

FY 2020 Annual Report of Accomplishments and Results

OHIO - The Ohio State University
Ohio Agricultural Research and Development Center
Ohio State University Extension

I. Report Overview

The NIFA reviewer will refer to the executive summary submitted in your FY 2020 Plan of Work located in the Institutional Profile. Use this space to provide updates if needed.

1. Executive Summary (Optional)
<p>The College of Food, Agricultural, and Environmental Sciences (CFAES), which is known as “the cornerstone college” of The Ohio State University, encompasses three mission areas – teaching, research, and Extension. CFAES faculty, staff, and educators work together to discover new knowledge and offer science-based solutions in both the classroom and the community. Through our efforts divided across three campuses (Wooster, Columbus, and Statewide) we are connected by our mission: We sustain life.</p> <p>“While some things had to pause or slow down due to COVID-19, CFAES continued major progress on the priority of transforming the college’s physical presence, addressing deferred maintenance and needs for modern facilities to support our students, faculty, staff, and stakeholders, as well as finalizing our master plans to ensure efficiencies,” said Dean Cathann Kress. In the last three and a half years CFAES has completed \$42 million dollars in projects. In the past year alone, more than 40 projects of varying sizes were completed totaling \$9.3 million. With nearly 875 buildings and facilities, 11,000 acres of land across the state, 3,700 graduate and undergraduate students, 400 faculty members, and 1,400 staff members the total budget for CFAES is the fourth largest of the 15 colleges that make up The Ohio State University.</p> <p>Despite the challenges 2020 presented CFAES had a banner year. Research productivity was up in the college with a total of 553 proposals being submitted, a nearly 20% increase during last year, and 11 new grants being received at about half a million dollars, or greater. For the first time in its nearly 60-year history, The Ohio State University’s Farm Science Review was held virtually. Consisting of more than 190 scheduled educational events with more than 450 educational features, the event, which was posted online and will be available through summer of 2021, had already been viewed more than 66,000 times after one week.</p> <p>CFAES strives to have an impact not only on our students, but on all students studying at Ohio State, as the college’s areas of focus are integral to fostering a healthier life and a healthier world. The college directly educated nearly 30% of all Columbus campus undergraduates. Also, 25% of all Ohio State non-CFAES undergraduates enrolled in CFAES courses, which cover nearly every general education category.</p> <p>Research taking place in our college got considerable coverage in 2020. Soil Scientist and Distinguished University Professor in CFAES, Dr. Rattan Lal was awarded the 2020 World Food Prize for increasing the global food supply by helping small farmers improve their soil. Lal’s career, which has spanned more than five decades and four continents, has reduced hunger by pioneering agricultural methods across the globe which</p>

have restored degraded soil and reduced global warming. Dr. Linda Saif, Distinguished University Professor in the CFAES Center for Food Animal Health was named a Medifind COVID-19 Superhero for "leading the charge against COVID-19." Saif has researched coronaviruses, immunity, and vaccines for more than forty years and is recognized internationally as an expert on enteric viruses that affect food-producing animals, wildlife, and humans. The Book, Sex Control in Aquaculture, written by Ohio State CFAES Principal Scientist and Director of Aquaculture and Research Development, Dr. Hanping Wang, was named one of the best aquaculture books of all time by the popular book recommendation and ranking website, BookAuthority.com.

Since 2018, Dean Cathann Kress has emphasized a restructure of CFAES leadership to ensure greater clarity, efficiencies, and responsiveness. The initiative has been rolled out in three phases: 1. College Leadership Structure Changes, 2. Leadership Title Changes to Allow for More Effective Teams, 3. OSU Extension Leadership Changes.

Phase one changes focused on leadership structure changes involving CFAES Operations and CFAES Finance. In streamlining CFAES Operations, CFAES has assembled a single team to engage in college-wide strategies. The Grace Drake Agricultural Lab Land-Based Agricultural Operations was integrated into Wooster Farm Operations, and Ken Scaife, Joe Messenger, and Seth Walker transferred into the CFAES Operations Team. CFAES Finance received a new Senior Fiscal Officer, Terry Snoddy.

Changes made in phase two centered around increasing support of the unique components of the college and the faculty, staff, and students within, through title changes allowing for more effective teams. Dr. Tracy Kitchel's role as Associate Dean for Faculty and Staff Affairs was redefined and his title was changed to include "senior" as he took over some of the supervisory responsibilities of Dean Kress.

Phase three included changes relating to leadership in OSU Extension. The dual-leadership structure in OSU Extension included an Associate Dean and Director of OSU Extension and the Chair of the Department of Extension but was combined so that the department would have one leader. Dr. Jackie Wilkins assumed the position of Associate Dean and Director of OSU Extension and Chair of the Department of Extension. The department chair position occupied by Dr. Gregory Davis transitioned to Assistant Dean for Extension and Associate Chair. The position formerly held by Dr. Wilkins, Director of Operations for OSU Extension, was filled by Dr. Jeff McCutcheon. The completion of these leadership changes brought the third of the three phases planned for our college leadership restructuring to a close.

While many key leadership positions were filled within the college, there were also some notable leadership changes within the university. In June of 2020, the 15th President of The Ohio State University, Dr. Michael V. Drake, stepped down and made way for the 16th President, Dr. Kristina M. Johnson. Johnson came to Ohio State from the State University of New York where she served as the Chancellor since 2017. President Johnson has set a goal to double sponsored research and empower the next generation of explorers and discoverers. To reach this goal, the president reorganized the research, technology commercialization, and corporate engagement into a single portfolio headed by Dr. Grace Wang. Dr. Wang's title in the brand-new position will be Executive Vice President for Research, Innovation, and the Knowledge Enterprise. Dr. Wang's leadership will help faculty and students find the capital they need for spinouts and start-ups.

Beginning in fall of 2019, the CFAES Office of Equity and Inclusion entered a restructuring phase. First, the unit received a new name with the addition of the word "Diversity" to become CFAES Diversity, Equity, and Inclusion to better represent the scope of the unit's efforts. A search was also launched to fill the vacant position of Assistant Dean and Director of Diversity, Equity, and Inclusion which concluded in the summer of 2020

with the appointment and return of Dr. Kathy Lechman. Dr. Lechman, the former Assistant Dean for CFAES Equity and Inclusion, returned to CFAES bringing new experiences and insights from her time with Ohio State's Kirwan Institute for the Study of Race and Ethnicity.

To aid her efforts, Dr. Lechman has assembled a diversity advisory council comprised of faculty, staff, and student representatives. The council is tasked with providing recommendations, identifying issues, developing goals, and engaging in difficult conversations related to diversity, equity, and inclusion in addition to advising the Dean.

To ensure student success, focus CFAES scholarship and discovery, engage stakeholders and partners, and enhance efficiencies and resources in the college, CFAES actions are guided by the four Grand Challenges that were outlined in 2017:

- **Sustainability** – a simultaneous focus on viable agricultural production, food security and safety, and environmental and ecosystem sustainability.
- **One Health** – the intersection or interaction of human, animal, plant, and environmental health.
- **Rural-Urban Interface** – exploration of the tensions and opportunities created in the communities, industries, policies, economies, and communications between rural and urban residents.
- **Leadership** – preparation of the next generation of scientists and leaders.

Progress has continued toward refreshing campus infrastructure and improving physical elements. The overarching goal of the refresh is to develop a shared vision for Columbus, Wooster, and Statewide locations and to map out immediate and future facilities investments. Specific focus has been placed on the Waterman Agricultural and Natural Resources Library in Columbus, the Columbus Mid-West Campus, and the Wooster Campus. Some major project updates that took place in 2020 include:

- The new, ultramodern, 60,000-square-foot, \$33.5M Science Building on the Wooster campus. The new building houses entomology research space, undergraduate teaching labs, multifunctional space, collaboration space, a café, and the United Titanium Bug Zoo. This building offers space for both OARDC and ATI researchers to come together, which is aligned with the vision and strategic plan for CFAES.
- A groundbreaking ceremony took place in December for the forward-looking Controlled Environment Food Production Research Complex (CEFPRC). The \$35.8 million dollar project will be constructed at Waterman Agriculture and Natural Resources Laboratory on the Columbus campus. The facility will be the first of its kind in U.S. higher education and will offer an opportunity for collaboration, innovation, and education. The complex will house state-of-the-art research greenhouse space and will act as a home for the new Ohio Controlled Environment Agricultural Center (OCEAC).
- Construction was completed on the \$4.6M Wooster Farm Operations Building and Beef Facility during the summer and the buildings were occupied.
- A \$1M walkway project was initiated to increase connectivity across the two major areas on the OSU Wooster campus. This was a major goal of the ATI Re-Envisioning plan to help promote the one Wooster campus philosophy. So far, a path has been constructed from Research Services and Fisher Auditorium to a nearby convenience store. Future additions will connect the Applewood Village apartment complex, the Wooster Campus Conference Center, and the New Wooster Science Building.

The investment in a refresh of campus infrastructure demonstrates a commitment by CFAES to advance innovative scholarship, convert priorities to action, leverage interdisciplinary systems, and offer the greatest potential to sustain life by tackling today's grand challenges.

CFAES is deeply engaged in solving the water quality issues that face Ohioans every day. The CFAES Water Quality Initiative (WQI) prioritizes learning more about and boosting soil health, improving Lake Erie's water quality, and keeping the region's farms productive. WQI has focused in on Northwest Ohio as the area is rich in farming and harmful algal blooms in Western Lake Erie have been on the rise for the past 15 years. A new partnership with Cargill will see the company supporting CFAES research and extension in their efforts to share and help implement water quality best practices to stakeholders in Ohio and exemplifies OSU's dedication to developing and expanding strategic partnerships. As part of the partnership, Cargill sales representatives in northwest Ohio are encouraging their client farmers to work with their county's water quality associates. WQI Director, Heather Raymond, says the new connections can, "help farmers interpret soil tests, evaluate nutrient management practices, and ensure new practices are executed successfully." Cargill will also supply new equipment and technology to the project, including tools for monitoring water quality and drones for checking soil and crop conditions.

Another measure that was taken to support CFAES's commitment to water quality and management was the full integration of Stone Lab and Ohio Sea Grant (OHSG) into the college. Previously, Stone Lab and OHSG oversight responsibilities were divided between the OSU Office of Research and CFAES. Bringing Stone Lab and OHSG into CFAES will, "enhance opportunities for impact and ensure long-term strategic directions, allow for further integration across research, teaching, and extension – both within CFAES, Ohio State at large, and with other university and college partners across Ohio as well as stakeholders," says Dean Kress. The mission of the Stone Lab is to increase the public's understanding of water issues in Ohio, with an emphasis on Lake Erie, and to improve development and conservation of Lake Erie's resources, which aligns well with CFAES.

The Ohio State University and the College of Food, Agricultural, and Environmental Sciences were well-prepared to do their part in the fight against COVID-19 by ensuring that Ohioans were equipped with the knowledge necessary to stay safe and stop the spread. Dr. Linda Saif, Distinguished University Professor and world-renowned expert on coronaviruses, has spent more than 40 years at Ohio State studying coronaviruses, immunity, and vaccines as a renowned virologist and immunologist. During the current outbreak Saif has been working with Scott Kenney, Anastasia Vlasova, and Qihong Wang, researchers in the Center for Food Animal Health (CFAH), on a test to detect antibodies in those who have had COVID-19 and with the OSU Wexner Medical Center physicians on a plasma treatment for those who have been severely infected.

To study the long-term, longitudinal impact of COVID-19 on first responders, healthcare workers, and the general population a new Ohio State center was created, the Serological Sciences Center of Excellence, with funding from the National Cancer Institute. Saif is one of the center's four coprincipal investigators, who studies emerging animal, human, and zoonotic viruses, will lead one of the center's six components. Dr. Judit Puskas, a Distinguished Professor in Polymer Science in the CFAES Department of Food, Agricultural, and Biological Engineering invented a new polymer facemask that is expected to be more effective against COVID-19. Puskas is working with the Mayo Clinic to create and test the mask to meet the same safety and efficacy standards of an N95mask, but with more comfort and usability for the wearers. Puskas' mask is made of a nonwoven fabric comprised of biocompatible rubber composite formed into a fiber mat that can be used to create personal protective equipment including face masks.

OSU Extension professionals worked tirelessly to respond to community needs regarding COVID-19 and many creative solutions came out of their efforts. The podcast series on issues affecting agriculture was increased and nearly 200 virtual winter programs were offered virtually on

issues ranging from food preservation and processing to water quality and improving soil health. When county fairs were scaled back, OSU Extension-Cuyahoga County 4-H created a “Fair-in-a-box,” with supplies for a car parade, club competitions, and service projects. CFAES uses federal and state capacity funds to leverage additional funds from a variety of sources. During the 2020 fiscal year, CFAES managed more than 1057 extramural awards valued at over \$50 million, and \$45 million in grant expenditures. In addition, CFAES has 33 Invention Disclosures, 77 New Inventors, and 5 new patents issued.

In support of the research enterprise, a few selected competitive grants, research support, and cooperative agreements were awarded in 2020 to OSU researchers, including:

National Institute for Food and Agriculture

- Development of new swine reagents to broaden our understanding of immune correlates of protection and microbial pathogenesis. \$500,000
- Healthy soils, healthy waters: Will soil health improvements mitigate nutrient loading to the Great Lakes? \$499,926
- Plant-microbiome networks impact plant productivity and mitigate plant disease and food safety risks in hydroponic production. \$547,261

Commodity Specific

- \$2.9 million in new awards to support soybean research and extension projects.
- Developing the perfect molecular markers and new germplasm for rapid incorporation of resistance to soil borne pathogens of soybean, \$771,597
- Increasing soybean genetic gain for yield by developing tools, know-how and community among public breeders in the north central US. \$866,514

State of Ohio

- Develop cost effective alternatives for mitigating debris and environmental impacts around bridge piers. \$965,119
- Ohio SNAP-Ed FY 2020. \$6,788,911
- Manufacturing Extension Partnership (MEP). \$1,100,000
- Ohio Department of Agriculture, Specialty Crops Research, \$906,979

Private Foundations

- To research the development and evaluation of pathways to net-zero emission agriculture and cropping systems. Sloan (Alfred P) Foundation, \$1,494,969
- Improving the nutritional quality of tomatoes, Foundation for Food and Agricultural Research (FFAR), New Innovator Award, \$299,042

II. Merit and Scientific Peer Review Processes

The NIFA reviewer will refer to your 2020 Plan of Work. Use this space to provide updates as needed or activities that you would like to bring to NIFA's attention.

Process	Updates ONLY
1. The <u>Merit Review Process</u>	No updates to report.
2. The <u>Scientific Peer Review Process</u>	No updates to report.

III. Stakeholder Input

The NIFA reviewer will refer to your 2020 Plan of Work. Use this space to provide updates as needed or activities that you would like to bring to NIFA’s attention.

Stakeholder Input Aspects	Updates ONLY
<p>1. Actions taken to seek stakeholder input that encouraged their participation with a brief explanation</p>	<p>OSU Research and Extension is rich with advisory panels, teams, councils, and committees through every discipline of research and Extension work. From interdisciplinary work within the university to work with nongovernmental organizations, business and industry, communities, and other universities CFAES has placed a great deal of importance on developing and strengthening strategic and collaborative partnerships.</p> <p>As a land-grant institution it is our responsibility to stay current on issues influencing our stakeholders and the communities we serve. A USDA report recently stated that demand for graduates in the agriculture and food industry is currently greater than the supply from higher education institutions. Ohio State is adding programs and helping students get excited about agricultural careers to help address the shortage.</p> <p>In response to the need, CFAES looked to the Enrollment and Recruitment Task Force, which aims to increase knowledge and understanding of enrollment trends and data within the college. In this effort, CFAES has begun to develop new majors. A proposal from the college to establish a new, interdisciplinary program in sustainable agriculture, leading to the Bachelor of Science, was approved by the Ohio Department of Higher Education.</p> <p>An additional way CFAES responds to the needs of Ohioans is through the Knowledge Exchange (KX). 2020 was the inaugural year for the KX data and communications platform, a CFAES Research and OSU Extension collaboration. The Knowledge Exchange is a CFAES unit that translates research into engaging forms of communication like resources, videos, and tools that make the content, the research that is taking place at CFAES, more consumable for a broad audience. The goal of the platform is to get people actively connecting with research, asking questions, and sharing in the discovery process. The KX site will be continuously updated with new tools and projects regarding food supply systems, water quality, farm stress, and more.</p>

	<p>Prior to the official site kickoff in October 2020, on April 7, KX stepped up to the challenge of helping to disseminate science-based information and research on COVID-19 from The Ohio State University College of Food, Agricultural, and Environmental Sciences. In the first month the KX COVID-19 Hub saw 4,365 users visit the page for information ranging from state resources and protocols to a tip sheet on avoiding scams during the COVID-19 outbreak.</p>
<p>2. Methods to identify individuals and groups and brief explanation.</p>	<p>No updates to report.</p>
<p>3. Methods for collecting stakeholder input and brief explanation.</p>	<p>No updates to report.</p>
<p>4. A Statement of how the input will be considered and brief explanation of what you learned from your stakeholders.</p>	<p>No updates to report.</p>

IV. Critical Issues Table of Contents

No.	Critical Issues in order of appearance in Table V. Activities and Accomplishments
1.	Health and Wellness
2.	Economic Vitality
3.	Food Security and Production
4.	Environmental Quality and Sustainability
5.	Thriving Across the Lifespan

V. Activities and Accomplishments

Please provide information for activities that represent the best work of your institution(s). In your outcome or impact statement, please include the following elements (in any order): 1) the issue and its significance (e.g. who cares and why); 2) a brief description of key activities undertaken to achieve the goals and objectives; 3) changes in knowledge, behavior, or condition resulting from the project or program’s activities; 4) who benefited and how. Please weave supporting data into the narrative.

No.	Project or Program Title	Outcome/Impact Statement	Critical Issue Name or No.
1.	Federal Nutrition Education Programs (EFNEP/SNAP-Ed)	<p>Issue: According to the State of Obesity 2020 report, 17.1% of youth ages 10-17 and 34.8% of adults were considered obese. Ohio is ranked 16th in the United States for overweight and obese adults. In 2020, 14.5% of people in Ohio were considered food insecure.</p> <p>What has been done: Since 1969, OSU Extension has implemented the EFNEP program and since 1996 it has been the sole implementing agency for the SNAP-Ed program. These two federal nutrition education programs are focused on teaching eligible audiences to choose and prepare foods of high nutrient value and manage food resources to decrease food security. Specifically, for youth obesity prevention, embracing comprehensive evidence-based strategies delivered through community-based education and public health approaches. SNAP-Ed implemented a social marketing campaign in 2019 called “Celebrate Your Plate” (CYP)</p> <p>Results: In 2020 by summer classes were offered online, in which 266,911 youth were reached through face-to-face and online nutrition education programs. Ninety-five percent (95%) reported improvement in diet quality, 85% report better food resource management practices, more than 50% of participants reported eating more fruits and vegetables. Also reported were significant pre/post increases in meal</p>	1. Health and Wellness

		planning, buying healthy foods on a budget and confidence that food will last through the month. CYP reported a reach of 3,596,720. Ohioans	
2.	Food Preservation	<p>Issue: Home food preservation remains an important and popular cultural activity. It is critical that those who practice preserving and processing foods at home have access to the most reliable information available concerning food safety and food quality. In 2019, the CDC FoodNet surveillance project reported 25,866 cases of domestically acquired foodborne illnesses. https://www.cdc.gov/mmwr/volumes/69/wr/mm6917a1.htm?s_cid=mm6917a1_w Understanding proper food preservation technique is critical to maintaining a safe home food supply.</p> <p>What has been done: OSU Extension’s home food preservation workshops focus on the science behind home food preservation so that everyone who cans or freezes fresh fruits and vegetables understands why certain procedures must be followed precisely to ensure a high-quality, safe product that they and their family can enjoy. Hands-on classes are offered across the state and typically address: • Basic food safety principles • Water-bath canner and pressure canner methods • Principles involved in canning tomatoes, pickling, and making jams and jellies • Methods for freezing fruits and vegetables • Reliable, research-backed resources from the U.S. Department of Agriculture, OSU Extension, and others. For 2020 these activities took place as a series of educational offerings.</p> <p>Results: In 2020, 2,684 community members took part in the OSU Extension Food preservation online classes: 93.8% reported that they plan to use something they learned in the classes.</p>	1. Health and Wellness
3.	Mental Health and Wellness- Trauma Informed Care	<p>Issue: Mental health awareness is an important issue for all educators and community members who engage the public, as they are often the first line of defense for their participants. Education professionals have recognized the impact that a participant’s mental health has on relationships, productivity, and achievement and they realize that there is a great deal that can be done to help people with mental health issues.</p> <p>What has been done: In 2018, OSU Extension had its first instructors certified to teach and train trainers in Mental Health First Aide (MHFA), in 2019, Trauma Informed Care (TIC) was added. OSU Extension obtained permission to teach TIC online early in 2020 and MHFA online later in 2020.</p> <p>Results: OSU Extension educators trained 89 TIC care instructors and provided 41 TIC classes to 884 participants</p>	1. Health and Wellness

<p>4.</p>	<p>The State of the American Refrigerator during COVID-19</p>	<p>Issue: Perhaps no phenomenon has so quickly and radically altered household food production, consumption, and daily food patterns as the onset and duration of the COVID-19 pandemic. the pandemic and its aftermath hold the potential to influence household skills and management practices in a manner that reduces day-to-day household food waste. Furthermore, knowing the immediate and longer-term implications of this public health crisis on consumer food waste could influence short and long-term policy outcomes and public information campaigns.</p> <p>Key activities undertaken to achieve the goals and objectives: In July of 2020, a group of researchers, led by Dr. Brian Roe, surveyed 500 people from around the country to gain insight into how eating at home had translated to other changes in American kitchens and if intentions to consume the food in refrigerators had risen as a result.</p> <p>Changes in knowledge, behavior, or condition resulting from the project or program’s activities: The July 2020 survey results showed that 58% of respondents reported cooking more frequently at home compared to the same period a year ago. About one-third reported fuller refrigerators and freezers since COVID-19’s onset. Over one-fourth added a refrigerator to their home since the onset of COVID-19, and more than 10% added a freezer. Almost 50% said that their cooking and food management levels have improved since COVID-19’s onset.</p> <p>Who benefited and how: Results from this study have been disseminated widely to the public, policy, and research communities. Dr. Roe’s “The Impact of COVID-19 on Consumer Food Waste” was published in the Applied Economics Perspectives & Policy’s special issue on COVID-19. He presented survey results this fall as part of The National Academies of Sciences, Engineering and Medicine’s virtual conference, “A Systems Approach to Reducing Consumer Food Waste, and during ReFED’s Better Together: Food System Best Practices for Navigating COVID-19. He has shared practical resources and recommendations to consumers through multiple media interviews, sharing online and mobile applications to help plan how to use food consumers have in their homes, encouraging consumers to scan household stocks of non-perishable shelf-stable items to donate or share items purchased in panic and further customizing contents of food boxes offered by local emergency food agencies to ensure a match to the preferences of patrons.</p>	<p>1. Health and Wellness</p>
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<p>5.</p>	<p>Focus on Pests to Improve Public and Animal Health</p>	<p>Issue: Insects and related species (e.g. ticks, mosquitoes) frequently bite humans and animals, which can facilitate the transmission of diseases such as West Nile Virus, encephalitis, and Lyme disease. These diseases, and the pests that carry them, are rapidly expanding across the globe, and even within Ohio. For example, Ohio cases of Lyme disease have increased over 500% since 2009. To manage these pests and their ability to spread disease, new control and monitoring tools, as well as improved communication and coordination with external agencies and the public, are needed.</p> <p>Key activities undertaken to achieve the goals and objectives: Researchers in the Department of Entomology investigated novel mechanisms for insect and pest control. Partnering with OSU Pharmacy, the team identified unique, medicinal chemicals from the Cinnamosma plant that are toxic and repellent against mosquitoes, outperforming most current insecticides (e.g. DEET). Such biological compounds could eventually replace harmful, synthetic insecticides. The team is also researching mosquito microbiomes in the hopes of identifying key microbial species that may improve pest control.</p> <p>Changes in knowledge, behavior, or condition resulting from the project or program’s activities: Results from this study prompted the creation of a new website called, “the Bite Site: https://u.osu.edu/bite/,” which includes updated information on key, medically important species such as bed bugs and ticks. The “Mystery Bugs and Bites” fact sheet, a product of this project, was the 5th most viewed in January 2021, and the Bed Bug Field Guide mobile app has >10,000 downloads.</p> <p>Who benefited and how: The team’s efforts have increased their understanding of how pests, diseases and the rapidly changing environment interact, and why it is vital for pest control and</p>	<p>1. Health and Wellness</p>

		decreasing disease transmission. Research and extension activities keep Ohioans and other stakeholders safe and lessen disease risk to pets and livestock. The new, plant-based chemicals have the potential to protect people from mosquitoes that transmit Zika virus and other mosquito-borne diseases, such as malaria, dengue fever, West Nile fever, and chikungunya fever, which collectively debilitate the health and well-being of hundreds of millions of people around the globe each year. The research team’s “Mystery Bugs and Bites” fact sheet was the fifth most viewed in January 2021, and the Bed Bug Field Guide mobile app has >10,000 downloads.	
6.	Community Economics: Ohio Business Retention and Expansion Program (BRE)	<p>Communities that actively implement an on-going BRE program focusing on the retention and expansion of local businesses will:</p> <ul style="list-style-type: none"> • Improve the business climate of the community • Help to make local businesses remain competitive • Increase employment • Stabilize the local economy <p>The Ohio Business Retention & Expansion Program provides the resources, training, and tools to develop the capacity of the community to better understand its economy. In addition to enhanced community capacity to address critical community issues, other outcomes of such community engagement include a streamlined BR&E process that enables local leaders to focus on planning, action and results; a database of local information; and a more robust local economy.</p> <p>To help local leaders gain a better understanding of issues related to their economy, the Ohio Business Retention and Expansion (BRE) program provides a structured approach to assessing and addressing business needs. Community input was collected and compiled and formatted as a reference to better inform local decision making.</p> <p>In 2020, there were four community surveys and one regional survey conducted. Combined and as a result of the program, 12 new business plans were developed, 178 fulltime jobs were created, and more than 3800 jobs were retained.</p> <p>One participant noted: <i>‘We had a prospect who was looking into constructing a new building. However, he’d heard mixed reviews about our Planning Process. I showed him our most recent survey findings so he could see how our Planning Process was rated by the business community. He indicated that the information was helpful and at this time it looks like he is going ahead with the project.’</i></p> <p>Participants also indicated an improved working relationship because of meeting more regularly to discuss community and economic development issues.</p>	2. Economic Vitality
7.	Agricultural Lender Seminars	<p>Issue (Who cares and Why)</p> <p>Farm operators need access to financial support and borrowing to purchase farm assets and to purchase annual operational expenses. Agricultural lenders across</p>	2. Economic Vitality

		<p>Ohio are part of the Federal Farm Credit System and include Farm Credit, Ag Credit, local community banks, local credit unions, and the USDA Farm Service Agency. In 2019, Ohio had 77,800 farms with 13.6 million acres engaged in production with a state net farm income of nearly \$1.275 Billion. Ohio ranks #16 in the U.S. for gross receipts of farms at \$9.437 Billion in 2019. Nationally the farm Debt-to-Asset ratio forecast for 2020 is at 13.84, up 17% from 2014 (approximately 2.8% increase per year between 2014 and 2020F). Nationally in 2020, total farm debt (real estate and nonreal estate, \$418.6 Billion) is secured and supported by the Federal Farm Credit System (43%), Commercial Banks (40%), and Individuals and others (17%). Source: https://www.ers.usda.gov/data-products/farm-income-and-wealth-statistics/ As of 2019, average farm equity (net worth) of Ohio major farms was \$970,304 with \$1,032,046 in farm assets and \$61,742 in farm liabilities. Ohio farmers paid \$200 million in interest expenses in 2019. Agricultural lenders provide products, service and credit to Ohio’s farmers and are strategically positioned to disseminate knowledge and resources from the land-grant university/cooperative Extension service. Source: Ani Katchova, Ohio State; College of Food, Agricultural, and Environmental Sciences; Department of Agricultural, Environmental, and Development Economics (AEDE); USDA ARMS data files</p> <p>What has been done Ohio State University Extension established annual seminars specifically to educate professional agricultural lenders, USDA FSA loan officers and analysts. The planning is dedicated to identifying the needs of lenders and building a team of instructors to deliver current, relevant, and research-based information and tools. The information taught and relationships built with land-grant university Extension professionals adds value to Ohio’s agricultural lending industry. In 2020, the Ag Lender Seminar was a virtual webinar that attracted 83 agricultural lenders and industry professionals to a compact, half-day seminar. The seminars appeal to the professional development needs of lenders throughout their career. Attendance at the Ag Lender seminars has been observed: first timers (31%), 2 to 10 times (37%), 11-20 times (19%), and 20+ times (13%). The audience was 70% male (n=58) and 30% female (n=25). The percentage of the lender customers was: grain farms (43%), dairy/livestock farms (10%), grain and livestock farms (19%), specialty crop farms (4%), small and beginning farms (11%), rural housing (6%), and agri-business (7%).</p> <p>Results Lenders have reported knowledge gained with before and after, self-reported data that showed 14% to 31% increases in knowledge on topics and issues taught at OSU Extension Ag Lender Seminars. Knowledge gained will be used by lenders in three</p>	
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		<p>ways; directly by the lender with clientele, in-directly by the lender to process clientele applications and portfolio management, and as professional development for the lender. Most lenders will directly use these seminar topics with clientele: grain prices and farm policy (72%), Growing Customer Relations (59%), and Crop Inputs/Margins, Land values/rents and custom rates (74%). Many lenders will also use these seminar topics as professional development: US Ag and Financial Conditions (47%) and Niche/Small Farms Legal Issues (61%). Lenders provide positive feedback and input to OSU Extension on developing future seminars and continuing with Extension tools and resources online and through the county Extension office system. It is estimated that reaching 83 Ag Lenders in the OSU Extension seminars will have a multiplier effect and ultimately reach 8,217 farm clientele.</p>	
<p>8.</p>	<p>OSU Income Tax Schools / Tax Education</p>	<p>Issue A complex income tax code and associated income tax issues creates many educational opportunities in Ohio. The legislation passed addressing COVID-19 has created additional need for income tax education among farmers and tax professionals. The Ohio State University Income Tax School Program began 57 years ago as an effort to provide education for rural tax professionals, farmers and others affected by tax laws and changes. Continuing educational credits are offered for most of the income tax programs and are designed to meet requirements of clientele throughout Ohio. These programs target tax practitioners including certified public accountants (CPAs), enrolled agents (EAs), attorneys and other tax professionals who have ongoing continuing education requirements. In addition to addressing income tax, farm business owners have specific tax planning and filing needs, which calls for specific tax education. Issues surrounding property tax, sales tax and estate tax also call for extensive expertise in these areas.</p> <p>What was done OSU Extension offers two-day Tax Schools for Professionals throughout Ohio designed for tax practitioners with some experience preparing and filing federal tax returns for individuals and small businesses. Instruction focuses on tax law changes and on problems that they face in preparing tax returns. Highly qualified instructors explain and interpret tax regulations and recent changes in tax laws. These two-day schools offer continuing education credit for attorneys, CPAs, EAs and CFPs, and other tax return preparers. Due to pandemic restrictions limiting in-school attendance, OSU Extension offered its first virtual tax schools. One four-part webinar series and one two-day webinar were presented along with four in-person tax schools being held across Ohio with limited</p>	<p>2. Economic Vitality</p>

		<p>attendance. An accompanying webinar addressing tax professional ethics was also held to complement this program.</p> <p>An annual Agricultural Tax Issues Webinar is held for tax professionals and individuals interested in in-depth tax information focused on agricultural issues. The Agricultural and Natural Resources Income Tax Webinar is a six-hour live webinar geared for farm tax preparers and farmers who prepare their own taxes. This webinar also offers continuing educational credits. Our Farmer and Farmland Owner Webinar is also offered for farmers and farmland owners who prepare their own taxes or want to learn more about their farm taxes.</p> <p><i>Numerous Farmer Tax Schools and Policy and Outlook Meetings</i></p> <p>Our team provides one-on-one consultations with tax practitioners and individuals in the areas of income tax, property tax, sales tax, estate tax and other associated information. CFAES faculty and staff continue to work through professional development and research to meet the needs of clientele with difficult tax related questions.</p> <p>Results</p> <p>Attendance at the educational programs was 564 for the two-day Tax Schools for Professionals, 169 for the Ag Tax Issues Webinar, 260 for the Ethics Webinars, 64 for the for the Farmer and Farmland Owner Webinar and 203 for the Summer Income Tax Update. Attendees filed 179,547 federal tax returns in 2020 which included 14,501 farm tax returns (Schedule Fs). Participants were asked “whether they would attend again” ranked on a scale of 1 to 3 with 1 = Likely, 2 = Maybe and 3 = Unlikely. The average ranking was 1.12. Participants were asked if “stated learning objectives were met” ranked on a scale of 1 to 5 with 5 = highest. The average ranking was 4.69.</p> <p>The team taught 32 additional sessions (virtual and in-person) for ag lenders and farm audiences through seminars, workshops and outlook meetings reaching over 1200 participants. Evaluation results showed substantial gains in knowledge by the participants.</p>	
<p>9.</p>	<p>Small Farm Program</p>	<p>Issue</p> <p>The Small Farm program across Ohio, sees many landowners seeking ways to create income from new and small farms. Some will consider traditional farming enterprises while others are interested in pursuing the production of alternative and non-traditional land uses.</p> <p>The target audience consists of Landowners seeking to diversify larger operations and to provide opportunities for easier transition to the next generation of farm managers and small acreage owners who are looking for production practices conducive to small scale production.</p>	<p>2. Economic Vitality</p>

		<p>What was done In 2020, three Small Farm Colleges were planned for Miami, Licking, and Ross Counties and one conference, “Sowing Seeds for Success”, was planned to be held at the Ohio State Mansfield campus in late March. Two colleges were completed in Miami and Licking Counties with Ross County College canceled after seven of the eight weeks were completed due to COVID-19 restrictions. The “Sowing Seeds to Success” conference was completely ready to be held with more than 125 registrants but was canceled at the last minute due to COVID-19 restrictions. Other activities included a Small Farm segment of presentations during the OSU Extension 'AG Madness' Virtual event and the Small Farm Center virtual presentations during the virtual “Farm Science Review” in September.</p> <p>Results Seventy-six percent (76%) of the Small Farm College participants identified themselves as new clientele to Extension programming. 2020 College attendees indicated only 35% had some type of previous agricultural training, 37% do not have farming experience, 87% did not have a financial plan and 87% did not have a marketing plan. Participant surveys in the three colleges indicated 46% did not have an identified plan for using their land. Those responding to post evaluations, indicated 98 percent of the participants would recommend the program to others and 98% of the college participants felt they learned several new things and felt the program met or exceeded their expectations. Top motivational choices to owning their land were: lifestyle (82% of respondents), earn a living (46% of respondents) and retirement (35% of respondents). As a result of attending one of the two Small Farm Colleges, post-program surveys indicated 77% of the participants developed or changed their farm use plan after attending these colleges, while 87% indicated they received the necessary tools to develop a ‘whole farm business plan’.</p>	
<p>10.</p>	<p>Helping Producers Weigh Economics and Considerations Between ARC and PLC</p>	<p>The issue and its significance (e.g. who cares and why): The passage of The Agricultural Improvement Act of 2018 (The 2018 Farm Bill) meant Ohio’s 231,274 registered Farm Service Agency (FSA) farms faced many complicated decisions regarding commodity programs and crop insurance. Making the right decisions concerning which farm program payments to elect can make the difference in a farm surviving another year. To help producers understand their choices between the Agriculture Risk Coverage (ARC) and Price Loss Coverage (PLC) programs, AEDE partnered with OSU Extension and the Ohio Farm Service Agency (FSA) to deliver education, trainings, and online decision tools.</p> <p>Key activities undertaken to achieve the goals and objectives:</p>	<p>2. Economic Vitality</p>

		<p>The team developed outreach opportunities to educate Ohio producers, landowners, and Agribusinesses about FSA commodity programs. They also worked with leading agricultural research institutions to develop online decision tools that simulated alternative price, market, and yield scenarios, which producers could use to analyze risk, program performance, and practically apply information. An educational webinar held on December 1, 2020 was attended by 274 participants; after the event, hundreds of stakeholders accessed the slides and recordings. These efforts assisted farmers and producers in effectively mitigating production and financial risks associated with their operations.</p> <p>Changes in knowledge, behavior, or condition resulting from the project or program’s activities: In 2020, the decision tools were accessed and downloaded by 9,290 users. The Farm Bill webpage had 5,138 views. Experts conducted 100’s of one-on-one consultations with farm management and OSU Extension staff. 57% of surveyed participants reported plans to use the decision tools to assess their options after attending a program and 97% of respondents said they gained additional knowledge related to commodity program selection. 8 out of 10 attendees said that the webinar directly influenced their decision and that they were somewhat likely or extremely likely to take action as a result of the information learned.</p> <p>Who benefited and how: The delivery of information in a digestible way through hands-on learning helped producers, extension agents, agricultural lenders and other stakeholders make informed decisions to better their operations and businesses.</p>	
<p>11.</p>	<p>Addressing Ohio Grape and Wine Industry Needs During the COVID-19 Pandemic</p>	<p>Issue: The Ohio wine grape industry produces over 1,500 acres of wine grapes and generates more than \$1.3 billion in economic impact. One major constraint on the industry is that grape supply lags winery demands due to climate, labor, and economic factors. Additionally, many individuals joining the industry lack the background necessary to scale commercial operations while maintaining quality standards. The OSU Enology and Viticulture Extension program (EVET) provides annual educational programming and one-on-one consultations to solve many of the challenges faced by new and veteran industry members.</p> <p>Key activities undertaken to achieve the goals and objectives: The EVET adapted to a remote learning format throughout the 2020 pandemic which led to: an expansion of recorded webinar opportunities, improvement in</p>	<p>2. Economic Vitality</p>

		<p>communication timeliness by adopting a new blog and newsletter format, one-on-one virtual vineyard visits, and a multi-day virtual annual wine industry conference. The team also published wine and grape production factsheets and guides. To address grape acreage expansion, the EVET in collaboration with Ohio Grape Industries Committee (OGIC) renewed the Vineyard Expansion Assistance Program (VEAP) in 2020, which provides up to \$3,000 per acre for up to 3 acres to install new vineyards.</p> <p>Changes in knowledge, behavior, or condition resulting from the project or program's activities: In 2020, the team delivered 15 workshops and conducted 121 site consultations. Under travel restrictions, remote communication with stakeholders increased substantially and the EVET produced 9 blog posts, 10 newsletters, 2 factsheets, 1 spray guide, 4 annual fruit maturity updates, and organized the creation and editing of 2 new production guide bulletins to be published in 2021.</p> <p>Who benefited and how: While limitations were posed by the COVID-19 pandemic, the OSU EVET continued to deliver research-based extension programming that reached a wide audience and significantly contributed to enhancing the production quality of Ohio's grapes and wine industry. In 2020, the team delivered a total of 15 workshops (10 webinars; averaged 45 participants per event) and conducted 121 site consultations (94 conducted remotely via Zoom or phone). The EVET produced 9 blog posts, 10 newsletters, 2 factsheets, 1 spray guide, 4 annual fruit maturity updates, and organized the creation and editing of 2 new production guide bulletins to be published in 2021. These documents hosted by the Ohio Buckeye Appellation Website were visited over 8,500 times in 2020. The co-organization of the 2020 and 2021 Ohio Grape and Wine Conference (OGWC) added to the team's outreach and was attended by a record 280 (in-person) and 330 (online) individuals. The EVET oversaw the VEAP evaluations for 27 applicants, 14 of whom were funded, resulting in planting for 28 new vineyard acres across Ohio. This new vineyard acreage will result in an estimated \$615,000 contribution to the economic impact of the Ohio grape and wine industry.</p>	
<p>12.</p>	<p>Building Consensus and Assessing Feasibility of Food Growing and Processing in Lima, OH</p>	<p>The project was an effective reuse of vacant land planned in collaboration with a dozen stakeholders who reached consensus to develop and implement the South Jackson Community Gardens project. Stakeholders met 37 times between 2017-2020 to reach consensus on the scope, timeline and continued management of the project. Commitments ranged from funding to programming expertise to project management. The final project is to design and build a model urban garden and</p>	<p>3. Food Security and Production</p>

		<p>community space for food and health-related entrepreneurial activities. The space will provide wellness programming and opportunities for residents.</p> <p>From December 2018 through December 2020, the focus was to implement the project plan. Stakeholders held a final planning meeting in December 2018 to develop a timeline and identify who would be responsible to do what. Tasks included scheduling and publishing events, developing a timeline for excavation and construction, and developing a master list of programs that would be conducted at the site. The first step, to complete and execute a lease agreement between the City and Chamber, was completed by Spring, 2019. While this was being accomplished, OSU Extension CD and the Knowlton School faculty designed and developed site and construction plans. Plans were shared and revised during group and one-on-one stakeholder meetings that occurred between January and May.</p> <p>Following plan development, beginning May 31 2019, five “Final Friday” and two separate planting events were held to engage the community and to build neighborhood support. Poster boards of the site plan were posted during these events. Over 200 community members attended, with 7 neighbors volunteering to take leadership roles in supporting the project. In addition to learning about how the site would be developed, neighbors participated in a variety of programs and activities, food giveaways and fun. Extensive excavation and planting of trees and grasses was completed in August/September 2019.</p> <p>During 2020, despite the pandemic, stakeholders and community members rallied to complete the garden, including building of 12 raised planting beds, constructing a shed and planting the first crops. Following COVID safety guidelines, a group of between 5-10 volunteers met and worked at the site 17 times over the course of the 2020 growing season, while building a deeper alliance with the area neighborhood. A unifying event in September 2020 brought city leaders, including the Chief of Staff, food distribution services and over 30 neighbor and community volunteers together to celebrate the gardens’ successful completion and to harvest the vegetables.</p> <p>The stakeholders continued meeting virtually monthly during 2020 to plan for future sustainability of the gardens. A strategic plan was developed that included transitioning the project to the Chamber Foundation and Activate Allen County, hiring a seasonal site coordinator, and scheduling regular educational events at the site. Almost \$20k in remaining project funds are now dedicated to support the new position and to implement the plan during 2021. The stakeholders also plan to leverage future funds using the Chamber Foundation 501c3 status to retain the position into the future. Significant research outcomes also resulted from the project, including publishing a book chapter case study.</p>	
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<p>13.</p>	<p>eFields Program</p>	<p>Issue: In 2017, the Digital Agriculture team decided to initiate a new on-farm research effort that was named eFields. The twenty-person team included county educators, field specialists, students and on-campus faculty. eFields is an Ohio State program dedicated to advancing production agriculture using field-scale research. This program utilizes modern technologies and information to conduct on-farm studies with an educational and demonstration component used to help farmers and their advisors understand how new practices and techniques can improve farm efficiency and profitability. The program is also dedicated to delivering timely and relevant, data-driven, actionable information.</p> <p>What has been done: During its first year (2017), a total of 45 studies were conducted in 14 counties with 39 partnering farms that also included 21 industry partners, which supported various projects. The eFields project has continued to expand since 2017. In 2020, the eFields report included 218 studies, 107 farm collaborators, 55 industry partners, and 65 Ohio State investigators. Projects covered seven focus areas: precision seeding, precision nutrient management, precision crop management, soil compaction, remote sensing, forages and data analysis and management. Results from all four years are provided to stakeholders as a printed report and also as an online publication available at https://digitalag.osu.edu/efields The annual report highlights how technology and input management decisions can improve Ohio crop production. The information from the 2019 eFields report was distributed through more than 6,000 printed copies plus more than 7,000 interactions with the e-version. So far in 2021, 3,400 printed copies of the 2020 report have been distributed with more than 3,500 interactions for the e-version. Distribution and viewing included more than 40 US states and 38 additional international countries.</p> <p>Results: The eFields program has expanded on-farm research across the state and strengthened relationships between farm managers and Extension professionals. Key results included the soybean seeding rate studies, fertilizer management, and soil health studies. The soybean seeding rate results indicated farmers could plant less seed while maintaining yield with an optimum soybean seeding rate between 120,000 and 140,000 seeds/ac. Fertilizer results highlight the importance of application placement and timing. A soil health survey of 88 farm fields in Ohio has helped</p>	<p>3. Food Security and Production</p>

		<p>provide data for Ohio farmers to begin benchmarking soil health metrics and understanding how management practices impact soil health. Feedback from farmers and consultants has been excellent with suggestions on how to improve future programs and what studies farmers would like to see completed by Ohio State.</p>	
<p>14.</p>	<p>Women in Agriculture</p>	<p>Issue: “Annie’s Project” is a six-week program designed to address risk management education for farm women. In Ohio, events are organized by the “Women in Ag” team. Its objective is to educate women entrepreneurs so that they are more prepared to make farm management decisions. While many women own and operate farms, others play a major role in the decision-making process of farm operations for farm families. Annie’s Project provides in-depth sessions on topics that are important for decision-making on the family farm. The program topics covered include human resources, legal risks, financial risks, marketing risks, and production costs and risks. Sessions are designed to be interactive between the presenters and the participants, with information tailored to the needs of the participants.</p> <p>What was done:</p> <ul style="list-style-type: none"> • OSU Extension educators and state specialist meet once a month to discuss program ideas and upcoming educational events. • Ohio Women in Agriculture Display in the Farm Science Review Ag Management Area. Participants to the Farm Science Review (FSR) are from many demographic backgrounds and the women in agriculture displays provides an educational resource for participants to learn about educational opportunities across the state. Educational opportunities to help women learn, grow, connect, inspire and empower them to be better business owners and partners in agriculture. • The Tri-State Women in Agriculture Dinner and Program was a partnership with Purdue Extension Steuben County and Stoy Farms. Topics included Introduction to Annie’s Project, Managing Stress on the Farm, and Meal Prepping. • In 2020 at the Ohio Virtual Annie’s Project Reunion, alumni participated in an opening session and inspirational message. Three tracts of breakout sessions on Farm Management, Food, and Livestock. Breakout sessions include grain and livestock market updates, backyard poultry, food prep and preservation and more. 	<p>3. Food Security and Production</p>

		<p>Results: Farm Science Review results included 222 views, 19 clicks and 41 leads were documented on the “Map Your Show” site. Seven video presentations of successful women in agriculture in Ohio were recorded and uploaded to the show site and YouTube with 174 views. “Kitchen Table Conversations” occurred each day of the show with 64 registered participants. The three sessions were recorded and uploaded to YouTube with 25 online views.</p> <p>Tri-State Women in Agriculture Dinner and Program had 41 total participants. While the program is focused on women in agriculture, everyone is welcome to attend.</p> <p>Virtual Annie’s Project Reunion had 28 participants and 12 Extension educators were part of the reunion. Participants stated, “Annie’s Project is a great program to help bridge the gaps.” “Need for continued educational programs to help support the women in agriculture.” “I really enjoyed these sessions and getting to learn more about homesteading. I hope to get more involved with Ohio Women in Ag and Annie’s Project.”</p>	
<p>15.</p>	<p>Farm Succession Planning</p>	<p>Issue (who cares and why) Ohio producers farm more than 13.97 million acres and farming is the top economic industry in the state. As the average age of farm operators increases, transferring the ownership and management of the family business to the next generation will become one of the most important issues farm families will face in Ohio. The average age of the principal farm operator in Ohio is 57.7 years, up from 56.8 in 2012. While many farmers dream of seeing their legacy passed on to the next generation, many postpone initiating a plan for the transition of their business for a variety of reasons. Transferring a family farm or farm business to the next generation can be a challenging task. Legal issues, tax laws, and personal differences between family members are a few of the issues families must confront when transferring the managerial and asset control of a family business.</p> <p>What has been done? Given the aging farm population and the importance of agriculture in Ohio, farm management specialists are working to provide educational assistance to farm families through educational workshops, individual farm consultations, and educational materials. In 2020, OSU Extension offered two-day intensive “Passing on the Family Farm” workshops at targeted locations across Ohio. Additionally, the team provided shorter presentations at workshops, producer meetings and at state-wide conferences. Farm management specialists have continued their work in authoring</p>	<p>3. Food security and production</p>

		<p>farm transition publications including a “Farm Transition Matters” series for the National Agricultural Law Center funded by USDA National Agriculture Library.</p> <p>Results Even with all the in-person restrictions to programming due to the coronavirus pandemic, the OSU Extension Farm Succession Team offered 19 farm succession workshops and presentations with 538 individuals learning critical farm succession and estate planning principles. Ninety-eight percent (98%) of the attendees indicated they had increased their knowledge of farm succession as a result of their attendance. Eighty-five percent (85%) of the attendees at “Passing on the Farm” workshops did not have a farm succession plan with only 43% indicating that a successor had been identified. As a result of the workshop, 84.6% reported they would update their will as well as meet with an attorney. Only 19% of the farm families have held intergenerational family business meetings prior to attending the workshops; more than 76% indicated they will begin holding these meetings with an additional 15.3% indicating they may hold them in the future. More than 80% (83.4%) of the attendees indicated they would complete the OSU Extension “Getting Your Affairs in Order” document. Fourteen factsheets were developed as part of the “Farm Transition Matters” series. This series will be published in 2021.</p>	
<p>16.</p>	<p>Center for Foodborne Illness Research and Prevention</p>	<p>Issue: Addressing the food safety challenges of the 21st century requires an integrated, systems-based approach that is rooted in science and driven by risk. However, local, national, and international food safety stakeholders struggle with how to implement such an approach. Given its expertise and reputation, the Center for Foodborne Illness Research and Prevention (CFI) at Ohio State is positioned to make a significant contribution locally, nationally, and globally.</p> <p>Key activities undertaken to achieve the goals and objectives: The establishment of CFI at Ohio State addresses the need for synergy by fostering interdisciplinary collaborations and facilitating the translation of research into policy and practice. CFI regularly holds events to engage the community and disseminate information. CFI hosted a webinar on COVID-19 and food safety in honor of World Food Safety Day on June 7, 2020. Over 100 people from OSU, other academic institutions, government agencies, and the food industry came together to attend the event.</p>	<p>3. Food security and production</p>

		<p>Changes in knowledge, behavior, or condition resulting from the project or program’s activities: CFI’s objectives received strong financial support and had clear impacts for behavior and policy change. CFI obtained a \$3.4 million grant from the Gates Foundation and the UK Department for International Development for food safety work in Ethiopia. CFI was also awarded a total of \$110 thousand in funding from multiple sources to research prenatal mycotoxin exposure in Guatemala. CFI received a \$76 thousand OSU Team Science SEEDS Grant to develop methods to assess the public health impact of foodborne illness using electronic medical records.</p> <p>Who benefited and how: The risk-based framework developed in the Ethiopia project and results from the Guatemala project has the potential to inform food-safety policy and behavior in low- and middle-income countries (LMICs). The electronic medical records project directly impacts food safety by addressing limitations in current estimation methods, which can also be used to inform policy makers. CFI will continue to engage the food-safety expertise at Ohio State with the needs of local communities and state, federal, and international decision makers to prevent foodborne illness and protect public health.</p>	
<p>17.</p>	<p>Protecting Food Crops from Insects</p>	<p>Issue: Insects continuously threaten Ohio farm productivity. Many farmers have relied on traditional and modern (e.g., transgenic) insect control, yet some insects are now resistant to these tools, even transgenic crops. At least two of the most important pest species can now damage transgenic corn in Ohio, causing additional insecticidal application. Many of the insects in Ohio are invasive, and farmers require information and training to identify, monitor and manage them to limit yield losses. To successfully manage these pests and to ensure safer and more productive food supply, we need to coordinate and engage with many stakeholders, including farmers, federal agencies, and agricultural industry and commodity representatives. These stakeholders require improved management strategies supported by unbiased research.</p> <p>Key activities undertaken to achieve the goals and objectives: Farmers cannot control pests without knowing when they are present; therefore, the team expanded their insect trapping network. This network monitored more than 10 insect pests of corn (both field and sweet), soybean, wheat, fruits, and vegetables. Data was distributed through newsletters that reached state, regional and national stakeholders. By comparing trap numbers from past years, these data are helping understand impact of climate change on pest abundance and distribution.</p>	<p>3. Food security and production</p>

		<p>By collaborating with farmers, OSU Extension and agricultural industry, researchers studied the distribution of the invasive Asiatic garden beetle and compared the efficacy of several chemicals to control this pest. The team experimentally released natural enemies of the brown marmorated stink bug to help limit damage to fruits. This research is also identifying genetic mechanisms for insect resistance that can be eventually used for more rapid and accurate monitoring.</p> <p>Changes in knowledge, behavior, or condition resulting from the project or program's activities: Entomologists have improved and expanded efforts in engaging and communicating crop pest management guidelines. The team has distributed over 13,000 field guides and quick ID cards to help control stink bugs in soybean across Ohio and the Midwest. The quick ID/management card for the new invasive pest the soybean gall midge will reach over 130,000 stakeholders.</p> <p>Who benefited and how: With cooperation among OSU extension, agricultural industry, and other land-grant universities, corn growers afflicted with Asiatic garden beetle now have new tools to prevent damage. More fruit growers have requested participation in our natural enemy releases, thereby helping establish a more effective population. Growers changing tactics to control caterpillars in corn based on new information on insecticide and transgenic resistance.</p>	
18.	Farmland Owner's Guide to Solar Leasing	<p>While Photovoltaic (PV) solar energy production has a brief history in Ohio, "utility-scale" production is on the rise. As of February 2021, there were 34 large scale solar projects representing 6,220 megawatts (MW) of potential electric generation capacity submitted to the Ohio Power Siting Board (OPSB). The increasing development of utility-scale PV solar consumes massive tracts of land. Combined, the 34 projects currently submitted to the OPSB have an average footprint of 1,775 acres each, yielding a combined total of 60,337 acres for solar development. As a result of the new development trends, farmers across Ohio are now being approached to lease large tracks of ground for solar development.</p> <p>Although solar energy is "green" and "renewable," large scale solar energy development is not without conflict. Leasing land for a solar energy development raises both positive and negative implications for the land, family, farm operation, and community. Typically, lease agreements between solar energy developers and landowners require a long-term legal commitment of 25 years or more. This long-term action can require changes in a farm operation, remove a generation from the land, affect farmland availability and reuse, and alter the character of a community's</p>	4. Environmental Quality and Sustainability

		<p>landscape. On the other hand, leasing farmland for solar energy can satisfy demands for renewable energy, create economic stability for farmland owners, and generate revenue for a community.</p> <p>In order to help, Ohio State University Extension Community Development produced resources for agricultural landowners faced with decisions about leasing land for solar energy development. Legal and energy experts have developed a technical guide titled <i>Farmland Owner's Guide to Solar Leasing</i>. Using the technical guide as a primary resource, a two-hour outreach and education workshop was developed to help disseminate this critical information to farmers throughout Ohio. These resources aim to help farmland owners understand solar energy development activity, the solar energy leasing process, and the language and terms they will encounter in a solar lease.</p> <p>The <i>Farmland Owner's Guide to Solar Leasing</i> publication was made available to the public in August 2019 as a free download on the OSU Extension Farm Office and Energize Ohio websites. The publication was featured by OSU CFAES News Tips and Ohio's Country Journal. To date, we have delivered 14 workshops on solar leasing reaching 551 participants. Of the 52 completed program evaluations, 87% indicated that they found the workshop valuable and will use the information presented while making future decisions on utility scale solar development. In addition, the OSU Extension utility scale solar energy development webpage experienced 455 unique viewers who spent an average of 8 minutes and 27 seconds on the webpage. In 2020 (?) the <i>Farmland Owner's Guide to Solar Leasing</i> bulletin has also received 478 additional downloads. In addition, Community Development educators and field specialists have presented three solar leasing sessions at Farm Science Review and distributed more than 200 additional copies of the publication.</p>	
<p>19.</p>	<p>Pesticide Safety Education Program (PSEP)</p>	<p>Issue Pesticide application businesses, public agencies, and farms need to manage pests safely and effectively. Employers need employees who are licensed, trained in best management practices, and current with state and federal regulations. The commercial and private pesticide applicators require continuing education to maintain their license and livelihoods.</p> <p>What was done Pesticide Safety Education Programs (PSEP) offered pesticide exam preparation workshops to 354 new commercial pesticide applicators. Continuing education programs were provided to 4238 commercial pesticide applicators to assist them in meeting requirements under Ohio pesticide law. Approximately 25 state Extension specialists and county educators contributed their expertise to the recertification programs.</p>	<p>4. Environmental Quality and Sustainability</p>

		<p>Through recertification programs, PSEP provided research-based recommendations and best practices training for commercial applicators. PSEP also provided in-service training and teaching resources for county educators to help them prepare for county pesticide applicator meetings; approximately 3200 private applicators recertified through participation in more than 100 county meetings in 2020. Another 253 private applicators recertified online.</p> <p>Results Commercial applicators attending recertification programs agreed they had learned how to control pests more effectively (87%) and were better informed how to comply with pesticide and environmental regulations (91%). For those attending county meetings, more than 92% agreed they had learned how to apply pesticides more safely, had improved practices to protect the environment, and controlled pests more effectively. Each private and commercial applicator attending in-person recertification programs in 2020 received an OSU Extension publication with current pest management recommendations.</p>	
<p>20.</p>	<p>Nutrient Management</p>	<p>Issue A productive crop production system often requires the addition of inorganic or organic-sourced nutrients to supplement the soil available nutrient pools. Yet nitrogen and phosphorus leaving the soil system, with excess precipitation through surface or tile drainage, can enter streams resulting in eutrophication of water bodies. Under some environmental conditions, the predominate eutrophication species are cyanobacteria that can produce harmful liver toxins, which must be treated by water treatment plants before distribution. Economic considerations in nutrient management occur both at the farm where excess nutrients not used during the growing season can be an unrecoverable cost and to society where the ecosystem impacts of eutrophication have associated costs. Implementation of “4R nutrient management” on the farm can mitigate soil nutrient exposed to offsite transport.</p> <p>What has been done Applied research projects have been conducted across the state to document the agronomic and economic outcomes of 4R practices at the local level with farmer cooperators and add to the Land Grant University (LGU) databases used to generate nutrient recommendations. Water quality outcomes of practices are being measured in cooperation with USDA-ARS, Soil Drainage Unit to document water quality impacts of 4R practices. Outreach programming has taken agronomic, economic and water quality impacts to the agricultural industry to promote better nutrient management practices. In 2020, the publication of the “Tri-State Fertilizer Recommendations for Corn, Soybean, Wheat and Alfalfa, 2020” that provides lime, nitrogen, phosphorus</p>	<p>4. Environmental Quality and Sustainability</p>

		<p>and potassium recommendations covering rate, timing and placement was released. Support was provided to NRCS in the revision of the 590 Standard.</p> <p>Results Applied research on 4R nutrient management was conducted on 26 on-farm sites and 3 research stations with 65 field projects focused on evaluating 4R nutrient stewardship principals including rate, placement and timing using commercial fertilizers and manure sources. Agronomic, economic and water quality outcomes were shared through agronomy, fertilizer certification, nutrient management, and other meeting formats to 13,125 participants. Additional nutrient management outreach occurs via printed materials and outreach through the Crop Observation and Recommendation Network Newsletter distributed by email weekly to 5,100 recipients and has another 26,000 web visits monthly. Fertilizer Certification program participants were surveyed on changes they have made to phosphorus fertilization rates used on their farm compared to LGU recommended rates. Survey respondents reported that 63% have newly adopting LGU rates of phosphorus fertilizer as result of the training (25% were already using LGU rates) resulting in 88% of participants now using LGU phosphorus recommendations.</p>	
<p>21.</p>	<p>Managing Ohio's Forest Resources</p>	<p>Issue: Ohio has nearly 8 million acres of forest land. Maintaining the health of the forests is critical for sustaining biodiversity, wildlife habitat, and supporting over 120,000 jobs in Ohio's \$10 billion forest products industry. Invasion of non-native insects, diseases and plants, land use change, the absence of natural fires, and natural aging have caused major changes in the species composition and structure of Ohio's forests. The future of the forests depends on gaining a deeper understanding of these changes and successful development and implementation of management strategies to reverse them.</p> <p>Key activities undertaken to achieve the goals and objectives: Researchers have pioneered new approaches including managing some forests in an early successional state; developing "soft" habitat edges along maturing woodlots for wildlife; and educating landowners on managing forests under changing climate conditions. The team has provided research and teaching on the importance of urban forests as part of larger ecosystems and conducted research to better understand drivers of forest management decisions. The Ohio Woodland Stewards Program provides workshops and materials to meet the educational needs of Ohio's private woodland owners, as well as public agency and NGO forest managers.</p>	<p>4. Environmental Quality and Sustainability</p>

		<p>Changes in knowledge, behavior, or condition resulting from the project or program’s activities: As part of the National Bobwhite Conservation Initiative, this research was used to develop wildlife habitat incentives for private-woodland owners. OSU also collaborated with the U.S. Forest Service and others to help recover and sustain Ohio’s critical oak forests and worked with urban forest managers to restore riparian forests. Information about understory plants and guidance about planned disturbances has allowed forest managers to better identify and anticipate changes in forest composition and non-native invasive species encroachment patterns.</p> <p>Who benefited and how: The Woodland Stewards workshops on non-native invasive species has trained 2,589 natural resource professionals and over 9,815 landowners. A smart phone app, developed as a result of this research, is being utilized, by citizen scientist and professionals, to track Ohio’s new invasive insect threat, the spotted lanternfly and its host plant. The work of the research team has documented the contribution forests make to the state’s economy, leading to greater public and private support for this important sector.</p>	
<p>22.</p>	<p>Protecting Ohio’s Water Resources</p>	<p>Issue: Ohio’s water resources provide a wide range of important services including drinking water and irrigation, power, fisheries, scenic value and recreation, and ecosystem functions. Changes in population, land use, and climate have compromised water quality, fragmented habitats, and contributed to loss of biodiversity in streams, rivers, and wetlands, often with serious effects on environmental condition and human health. New and emerging contaminants, such as microplastics and pathogens, also threaten aquatic ecosystem integrity. These and other environmental stressors must be addressed to sustain and improve the water quality that is vital to Ohio’s quality of life, economy, and environment.</p> <p>Key activities undertaken to achieve the goals and objectives: In 2020, researchers used their multidisciplinary expertise in aquatic and soil sciences, sociology, and decision science to engage in research, extension and outreach activities via the Ohio Certified Volunteer Naturalist Program, Aquatic Ecosystems Extension Program, and the Shiermeier Olentangy River Wetland Research Park (ORWRP) to advance three goals:</p> <ol style="list-style-type: none"> 1.) Reduce Nutrient Loads: The team used surveys and instrumented fields to understand farmer conservation decisions and their impact on water quality and used this knowledge to develop decision-support tools. 	<p>4. Environmental Quality and Sustainability</p>

		<p>2.) Restore Impaired Ecosystems: Researchers monitored urban streams for the impacts of invasive species, artificial lighting, and contaminants on aquatic biodiversity and water quality, and documented the effects of restoration efforts on coastal wetlands.</p> <p>3.) Protect Biodiversity: To help restore extirpated/endangered populations in Ohio rivers and wetlands, OSU raised and conducted translocations of rare fish species.</p> <p>Changes in knowledge, behavior, or condition resulting from the project or program’s activities: The research team finalized the revised Ohio Phosphorus Risk Index (On-Field Ohio!), an online tool that was incorporated into new USDA standards to guide Ohio farmers to reduce erosion and phosphorus losses. Results of the farmer conservation behavior research were used by the governor’s office to design strategies to reduce runoff into Lake Erie and contributed to a major workshop on nitrogen held by the National Academies of Science. The team also coordinated Ohio’s aquatic invasive species committee and represented the state on the NC Algal Bloom Action Team. OSU conducted new research and modeling to extend the work to the Ohio River watershed.</p> <p>Who benefited and how: Researchers continued to provide expertise related to the local and national impacts of changes to the Clean Water Act. This work increased the knowledge and skills of students, managers, scientists, and stakeholders engaged in water protection. The ORWRP hosted or participated in 41 activities in 2020, engaging 1,300 OSU students, staff, and community members in classes, trainings, service projects, and retreats. Online outreach was expanded to include weekly zoom clinics for pond owners, the Well Water Interpretation Tool was visited more than 11,000 times, and educational programs about aquatic invasive species reached over 11,000 individuals.</p>	
23.	Real Money. Real World.	<p>Issue: One of the most important life skills young people will need to succeed as adults is resourceful money management.</p> <p>What has been done: In 2020, a new, updated “Real Money. Real World.” curriculum was released and in early 2021 an online version will be released. OSU Extension developed the “Real Money. Real World.” curriculum designed to: 1) increase youth awareness of how education level and corresponding career choice influence personal income and financial security; 2) increase youth knowledge of money management tools used in daily spending for cost-of-living decisions; and 3)</p>	5. Thriving Across the Lifespan

		<p>increase youth awareness of how income and lifestyle choices affect the amount of money available for discretionary spending. Middle and high school age youth learn basic money management practices in the classroom and then make simulated lifestyle and budget choices through a spending simulation. During the spending simulation, students assume the role of a 27-year-old adult. They receive an occupation, monthly salary, and the number of children they are to raise. Community volunteers staff booths that represent actual businesses in the community.</p> <p>Results: In 2020, 805 youth participated in RMRW through March of 2020. Nearly 75 percent (74.2%) reported a positive change in understanding deductions taken from paycheck; 63.4% reported a positive change in understanding the costs to maintain a household.</p>	
24.	Successful Co-parenting	<p>Issue: When parents divorce, the children often pay the highest price. Of the approximately 40,000 marriages that break up in Ohio each year, more than 45% involve minor children. Co-parenting allows a child or children to have a secure upbringing without conflict of interest. Co-parenting enables the child or children of divorce to maintain a healthy close relationship with both parents.</p> <p>What has been done: Family and Consumer Sciences' Successful Co-Parenting is a face-to-face two- to three-hour class designed to equip parents with the knowledge, skills, tools, awareness and strategies to help their children adjust to divorce now and in the future. A new addition in late 2019 was the introduction of an online format for the class.</p> <p>Results: In 2020, 391 participants took part in the program. Ninety-three percent (93%) of participants report being more prepared to co-parent as a result of the program; 97.4% report learning new information and 99.4% plan to use the information that they learned.</p>	5. Thriving Across the Lifespan
25.	4-H CARTEENS Programming	<p>Issue: Inexperienced adolescent drivers sometimes demonstrate risky driving behaviors that put themselves, their passengers, other motorists and personal property at risk. Educational programs are conducted for first-time teen traffic offenders in 4-H CARTEENS counties. Teens are assigned to the 4-H CARTEENS program through local court systems.</p> <p>What has been done: 4-H CARTEENS is a traffic safety program for juvenile traffic offenders conducted by 4-H teen leaders and program partners, including local law enforcement officers. The "CAR" in CARTEENS stands for "Caution And Responsibility", and "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,</p>	5. Thriving Across the Lifespan

		<p>consequences of unsafe decisions, dealing with peer pressure, understanding traffic laws, and recognizing and reacting to traffic signs and signals.</p> <p>Results: Results from the retrospective pre-post assessment instrument for 2020 CARTEENS programs show a positive change in knowledge and behavior from the pre to the post assessment, included the following percentages for the respective statements:</p> <ul style="list-style-type: none"> • I know which Ohio laws govern teen drivers (52% increase) • I do not engage in distracting behavior while driving (43% increase) • I understand the relationship between vehicle speed and stopping distance (35% increase) • I think about my responsibility as a safe driver (41% increase) • I think about the consequences of engaging in risky driving behaviors (36% increase) • I adjust all things that might distract me (eating, cell phone, music) before I drive a car (45% increase) <p>In addition, 91% of the teen participants stated that the 4-H CARTEENS program is "Very" (61%) or "Somewhat" (30%) Likely to change their driving habits, and 90% agreed with the statement, "I am less likely to be a repeat traffic offender as a result of attending this CARTEENS program."</p>	
<p>26.</p>	<p>Assuring Quality Care for Animals</p>	<p>Issue: Knowledge of the science of genetics, nutrition, management, handling, and environment in relation to the youth's food animal projects plays a critical role in the success of producing safe and wholesome food products for consumers. By participating in learning activities designed to help ensure their food animals are well cared for and that their products are safe for consumers, junior fair exhibitors and their families will understand the important linkages among their responsibilities, obligations, public perceptions and consumer confidence in assuring well-cared-for animals and quality products. The Ohio Department of Agriculture (ODA) requires all youth exhibiting food animal projects to participate in quality assurance programming. OSU Extension provides leadership for implementing quality assurance programming in partnership with ODA, FFA and County Agricultural Societies' Senior Fair Boards.</p> <p>What has been done: Ohio State University Extension developed the Assuring Quality Care for Animals Youth QA Curriculum. Annual updates are created, and county QA adult coordinators/instructors are trained once every three years. Youth livestock exhibitors ages 8 to 11 annually participate in a face-to-face education session that is taught by</p>	<p>5. Thriving Across the Lifespan</p>

		<p>an authorized instructor. Those ages 12 to 19 annually complete an educational session or successfully complete a test-out option.</p> <p>Results: In 2020, 33,986 youth livestock exhibitors successfully completed QA training and 6,217 adult coordinators/instructors assisted with delivery of the QA programs.</p>	
27.	Ohio 4-H Youth Development and 4-H Volunteer Program	<p>The Ohio 4-H Youth Development Program enrolled 90,807 youth members in 2020. Of those, 63,909 participated in clubs, 18,619 were reached through school-based programming, and 800 participated in virtual camps. COVID-19 stay-at-home orders, and subsequent safety precautions dramatically reduced the reach of programming compared to 2019. Included here is a link to Ohio's 2020 4-H statistical infographic: http://go.osu.edu/OH4-H2020Stats</p> <p>Financial impact of Ohio's adult 4-H volunteer time contribution: Using an average of 10 hours per month of donated volunteer time for 2020, and a value of Ohio volunteer time at \$24.60/hour (2019 data, from the Independent Sector): 10 hours x 12 months = 120 hours/year 120 x \$24.60 = \$2952 per year per volunteer \$2952 x 13,102 adult 4-H volunteers = \$38,677,104 of donated time (as a point of comparison, NIFA funding for OSU Extension in 2020 was \$11,279,552)</p>	5. Thriving Across the Lifespan
28.	A Statewide Network for Multiple Pathways to a Baccalaureate Degree in Sustainable Agriculture	<p>Issue: Agricultural degree programs that align with gen Z's passion for alternative approaches to sustainable food and agricultural systems are in high demand, though many students cannot afford higher education. Ohio community colleges are responding to these needs with certificate and associate degree programs in sustainable and/or urban agriculture and food systems. For other majors, many students begin a degree at a community college and complete the program at an accredited university. Despite the opportunity to increase the flow of students toward agricultural degrees, no statewide networks of aligned sustainable agriculture programs existed between community colleges and land grant institutions in the US.</p> <p>Key activities undertaken to achieve the goals and objectives: Researchers created a statewide network among Ohio community colleges, 1890, and 1862 land grant universities. The team expects to impact knowledge and practice for sustainable agriculture education, increase the number and diversity of agricultural baccalaureate students, build knowledge in sustainable agriculture, especially in systems thinking and entrepreneurship, and prepare students for a wide range of possible careers from small business owners to sustainability officers for</p>	5. Thriving Across the Lifespan

		<p>large corporations. Six core instructional themes have been integrated into curricula: i.) Critical thinking; ii.) Foundational knowledge; iii.) Practical experience; iv.) Farm practical skills and STEM; v.) Entrepreneurship; and vi.) Leadership and Teamwork. Each of the institutions in the network address these themes in their sustainable agriculture programs, including a new major at The Ohio State University.</p> <p>Changes in knowledge, behavior, or condition resulting from the project or program's activities: This work will improve knowledge and practice regarding sustainable agriculture education, increase the number and diversity of students in agricultural certificate, AS and BS degree programs, grow the number of students who become entrepreneurs and establish their own farm-related businesses upon graduation, and satisfy a job market that demands individuals with a strong understanding of sustainable agriculture principles and practices. The integration of systems thinking, entrepreneurial and hands-on practical skills with formal classroom instruction is a novel approach that could be emulated in other programs focused on sustainability.</p> <p>Who benefited and how: This project represents the first partnership among Ohio educational institutions in sustainable agriculture education. It links certificate and associate degree programs that have recently been initiated or are currently planned and engages them in supporting students to move up to the next level, a baccalaureate program. The project takes advantage of current student interest in agricultural jobs and in food system development. The team anticipates additional institutions will join this collaboration over time, creating an innovative model that can be shared and expanded throughout the region and nation.</p>	
<p>29.</p>	<p>A Systematic Investigation into the Actions and Processes Which Foster and Sustain Adolescent Motivation in Formal and Non-Formal Educational and/or Positive Youth Development Settings</p>	<p>Issue: Engagement in Positive Youth Development (PYD) programs can benefit youth relationships and motivation, while decreasing delinquent behavior. Participants who are intrinsically motivated (IM) to join PYD programs experience sustained motivation and participation. Literature indicates PYD mixed with School Based Agricultural Education (SBAE) activities can support youth psychological needs. More research is needed to conceptualize best practices for supporting student psychological needs/motivation and SBAE teacher motivational beliefs to better understand how these beliefs are formed and influence motivational strategies used.</p>	<p>5. Thriving Across the Lifespan</p>

		<p>Key activities undertaken to achieve the goals and objectives: Phase I explores motivational beliefs of SBAE teachers and how beliefs influence student motivational process has been completed. Phase II focuses on substantiating The Process of Supporting Psychological Needs Within the SBAE program model. Phase II uses quantitative surveys to gauge youth motivational outcomes and qualitative field observations and teacher/student interviews to explore motivational strategies. Phase III and IV apply The Process of Supporting Psychological Needs Within the SBAE Program model to Career and Technical Education (CTE) and PYD programs. Since motivation is context-specific, it is essential to assess the application of The Process of Supporting Psychological Needs Within the SBAE Program model to PYD programs that do not exist within formal classroom settings.</p> <p>Changes in knowledge, behavior, or condition resulting from the project or program's activities: This research will build on the lacking literature base concerning the day-to-day actions and processes educators utilize to support youth motivation. Research findings will be used to secure future funding to expand the application of the motivational process model to PYD programs across the United States. Intended outcomes of this project are to (a) codify teachers' beliefs regarding student motivation, (b) develop a substantiated model which outlines the motivational processes which occur within PYD programs couched informal education settings, and (c) further apply a model which describes the motivational processes occurring within non-formal or community based PYD programs.</p> <p>Who benefited and how: Phase 1 results: School Based Agricultural Education teachers in Ohio and across the country. During this reporting period the conference publication and the podcast (product) was available for all teachers who wished to review it. The Owl Pellet Podcast had over 3200 social media followers to advertise and publish their podcasts Results can impact the motivational strategies and outcomes youth experience. In addition to the research, graduate students will be involved in the research process and will learn to conduct participatory research in the field. In Phase II graduate students will be included in conceptualizing the research design and conducting the data collection and data analyses to further enhance their ability to become sound, future independent researchers.</p>	
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