary of their traffic violations follows: speeding (190), failure to control (34), assured clear distance (21), failure to yield (20), stop sign/ red light (24), reckless operation (5), seat belts (4), improper lane movement (5), and "other" (15). The majority of teens participating in driving education were either 16 or 17 years old.

Results

Evaluation results revealed the following: 48% of teens indicated they now think about their responsibility as safe drivers; 38% think about the consequences of engaging in risky driving behavior, 47% now adjust all things that might distract them (eating, cell phones, music) before driving their car, 37% now understand the relationship between vehicle speed and stopping distance.

As an overall indicators of the CARTEENS program, participants were asked to rate the instructors. 97% rated the instructors as either "Good" or "Excellent". When asked how likely the CARTEENS program was to change driving habits, 91.4% indicated "somewhat likely" or "very likely". Overall, participants rated the program as "excellent" (61.5%) or "good" (35.2%). Finally, 90.5% "agreed" or "strongly agreed" that they were less likely to be a repeat traffic offender as a result of attending the CARTEENS program. When we extrapolate the results of the evaluation to the total youth who participated in the program across the state (N=9000), we conclude that 4,230 teen drivers now adjust all things that might distract them (eating, cell phones, music) before driving their car.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #14

1. Outcome Measures

number of Ohio youth who increased their STEM knowledge / skills

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	45661

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Recent statistics show STEM education in the United States is not improving. In 2011, only 30% of high school graduates were prepared for college-level science work, and only 45% were mathready. Poor preparedness in STEM subjects, coupled with the fact that record numbers of current scientists and engineers are approaching retirement means there is a great need for the encouragement and development of STEM skills in today's youth.

What has been done

In 2017, the OSU Extension "STEM Pathways" program reached more than 48,000 youth. The program was supported by 58 OSUE Extension professionals, and more than 2,500 adult and teen volunteers. STEM Pathways was delivered to Ohio youth through many different channels: camps, 4-H clubs, school classrooms, after-school sites, public events (including fairs, festivals, and sporting events), and Farm Science Review. STEM Pathways even reached youth in Honduras, using Ohio students to teach challenges there.

Results

Evaluation data was collected on both quantitative and qualitative measures. 93% of youth participants indicated an increased interest in STEM; 85% reported that completing STEM challenges and other STEM activities helped them develop or strengthen their abilities to work with other. Other quantitative results of note: 79% of participant are more interested in science as a result of their STEM programming participation; and 92% agreed that teamwork and communication, two essential elements of STEM projects and real-life problem solving, were important to accomplish STEM challenges.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #15

1. Outcome Measures

Percent of youth participants demonstrating confidence in their STEM skills and knowledge during a program that used a weather balloon to capture the eclipse on August 21, 2017

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Currently the US is lagging behind in STEM education. As youth development volunteers, ?It is our job to raise the next age of scientists and engineers. Through this project we reached the hearts and minds of the student engineers on our team,? said a Knox County 4-H advisor.

What has been done

Knox County took advantage of the big celestial event in 2017 to get 4-H members excited about science. Eleven 4-H members in Knox County launched weather balloons from Pennyryle State Park in Kentucky prior to the August 21 eclipse. The balloons would rise to 19.89 miles high, which would enable them to capture the full effects of the eclipse.

The Knox County 4-H team applied to the NASA program and were accepted. They travelled to Montana to train on the NASA equipment. It took 18 months of preparation to prepare for the 2017 balloon launch. There were 7 test balloons launched prior to the eclipse day as practice runs. The test runs were necessary, as there was only a ten-minute window during which the kids could launch the balloon in order to capture the eclipse. The Knox County team met with an OSU theoretical astrophysicist, appeared on television, and visited Battelle and The Ohio State University's Department of Astronomy in Columbus, as well as NASA's Glenn Research Center in Cleveland. The preparation work to get the balloons ready to launch included computer programming and working with hardware.

Results

The balloons were launched successfully and perfectly on time, and were able to reach the needed 100,000 feet altitude in order to capture the eclipse from space, as well as to view the earth, moon, and sun. The balloons successfully captured still images, two 4K video streams of the launch and eclipse, and the moon's shadow as it passed from west to east. All flight data was also successfully captured, including temperature, pressure, global positioning system data, time, latitude / longitude, heading, speed, and altitude. The Knox County 4-H advisor said this of the experience: "The significance of the project goes far beyond the launch of balloons. It is our job to raise the next age of scientists and engineers. With this project, we reached the hearts and minds of the student engineers and got kids interested in the STEM program. The group learned a lot of skills that go above and beyond just the scientific part. They sat on panels and answered hard science and data questions from the public, learned to work with all sorts of equipment, put together short movies and a documentary, and came out of the experience with new dreams for the future." One of the 4-H club members said of the experience, "I was feeling anxious when the launch took place because we knew the eclipse was starting to happen. It was an amazing experience that is hard to describe. We were all proud of each other and super excited to see the footage we captured." The collected data was sent to NASA and Google, who partnered to create a 90-minute film called the "Eclipse Mega Movie." The Eclipse Ballooning Project was a collaboration of students streaming live video and camera shots from 55 balloons launched across the continental US along the eclipse path. The teams were the first to show eclipse videos from space, and were also the first to stream live videos of a total solar eclipse from the edge of space. {How many people viewed, etc}

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

In some counties, there do not exist a full complement of the other three program-area related Extension educators, so 4-H educators often have to fulfill multiple programmatic roles, which puts a strain on their time and programming.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

See results in the outcomes sections for this planned program.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 16

1. Name of the Planned Program

Strengthening Families & Communities (Extension)

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	25%		0%	
724	Healthy Lifestyle	25%		0%	
801	Individual and Family Resource Management	25%		0%	
802	Human Development and Family Well-Being	25%		0%	
	Total	100%		0%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	32.0	0.0	0.0	0.0
Actual Paid	32.0	0.0	0.0	0.0
Actual Volunteer	27.6	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
1471222	0	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1471222	0	0	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Conduct formal and informal needs assessments
- Develop programming materials and curricula
- Conduct meetings, workshops and educational sessions
- Conduct program evaluation and applied research
- Form and sustain community partnerships
- Train volunteers, paraprofessionals, and other community agency/organization professionals

2. Brief description of the target audience

'Strengthening Families and Communities' programming is tailored to meet the needs of each audience we engage. School programming is age appropriate, whereas programs at Senior Centers are targeted to inform on safe food preparation for individuals living alone or with one other person. The end result is a program that has the potential to encompass all residents of the state. Below is a listing of the specific groups we intend to reach with targeted awareness, educational and skills-development programming:

- Parents of children ages birth to 18, including, but not limited to: teen, step, adoptive, foster, single, divorcing, incarcerated, fathers who have not yet established paternity, and grandparents;
 - Adults in, or thinking about entering, intimate relationships;
 - Young adults;
 - Older adults and those who care for them;
 - Baby boomers, especially women;
 - Limited resource families, including mothers with young children and food stamp recipients;
 - New employees;
 - Bankruptcy filers;
 - Debt burdened individuals and couples;
 - First time homebuyers;
 - Individuals with diabetes and their caregivers/family support members;
 - Food establishment managers and food service employees;
 - Volunteer food preparers;
 - Child care providers;
 - Teachers;
 - Social service professionals;
 - General consumers (other formal or informal education).

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	151657	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

- Educational sessions held with two or more participants

Year	Actual
2017	669

Output #2

Output Measure

- number of volunteer hours given

Year	Actual
2017	57500

Output #3

Output Measure

- number of Dining with Diabetes classes taught

Year	Actual
2017	71

Output #4

Output Measure

- total number of volunteers participating in the planning and / or implementation of 'Strengthening Families and Communities' programming

Year	Actual
2017	9085

Output #5

Output Measure

- number of visits to the blog for the OSUE signature program, "Live Healthy Live Well"
Not reporting on this Output for this Annual Report

Output #6

Output Measure

- number of individuals participating in the 'Live Healthy Live Well' program
Not reporting on this Output for this Annual Report

Output #7

Output Measure

- number of 'Likes' on posts to the "Live Healthy Live Well" OSUE signature program Facebook page
Not reporting on this Output for this Annual Report

Output #8

Output Measure

- number of individuals who participated in a 'Strengthening Families and Communities' event / project that are defined as under-represented individuals (i.e., individuals who may not have participated fully - e.g., women, minorities, persons with disabilities, small farm owners, etc).

Year	Actual
2017	44802

Output #9

Output Measure

- number of participants in 'Live Healthy Live Well' email challenges
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 participants who increased their financial literacy
2	number of participants who have developed an integrated plan for achieving financial security
3	number of 'Successful Co-Parenting' participants who plan on using information learned in the educational event they attended
4	number of 'Live Healthy Live Well' participants who reported using the information they learned during the email challenge, which may help reduce the risk of chronic disease
5	percentage of 'Dining with Diabetes' (DWD) participants that report engaging in cooking activities to help take control of their diabetes - using healthy oils in cooking, substituting herbs and spices for salt and using nutrition labels
6	Number of individuals participating in the 'Successful Co-Parenting' program who feel more prepared to co-parent as a result of the program
7	Number of individuals participating in 'Healthy Finances' programming who indicated the intent to change one more behaviors as a result of attending an educational session.
8	Number of 'Dining with Diabetes' (DWD) participants who report engaging in physical activities to help take control of their diabetes - fitting exercise into their daily routine, exercising continuously for at least 30 minutes at least three times per week, and being physically active on a daily basis.

Outcome #1

1. Outcome Measures

number of participants who increased their financial literacy

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

number of participants who have developed an integrated plan for achieving financial security

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

number of 'Successful Co-Parenting' participants who plan on using information learned in the educational event they attended

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

number of 'Live Healthy Live Well' participants who reported using the information they learned during the email challenge, which may help reduce the risk of chronic disease

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

percentage of 'Dining with Diabetes' (DWD) participants that report engaging in cooking activities to help take control of their diabetes - using healthy oils in cooking, substituting herbs and spices for salt and using nutrition labels

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Number of individuals participating in the 'Successful Co-Parenting' program who feel more prepared to co-parent as a result of the program

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1410

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Current estimates indicate that about 40,000 Ohio marriages end each year. Of those divorces, approximately 45% involve families with minor children. The OSUE Successful Co-Parenting (SCP) curriculum is developed to equip divorcing parents with the knowledge, skills, tools, awareness, and strategies which will enable them to best help their children adjust to divorce. The primary audience of the SCP program are parents of minor children currently going through the divorce process. Though not the majority, parents of minor children who are never married, going through separation or providing kinship care are also included in the program.

What has been done

The Successful Co-Parenting class is delivered in a single two and a half hour session. Topics discussed include: maintaining healthy parent-child relationships through the divorce process; teaching parents to identify and deal with their own grief and loss during the divorce period and how to maintain their own mental health; how and why to avoid conflict with their co-parent; how and why to maintain healthy communication with their co-parent and child(ren); the importance of creating a stable environment for the child(ren).

In 2017, a team began working on the development of an online module for SCP; target launch date is November 2018. The online module is intended to be used in Ohio counties that lack a Family and Consumer Sciences educator or for counties whose educators lacks the expertise on the topic; the module may also be used with very rural or hard-to-reach clientele.

A youth-based divorce education program (called 'What About Me??') was developed and is being piloted by 5 counties currently.

Results

In 2017, there were 1,912 individuals (completing evaluations); more than that attended programming. As of the end of 2017, this program was being offered in 14 of 88 Ohio counties (expanded by 1 county since 2016). The average age of participants was 36.3 years. Most of the

participants (77.9%) were employed full-time. 78.1% of participants were experiencing their first divorce. Post-program retrospective evaluations revealed that 93.6% of individuals believed that they learned new information from the SCP program. 95.8% of participants indicated that they plan to use the information they learned in the program. 90.5% of participants feel more prepared to co-parent; 93.6% believed the class was helpful. 50.1% of participants experienced a positive change related to how to use healthy communication techniques such as problem solving with co-parents.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
801	Individual and Family Resource Management
802	Human Development and Family Well-Being

Outcome #7

1. Outcome Measures

Number of individuals participating in 'Healthy Finances' programming who indicated the intent to change one more behaviors as a result of attending an educational session.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	247

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

It is not uncommon for individuals and families to experience financial troubles. Unexpected life events, such as losing a job, declining health, or loss of adequate health insurance can impact personal economic well-being. While these events are sometimes unavoidable, having financial management skills and a solid financial plan in place can help make coping with those life events more manageable. OSUE ?Healthy Finances? education helps individuals and families improve their present and future economic well-being.

What has been done

In 2017, 274 evaluation tools were collected from participants attending 'Healthy Finances' programs.

Results

On a post-session retrospective evaluation ? the following percentages of people experienced a positive change from 'before' to 'after' the educational intervention: 71.1% use written goals to guide financial decisions; 68.8% know their net worth; 68.1% set aside money for occasional expenses; 67.9% set aside money for emergencies. Following percentages of people indicated either 'agree' or 'strongly agree' on a 4-point scale: Learned new information from this program (94.5%); plan to use information I learned in this program (96.5%).

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management

Outcome #8

1. Outcome Measures

Number of 'Dining with Diabetes' (DWD) participants who report engaging in physical activities to help take control of their diabetes - fitting exercise into their daily routine, exercising continuously for at least 30 minutes at least three times per week, and being physically active on a daily basis.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	62

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Diabetes costs Ohio \$4.6 billion annually. According to 2015 state of Ohio data, more than 11.7% of Ohio adults have been diagnosed with diabetes. Since 2000, the number of Ohioans with diabetes has increased nearly 37%. Those with diabetes can develop serious health complications, including cardiovascular disease, blindness, kidney failure, and non-traumatic lower extremity amputations; diabetics lose an average of 10 - 15 years of potential life as a result of their disease.

What has been done

OSU Extension offers nutrition education for pre-diabetic individuals, which helps them to learn how to better manage their food intake and meals. Educational programs include live cooking demonstrations, menu planning, diabetes management, carbohydrate counting, insights on portion control, label reading, and healthy recipe taste-testing. The ?Dining with Diabetes? (DWD)

course is a three-part series, with three distinct modules: fats and sodium; carbohydrates and sweeteners; and vitamins, minerals, and fiber. DWD uses a pre-post evaluation tool, which matches responses from before the program to post-program. In 2017, 116 matched evaluation tools were returned (though the number of participants in the program was higher). Pre-test and post-test to measure knowledge (gains). Also 3-month follow-up conducted.

Results

In comparison of the pre-test and post-test measuring knowledge, evaluations showed that 66.7% of participants scored better on the post-test (this is up from 2016, which was 48%). On the post-test evaluation, participants were given a list of several healthy behaviors, and asked which activities they had adopted since taking the DWD series. 90% of participants report eating more fruits and vegetables; 85% considering portion sizes when making meal choices; 79.2% reviewing the food label before eating; 66.7% checking their feet. 43.3% reported eating five or more servings of fruits and vegetables in a day; 53.3% reported eating baked fish (prepared with little or no fat). 71.4% report (at follow-up) that they were participating in a physical activity (like walking) on a daily basis). Over 81% reported cooking more at home; 94% reported eating smaller portions; over 75% are using the recipes provided by the program at home. Group A1C average decreased by 0.39.

Comments: 'The class gave me an understanding of what I was doing wrong and how to correct it. Great class!'; 'Be more aware of what you eat! Portion control, the values of potassium. This is helping me be more supportive of my cousin who has insulin dependent diabetes. We are better able to share ideas, thoughts on cooking, etc. This helps us both manage our health! Goal for this class achieved.' 'I am more aware of what I can eat, instead of just what I can't eat.' 'I have learned that eating healthy doesn't mean you cannot enjoy flavorful foods.'

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

- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

There are other non-profits and organizations offering educational events similar to OSU Extension -- consumers have lots of choice when it comes to sources of their information. OSUE must be competitive in both price and diversity of offerings in order to maintain a steady level of participants.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

See results sections in the outcomes reported for this planned program.

Key Items of Evaluation

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 with 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.