

FY 2020 Annual Report of Accomplishments and Results

Maryland
University of Maryland Eastern Shore
Submitted: Tracie Bishop

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)
In the past, the University of Maryland College Park and the University of Maryland Eastern Shore (UMES) submitted jointly the Report of Accomplishment. This is the first report submitted solely by the UMES Agricultural Experiment Station and Extension Program. The cooperative relationship in research and extension established over many years will continue but each institutions will report their accomplishments separately.

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
2. The <u>Scientific Peer Review Process</u>	No updates

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
1. Actions taken to seek stakeholder input that encouraged their participation with a brief explanation	No updates
2. Methods to identify individuals and groups and brief explanation.	No updates
3. Methods for collecting stakeholder input and brief explanation.	No updates
4. A Statement of how the input will be considered and brief explanation of what you learned from your stakeholders.	No updates

IV. Critical Issues Table of Contents

No.	Critical Issues in order of appearance in Table V. Activities and Accomplishments
1.	Food and Agriculture
2.	Climate Change
3.	Renewable Energy Resources
4.	Safe, Secure, Abundant Food Supply
5.	Human Health, Nutrition, & Wellness
6.	Environmental Stewardship
7.	Family & Community Resiliency

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.

University of Maryland Eastern Shore Agricultural Experiment Station (AES)
 University of Maryland Eastern Shore Extension Program (EP)

No.	Project or Program Title	Outcome/Impact Statement	Critical Issue Name or No.
1.	Evaluation of Soil Health Building Practices on Soil Quality and Yield of Specialty Crops Grown on the Delmarva Peninsula AES	Soil health is defined as i) the capacity of the soil to sustain biological activity, diversity, and productivity, ii) to sustain plant and animal productivity, iii) to maintain or enhance water and air quality, and iv) to promote plant and animal health. Soil microbes play a major role in soil health by influencing carbon transformations, nutrient cycling, soil structure maintenance, and the regulation of pests and diseases. The overall goal of this three-year project is to evaluate soil health management practices/strategies to improve yield and quality of specialty crops grown	Food and Agriculture (No. 1)

		<p>on the Delmarva Peninsula. The two core objectives to accomplish this are 1) Evaluate the effects of organic fertilizers and biostimulants on soil quality and crop yield, and 2) Evaluate the effects of cover crops and living mulches on soil quality and crop yield. The fall 2019 experiments with four fertilizer treatments (T1: Chemical Fertilizer (20-20-20); T2: Sea-Crop + Molasses; T3: Vermicompost Tea + Fish Emulsion (VCT + FE) + Molasses; T4: Poultry Litter Leachate (PLL) + Molasses), with four replications each were analyzed. Crop yield and soil biological activity, as measured by soil respiration rate (CO₂ release), was evaluated. Soil biological activity was evaluated the week after each fertilizer application. There was no significant difference in crop yield between the control and treatments for both studies. However, there was a significant difference in CO₂ release at each sample date. The CO₂ release for treatments 4 and 3 were significantly higher when compared to the other treatments. Therefore, treatments 4 and 3 will be utilized for the larger soil health study to confirm these findings. Experiments in 2020 were severely hampered by COVID-19 shutdown of labs and work in green houses.</p>	
<p>2.</p>	<p>Identification and Characterization of viruses infecting soybean (<i>Glycine max</i> L.) and lima bean (<i>Phaseolus Lunatus</i>) using Next Generation Sequencing in the Mid-Atlantic region of the United States AES</p>	<p>Plant diseases caused by fungi, oomycetes, bacteria and viruses are one of the main limiting factors affecting agriculture and food security worldwide. Among plant diseases, most new/emerging infectious diseases appear to be caused by plant viruses. Viruses undergo rapid mutations to cause new diseases, and therefore need constant surveillance. Identifying and characterizing new/emerging diseases is becoming more important as international trade of plant products increases and as trading partners seeks to protect themselves from the introduction of unwanted diseases. The emergence of fast and affordable next-generation sequencing (NGS) has been widely used to identify novel pathogens, allowing to promote plant health or preventing disease. This proposal aims to provide a comprehensive survey of viruses infecting the two important legume crops relevant to the Delmarva Peninsula (Delaware, Maryland, and Virginia) including soybean (<i>Glycine max</i> L.), and lima bean (<i>Phaseolus lunatus</i>). Throughout this proposal, soybean and lima bean samples showing virus and virus-like symptoms from fields will be collected throughout the</p>	<p>Food and Agriculture (No. 1)</p>

		<p>legume growing regions in Delmarva and neighboring states. The extracted RNA will be subjected to the NGS analysis for exploring the presence of virus and virus-like agents infecting soybean and lima bean in combination with other diagnostic methods in virology applicable to monitor virus infection in field surveys. We collected 138 soybean samples showing virus-like symptoms from different locations in Maryland, Delaware and Virginia from 2017 through 2020. Each sample has been treated individually and virus infections are initially assessed by Enzyme-Linked Immunosorbent Assay (ELISA). The samples showing a positive result in ELISA testing, are subjected to RNA isolation and reverse transcription polymerase chain reaction (RT-PCR) amplification using different combinations of primers. Our preliminary data has allowed us to identify the presence of several viruses including Alfalfa Mosaic Virus (AMV), Soybean Mosaic Virus (SMV), and Soybean Vein Necrosis Virus (SVNV). Among the identified viruses, SMV was the most commonly occurring virus, appearing in 20.51% of all samples analyzed to date. Additionally these positive samples, were not exclusive to a single source but were obtained from multiple locales around the region. The results from this study will help to identify predominant pathogenic viruses our region an assist in eliminating plant diseases.</p>	
<p>3.</p>	<p>Development of <i>Aronia Mitchurinii</i> as a specialty crop alternative for the Delmarva Region AES</p>	<p>We seek to develop a multidisciplinary area of research in horticultural phytochemistry focused on high-value alternative crops. The focus is on studying the impacts of cultural management (fertilization, pest management, etc.) practices along with processing conditions on the phytochemical and nutritional content of the <i>Aronia mitchurinii</i> (also known as black chokeberry) fruit. Our unique multifaceted research approach will link agricultural production research with detailed phytochemical analyses and food quality research. Integrating classic agricultural research, phytochemical and food technology training in the laboratory and University outreach settings, this program will facilitate the introduction of new, high-value specialty crops on the Delmarva Peninsula and other US areas. Strongly focused on multidisciplinary research, our goals are to: 1. Develop a horticultural phytochemistry research direction with opportunities centering on an interdisciplinary, collaborative</p>	<p>Food and Agriculture (No. 1)</p>

		<p>approaches for selection and development of high-value specialty crops for small farms and under-served farmer communities. 2. Provide training for students in novel, specialty-crop development including horticulture, phytochemistry and food. Data from four years of growing and harvesting aronia for cultural management are being processed before summarizing this data. We have monitored another year of ripening of aronia, determined the timing for peak of antioxidants and peak of sugars and completed evaluation of four types of polymeric resins for the isolation of powdered antioxidants from aronia. The best resin and conditions for the process were determined. The influence of solvent, concentration of polymer and extract, and parameters of spin-coater on the quality of surface in antifouling samples was evaluated. Samples are now being tested for antifouling properties with samples of water from Assawoman Bay. We have created instructional videos for instrumental techniques that are used with aronia research to train new generations of students that will be involved in the project in the future. The results will help farmers to produce this crop with desired qualities and generate data for food and non-food use of these products.</p>	
<p>4.</p>	<p>Organic Specialty Crop Management On Delmarva For Optimized Plant Development And Pest Control AES</p>	<p>Organically grown food commodities continue to experience rising consumer demand and usage, in both the national and international arenas. Limited resource farmers in our region also desire to produce more organic crops to fill consumer's needs but require more information on production techniques including pest management, availability of affordable organic supplies, and the costs to be effectively engaged in organic production. One component of integrated pest management is the intercropping of the desired agriculture commodity crop with other species with pesticidal properties. Besides pesticidal repellent advantages, intercrops have been used as nutrient supplements, enhancements of habitats for beneficial organisms (natural enemies and pollinators), weed suppressive, and shade manipulations. However, their use with some organic crops is less widespread or unknown and this presents an opportunity to include/use intercropping as part of the organic IPM options in combatting pest problems in specialty crop production. The overall</p>	<p>Food and Agriculture (No. 1)</p>

		<p>benefit of this project is to produce selected specialty crops in an environmentally responsible manner with other intercropped species for optimized production, pest management and economic viability. Tomatoes were intercropped with lemon grass in organic culture and ginger production from rhizome seed pieces and seedling propagation was assessed for crop development and economics of production. Data were recorded for plant growth, chlorophyll fluorescence, chlorophyll content, yield characteristics and nutrient contents. The results are being analyzed and will support local farmers in their efforts to grow organic specialty crops.</p>	
<p>5.</p>	<p>Precision Livestock Farming with Advanced Phenotyping Technology AES</p>	<p>This study applies advanced technology to food animal management in order to enhance food animal production safely and effectively while considering both efficient production and animal welfare concerns. This Precision Livestock Farming with Advanced Phenotyping Technology (PLFAPT) targets woody (wooden) breast, a phenomenon in boilers affecting quality and negatively impacting economics. As of today, woody breast can only be detected after the harvest period. If woody breast, along with a correlation between the degree of hardness at the growth phase and woody breast after harvest, can be detected, a selection study consisting of chickens with harder and softer breasts can be established. Therefore, the goal of the first study is to find a device that measures "woodiness" in chickens and ensure the above experiment's feasibility. The second purpose of this study is to find a way to monitor food animal movement while considering food animal welfare and/or behavior. Such will be achieved by using a camcorder with LED and ultrasound technology, which will serve as a durable and relatively easy tracking system. The third purpose is to conduct a preliminary study to develop a weighing system that stores food animal weight records easier with a mobile app while enhancing its practicability. If these purposes listed above were to be utilized in food animal production, a major contribution to improved production efficiency will be achieved. IACUC# approval was obtained and a device to measure muscle hardness, secured. COVID-19 impacted the delivery of this</p>	<p>Food and Agriculture (No. 1)</p>

		instrument as well closing of research facility causing a delay in executing the experiments.	
6.	Animal Agriculture Small ruminant parasite management workshops EP	<p>Gastrointestinal parasites are the number one health problem from March – October in sheep and goats in Maryland as they are the most susceptible livestock to internal parasites. Helminthosis cost about 15% of the productivity of herds/flocks. Anthelmintic resistance is ever increasing due to misuse and abuse of the drugs. Barber Pole Worm (<i>Haemonchus contortus</i>), a blood-sucking parasite that pierces the mucosa of the abomasum, causing blood plasma and protein loss to the sheep or goat. Farmers can no longer rely on anthelmintic treatments alone to control parasites; a much more integrated approach needs introducing. Training events followed by hands-on exercises were organized to educate farmers, para-veterinarians, extension educators, and agricultural students. An Integrated parasite management (IPM) approach was adopted for Small Ruminants.</p> <p><i>Knowledge and skills gained:</i> Sheep and goat farmers increased their knowledge about selecting resistant breeding stock, using FAMACHA Score Card, applying rotational grazing, selecting forage and pasture grasses, identifying weeds, feeding nutritional diet for higher production and productivity, stocking density, and using anthelmintics properly.</p> <p><i>Household income increased:</i> Due to changed action, behavior and attitude of the participating farmers, the household income started increasing as losses due to parasites decreased, farm income increased because of reduced anthelmintics cost and introduction of parasite resistant breeding stock.</p>	Food and Agriculture (No. 1)
7.	Animal Agriculture UMES Apiary EP	The UMES Extension Program maintains a demonstration apiary at the UMES Agricultural Demonstration Farm to train community members, farmers, agriculturists, and scholars. Presently, the 11-colony apiary is building up strength. About a dozen of virtual meetings and consultations were conducted during spring and summer. Pollinators and honeybee colonies are declining in drastic numbers worldwide at an alarming rate. A similar trend has been observed in Maryland too. Their decline poses a	Food and Agriculture (No. 1)

		<p>threat to global agriculture and human food supply and security. The UMES Extension program has been sponsoring the UMES Honeybee Club for those individuals who want to learn how to promote honey bees and other pollinators on the Maryland Eastern Shore. The honeybee workshops have been very well attended, and the attendees have expressed to the Extension staff a growing interest in honey beekeeping. They have been exceedingly vocal, expressing a need for training and education.</p> <p><i>Knowledge and skills gained:</i> The participants enhanced their knowledge and skills of managing and handling honeybees through the workshops. The hands-on opportunity offered at the demonstrations about maintaining a healthy bee colony and minimizing winter losses strengthened their knowledge and skills considerably. In addition, the Master Beekeeper conducted workshops on how to check the hives for parasites and disease detection, identification of queens, and honey harvesting upgraded participants' practical skills. About a dozen farmers (attendees) have adopted and continued applying management principles, tools, and techniques to maintain healthy honeybee colonies. However, due to the COVID 19 crisis, in-person workshops and seminars have been limited to telephone consultations and virtual meetings.</p>	
<p>8.</p>	<p>Small Farm Program Specialty and ethnic crop education EP</p>	<p>Farmers in Delmarva Peninsula are unaware of various types of ethnic crops that can be grown, unfamiliar with the production practices and economic feasibility and market potential of growing such alternative crops in this area.</p> <p>Extension - Small Farm Program team hosted seven field demonstrations showcasing select specialty ethnic crops that included Callaloo, Hibiscus, Scotch Bonnet Peppers, and Bok Choy. In addition, an educational session was organized on Alternative Agriculture at the annual small farm conference, where over a hundred producers from Maryland and Delmarva Peninsula participated. Approximately 200 participants (producers, aspiring farmers, landowners, and agriculture service providers) have been introduced to new specialty ethnic crop opportunities through various events hosted by UMES Extension over the past two years.</p>	<p>Food and Agriculture (No. 1)</p>

		<p>Collectively, eighty-three participants (77%) increased their knowledge and understanding of growing stated specialty/ethnic crops. About 30% of participants confirmed that they would seriously consider growing a new specialty and/or ethnic crop. Over the past two years, 15 farmers attempted to grow on a trial basis and/or continued to grow the selected specialty/ethnic crops.</p> <p>Thelonious Cook, Manager, and owner of the Mighty Thundercloud Farm, is one of them, who grew 50 callaloo and sorrel plants. He is now growing about 400 plants of Jamaican Callaloo, Hibiscus, Bok Choy, Asian Greens, and herbs. Today, he is now supplying both fresh produce and value-added products, venturing into new markets creating a large clientele, and that has increased his farm income. Four farmers in attendance of the 2020 conference became fascinated with the ethnic crops that were on display and started preparing land to cultivate these ethnic crops.</p>	
<p>9.</p>	<p>Small Farm Program Specialty herb project initiative and demonstration garden: EP</p>	<p>Rising awareness of the medicinal properties of herbs and spices extract coupled with their use in noble food recipes has further fueled the demand. However, small-scale farmers have not capitalized on this potential cash crop because it is hard for herb growers to follow the strict food safety requirements regulated by the Maryland Health Department.</p> <p>Extension - small farm team has established a specialty herb garden at UMES - extension demonstration farm to educate and train interested farmers on the cultivation and harvesting practices of growing herbs. In 2020 alone, over 50 participants have visited the demonstration site and/or attended a classroom workshop to learn about specialty herbs, medicinal uses and benefits of herbs, as well as marketing and value added products. Due to COVID-19 restrictions, the Small Farm Program hosted two online webinars for those who were new to growing herbs or those who currently grow herbs but look to receive more in-depth information. Simultaneously, the team educated interested herb growers on how to establish and comply with the regulations and arranged to use the UMES food safety lab to test samples to ensure that they are safe.</p> <p>This program has been well received and has generated a considerable amount of interest among small-scale producers, gardeners, and</p>	<p>Food and Agriculture (No. 1)</p>

		homeowners interested in growing herbs for personal consumption. Over 100 participants attended an online webinar entitled "Growing Herbs at Home" in May 2020. One of the farms is now approved as a licensed herb-processing center.	
10.	<p>Small Farm Program Financial assistance programs for agriculture producers impacted by COVID-19 EP</p>	<p>The COVID-19 pandemic started causing major disruptions in the food supply, demand, and direct-to-consumer markets that put a financial strain on many farm operations, small businesses, and the agricultural community as a whole.</p> <p>Extension collaborated with the Small Business Development Center Eastern Region, the Agriculture Law Education Initiative (ALEI) and the Maryland Agricultural and Resource Based Industry Development Corporation (MARBIDCO) to provide a free webinar on May 20 for farmers impacted by COVID-19.</p> <p>Fifteen Maryland farmers increased their understanding of government relief programs and were walked through the online application process of Small Business Administration's Economic Injury Disaster Loan and Paycheck Protection Program. Several small farmers were able to connect with other agricultural organizations like MARBIDCO and ALEI and benefited from timely assistance on labor, insurance issues and applying for special loan/grant programs securing farm equipment.</p>	<p>Food and Agriculture (No. 1)</p>
11.	<p>Small Farm Program Helping farmers develop marketing plans and strategies EP</p>	<p>Many small-scale producers limit customer exposure, which unfortunately equates to lower farm sales, inefficient use of resources, and their inability to grow/expand the farm business. In addition, they are not much aware of identifying tools and strategies (beforehand) to mitigate marketing risks that could negatively affect their farm business.</p> <p>Extension collaborated with Delaware State University and National Crop Insurance Services to offer a 3-part workshop training/workshop series. A total of 55 farmers participated in a farm business planning process to evaluate potential risks the farm faces, determine the current well-being of the farm business, and understand marketing principles and how each element of the marketing mix (Product, Price, Promotion, Place, and People) is used to create an effective plan to manage the marketing decisions on the farm.</p>	<p>Food and Agriculture (No. 1)</p>

		Each participant spent about 64 hours in learning marketing plans and strategies. Seventy-five percent of participants successfully developed their own personal marketing plans for their respective farm businesses based on the educational materials and resource templates provided.	
12.	<p>Vegetables and Fruits Production</p> <p>Rejuvenation of fruits/apple industry: EP</p>	There is no commercial apple production in Somerset, Wicomico, and Worcester counties. Maryland farms fulfill only 9% of the apple consumption in the state, and the rest (>90%) is imported from neighboring states. There is an urgent need for diversification of fruits cultivation and extension of the fruit-growing season such as with strawberries to enhance farm income, promote local produce, reduce carbon footprint, and concomitantly rejuvenate the lost strawberry legacy on the Eastern Shore. Initiatives were taken to start a farmer market in the Fruitland area. One apple orchard was established at UMES – campus to rejuvenate the lost commercial apple industry on the Eastern Shore through demonstration and hands-on training. Conducted four trainings/workshops and one orchard visit and demonstration event. Extension events generated mass awareness and interest of the community people about the potential of fruits cultivation including day neutral strawberry through nanotechnology in these counties.	Food and Agriculture (No. 1)
13.	<p>Developing a Cost Effective Activated Gypsum Amendment that Reduces Ammonia Emission from Poultry Litter Bedding</p> <p>AES</p>	Protecting natural resources by utilizing a waste product (gypsum drywall) as a source of material to reduce the harmful effects of NH3 emissions from poultry production is truly innovative. The amendment of the gypsum (an USDA Conservation Practice Standard) in this study from pen litter trials to soil will improve soil health, change chemical and physical qualities, and increase water and air infiltration rates. Gypsum also Improves water quality by reducing the transport of dissolved phosphorous, pathogens and other contaminates in surface and subsurface waters (USDA 2015). Gypsum recovered from dry wall is (5% +/-) drier, more soluble than other sources, and reduces GHG (EPA-WARM) standards. It is a unique product that could contribute to the development of a superior ammonia emission reducing poultry bedding amendment in concert with organic acids to form an acidified form of gypsum. Acidified Calcium Sulfate has a greater potential for improving water quality since our results showed significantly lower	Climate Change (No. 2)

		<p>watersoluble phosphorus content in the litter when compared to PLT[®]. Benchtop tests and pen tests showed both products to be equally effective in ammonia control provided. Both amendments provided significantly lower ammonia emissions when compared to the control. Pen test results showed no difference between the Acidified Calcium Sulfate blend pre-dissolved and Acidified Calcium Sulfate - dry. However, field trials conducted in commercial poultry houses revealed that the Acidified Gypsum Sulfate blend dry did not provide good ammonia emission control. Thus, we recommend that adequate water be added to pre-dissolve the Acidified Calcium Sulfate after application. Litter analyses after the pen tests showed similar sulfur content in PLT[®] treated litter compared to Acidified Calcium Sulfate. PLT[®] had greater sodium content, while the litter treated with Acidified Calcium Sulfate had higher calcium content, which resulted in significantly lower water-soluble phosphorus content in the litter. Bird performance and footpad scores were the same or similar for both products tested. A new product was developed and is still being tested.</p>	
<p>14.</p>	<p>Prevalence and Antimicrobial Resistance of Salmonella in Organic and Non-Organic Chickens AES</p>	<p>With over one million cases each year in the United States (U.S), salmonellosis is the number one foodborne illness that results in hospitalization and/or death, and causes approximately \$365 million in annual direct medical costs. Salmonella is common in poultry and is spread to humans by contaminated meat. The continual recovery of antibiotic resistant (AR) bacteria is a global epidemic and non-typhoidal AR Salmonella is said to be responsible for 100,000 illness and approximately 40 deaths in the U.S.</p> <p>The overall goal of this study is to address this data gap through following five specific objectives: 1) to determine the prevalence of Salmonella in organic and non-organic chickens; 2) to serotype Salmonella isolates recovered from organic and non-organic chickens; 3) to investigate antimicrobial resistance profiles for these isolates; 4) to explore the virulence properties of isolated Salmonella; and 5) to develop outreach and extension programs for control of Salmonella in organic and non-organic chickens.</p>	<p>Safe, Secure, Abundant Food Supply (No. 4)</p>

		<p>Sampling was impacted by the COVID-19 pandemic (laboratory lock down and non-availability of chickens in the retail store) but 200 broiler samples, 100 organic and 100 non-organic) were collected and analyzed. Sixteen percent of organic and 62% of non-organic chickens were positive for Salmonella, suggesting that there was a significant difference in the prevalence of Salmonella between organic and nonorganic chickens. The study continues to collect and analyze samples and characterize the isolated bacteria. Potential explanations for these differences will be sought.</p>	
<p>15.</p>	<p>Potential of Day Neutral Strawberries (DNS) using Nanotechnology on the Delmarva Peninsula AES</p>	<p>Historically the tri-county (Somerset, Worcester, and Wicomico) area was the hub for strawberry production on the Eastern Shore of Maryland. However, the current production is zero in Somerset and negligible in Worcester, and Wicomico counties. In neighboring Virginia counties strawberry acreage is higher (263 acres), but production is seasonal and restricted to the summer season. The cultivation of June-bearing strawberries is a major source of farm income during the spring season and thereafter most of the produce is imported. We are proposing a holistic approach to extend the strawberry season beyond spring to sustain local farm income using day-neutral strawberries (DNS) on the Delmarva Peninsula. We will evaluate the potential of several DNS cultivars in terms of growth and development, and yield in the field and low tunnel conditions. This work will also help in the identification and later on forecast of various DNS diseases endemic on the Eastern Shore. We will introduce nanotechnology for the sustainable management of fungal and insect borne diseases in DNS. Zinc and sulfur are abundantly found in the earth's crust and both are an integral part of tri-County soils. Our approach will provide new avenues for the cultivation of organic strawberries. Work on objective 2, effect of nano-sulfur (NS) and nano-zinc-oxide (NZO) on fungal diseases, was conducted during this reporting period. Three independent experiments were conducted to standardize the concentrations of nano-zinc-oxide (NZO) and Nano-sulfur (NS) to inhibit the growth of gray mold (<i>Botrytis cinerea</i>) and leaf spot (<i>Mycosphaerella fragariae</i>) in vitro. Potted strawberry plants at 9-leaf stage were sprayed</p>	<p>Safe, Secure, Abundant Food Supply (No. 4)</p>

		<p>with 25 mM NZO. These plants were later (one day after NZO priming) sprayed with leaf spot inoculum (conidia: 106/ml) to observe the infection rate. Similarly, freshly harvested strawberries (Portola) were treated with 5, 10, 15, 20, and 25 mM NZO for 15 minutes and then stored at 4°C for postharvest evaluations. NZO (25 mM) treated strawberry fruits were also treated with gray mold inoculum (conidia: 106/ml) to observe its antifungal effects. NZO at 25 mM concentration completely suppressed the germination of conidia and hyphal growth in gray mold, but only hyphal growth in leaf spot. In addition, NZO concentrations also inhibited the formation of spores in gray mold at 5 mM and higher concentrations. We did not observe the inhibitory effects of common zinc-oxide on both the fungi. Postharvest treatments with NZO showed an increase in the storage life of strawberry fruits. The maximum increase in storage life was observed at 25mM concentration. This increase was 5 days more in comparison to gray mold treated strawberry fruits. Similarly, NZO at 25 mM concentration caused 80% reduction in leaf spot infection under greenhouse conditions. We suspect that NZO treatment caused adverse effects on fungal growth through multiple mechanisms including, charge disturbance across plasma membrane, production of reactive oxygen species, and chelation of essential nutrients. We proposed that NZO can be used to manage the foliar and postharvest diseases in strawberry cultivation. However, ecotoxicological studies are required to confirm the safe use of NZO for plant pathogen management. These results were communicated in workshops and will help strawberry producers in management of these diseases.</p>	
<p>16.</p>	<p>Utilization of Byproducts of Agricultural and Food Processing to Enhance Food Safety and Human Health AES</p>	<p>There is need for continued research on ways to expand the utilization of byproducts of agricultural and aquacultural operations, including use of fish skin and bones, crustacean shells, oilseed meals, fruit peels and pomace, and other such low value biomaterials. Those materials may be suitable for development of biobased films that may be incorporated with antimicrobials to improve food safety and extend shelf life. Hydolysed proteins including peptides with antioxidant functionalities may also be prepared from byproducts of seafood processing. The technical information needed to demonstrate the suitability of those materials for commercial</p>	<p>Safe, Secure, Abundant Food Supply (No. 4)</p>

		<p>applications in food, feed, nutraceutical, pharmaceutical and other areas is still lacking. This project will investigate ways to develop bio-based films with potential to confer antimicrobial and antioxidant benefits and thereby add value to fishery and other low value materials from agricultural/food processing activities. This can be achieved if films prepared from currently underutilized skins, bones, shells, and oilseed meals are used as vehicles for antimicrobials and/or antioxidants. Fish gelatin films offer several advantages compared to mammalian gelatin films including attractive barrier and color properties. Fish gelatin is recovered from materials that pose no allergenic risk and is completely biodegradable. Another advantage with fish gelatin is that it is kosher or halal, and both attributes are attractive to growing niche market segments. The potential to incorporate antimicrobials into fish skin gelatin films may lead to the development of new products that have commercial potential in diverse platforms. Careful preparation steps may be necessary for these low value-high volume byproducts to be used effectively. Investigating the properties of film-forming solutions, drying to low water activity, characterizing the prepared films, testing on food and packaging will provide insights on their ability to enhance food safety and extend shelf life. Fish gelatin- and soybean meal-based antimicrobial films were developed and antioxidant peptides from crab processing waste were produced. The COVID-19 pandemic severely impacted the progress of this study due to closing of research facilities.</p>	
<p>17.</p>	<p>NC 170: Personal Protective Technologies for Current and Emerging Occupational and Environmental Hazards AES</p>	<p>This project contributes towards Objectives 1. (Laundering studies) and 3. (Development of standards) of the NC-10 project. Laundering of pesticide-contaminated clothes is critical to reducing pesticide handler's exposure to pesticides and minimizing/preventing potential of cross-contamination of pesticide residues to the clothing of family members. The United States Environmental Protection Agency requires that all pesticide products in the United States include the following very general precautionary statement related to cleaning "Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry". As stated in the EPA Guidance manual published in 1993,</p>	<p>Safe, Secure, Abundant Food Supply (No. 4)</p>

		<p>"Decontamination is the removal of unwanted chemical from PPE rendering it safe for doffing, reuse, disposal, or some other post decontamination action. In practice, total removal of the contaminant is rare. Although the residues may be so low as to be inconsequential, uncertainty about the residue level is a continuing problem". Research on laundering/decontamination was a major part of the NC170 project in the 1980's. Since then significant changes in the pesticide formulations, types of washing machines and cleaning aides. For example, detergents no longer contain phosphates and high efficiency top-load and front load washing machines are now being used for washing. This research is expected to serve as the basis for recommendations to be used by pesticide safety educators in training. The research will be conducted in collaboration with extension specialists and other stakeholders in the US as well as researchers in other countries working on similar projects as part of the international consortium activities. Research to support revision and development of standards will be conducted as part of Objective 3 of the NC-170 project. UMES will work with collaborators to develop and validate the surrogate test chemical to be used to replace the commercial product currently used for testing. Research will also be conducted to support revision of spray method to be used for evaluation of whole body garments. Contamination and decontamination of cotton/polyester fabrics certified for ISO 27065 Level C1 and C2 garments was conducted in partnership with collaborators from Brazil and France. Methodology to contaminate and then launder the fabrics developed in 2018-19 was used for the study conducted in October 2019. Decision was made to repeat the study in April 2020 with a higher concentration of active ingredient sprayed on the fabrics because of the number of samples that were close to or below limit of quantification. Study was postponed due to the pandemic. UMES collaborated with pesticide safety educators at Washington State University to conduct decontamination field study in the US. Garments for the study were provided by UMES. Extension specialists at Washington State University worked with pesticide handlers who sprayed pesticide with hand-held applicators who volunteered to participate in the study. To allow</p>	
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		<p>comparison with laboratory data, a certified C1 fabric used for laboratory test was used for some pants used for the field study, in addition to pants and shirt purchased in the US. The questionnaire and garments provided to the participants were collected by Washington State at the end of the spray season and sent back to UMES for analysis. The questionnaire data has been entered. Since only two participants wore and washed 30 times, the study will be used primarily as a preliminary study. UMES coordinated the interlaboratory study for ISO 22608, pipette test. Two of the fabrics used for this study were the same as those used for previous interlaboratory study. The data was analyzed, and results included as an Annex in the revised ISO 22608 draft. A Project Group meeting was held to discuss the data and address the comments received from member countries. The EN/ISO Draft Information Standard (DIS) was balloted and approved as a DIS standard with 94% approval. Interlaboratory test for ISO 17491-4, spray test for whole garment testing, was completed using three options proposed by laboratories based on their internal tests with a new nozzle type. The data was discussed at the Project Group meeting held in December. All three options with the new nozzle type were rejected due to issues with spray volume reaching the test subjects. Modification made to the existing nozzle was pre-tested by four laboratories. Based on the results, decision was made to use the pre-test setting for the next interlaboratory test. As Convenor of ISO Working Group 3, UMES researcher is working closely with the Project Group Leader on interlaboratory study and revision of the standard. The standard is used for whole garment testing of protective clothing for pesticide operators and re-entry workers.</p>	
<p>18.</p>	<p>Development of effective and harmless silver-based materials as antimicrobial coatings AES</p>	<p>Silver and silver-based composites are brilliant antimicrobial agents for their broad antimicrobial activities to gram positive and negative bacteria strains, fungi, and viruses. These composites have been used as antimicrobial agents for centuries by incorporating into food containers, paints, medical devices, wound dressing, food packaging and so on. However, current reported silver-based antimicrobial composites have limitations, such as uncontrolled release of silver could not ensure long</p>	<p>Safe, Secure, Abundant Food Supply (No. 4)</p>

		<p>time antimicrobial efficacy; high application dose of silver might diffuse to food systems and are toxic to humans and have silver cores that might become environment hazards after usage. To meet these challenges, in the past, our group have successfully developed silver nanoclusters (AgNCs) embedded antimicrobial coatings that have great antimicrobial effects with low application dose which are comparable with silver nitrate.⁶ Also, the AgNCs with ultra-small particle sizes are environmental friendly and low toxic. However, the AgNCs is still not considered as coreless alternative. In this proposal, in order to further advance the antimicrobial application of silver to food systems and food packaging systems, we are planning to develop another silver-based coreless coating material by modifying edible coatings with alkynyl-Ag. Alkynyl-Ag will be chemically bounded to chitosan molecules and form transparent antimicrobial coatings. This novel coating material is expected to have both antimicrobial function and film-forming ability, which could be applied to the surfaces of food packaging materials and food products. The successful completion of this study will not only provide valuable information about the coatings and coating modifications but will also enhance safety of seafood or related products. The collaborators from another university were not able to complete experiments to develop and characterize chitosan-alkynyl-Ag (C-A-Ag) and to evaluate coating formation of C-A-Ag on the packaging materials for sea food surfaces due to COVID 19 pandemic. Therefore, the University of Maryland Eastern Shore (UMES) team was not able to perform experiments on the evaluation of antimicrobial effectiveness of coatings against pathogenic bacteria (drug sensitive and multi-drug resistant strains)</p>	
<p>19.</p>	<p>Development of an Annual Plasticulture System for the Asian Ethnic Crop ‘Bitter Gourd’ (<i>Momordica charantia</i>L.) AES</p>	<p>In the last two decades, there is a rapid rise in Asian populations throughout the USA and on the East Coast including the Delmarva Peninsula. This change in demographic profile brings opportunities for local growers to grow Asian ethnic crops to fulfill market demand in nearby metropolitan areas with concentrated Asian populations such as NY, NJ, Washington, D.C., and Baltimore. Most of these ethnic crops are imported from Asian and South American Countries. However, the 'Grow Local Movement' carved a path for premium pricing for these crops, which can</p>	<p>Safe, Secure, Abundant Food Supply (No. 4)</p>

		<p>enhance the profit of our farmers. Small farmers dominates the Delmarva Peninsula and could easily adapt the cultivation of ethnic crops to diversify production and minimize economic risks. However, indigenous cultivation practices for most these crops are not available, which is a major constraint for the commercialization of ethnic crops on the Peninsula. We are proposing the development of an annual plasticulture technology for Bitter gourd production. Bitter gourd is one of the most important Asian ethnic crops, used primarily as a vegetable and for medicinal purposes. Our multi-state (MD and DE) and multidisciplinary (Horticulture, Crop Physiology, Plant Breeding, Pathology, Nutrient management, and Extension) team will develop efficient and sustainable practices for Bitter gourd cultivation on the Delmarva Peninsula. This approach will also provide new avenues for the cultivation of other novel ethnic crops on the Peninsula to strengthen local farming businesses. Collaborations created through this proposal will align growers, faculty, and students together for the single cause of local prosperity by creating new knowledge. Objective 1, development of an annual plasticulture system for Bitter gourd using a vertical trellis and open bed regimes, used two Bitter gourd cultivars that were raised in starter trays during the first week of April, 2020 and planted (2-4 leaf stage) in the first week of May, 2020 using a plasticulture system in open bed regimes. The raised beds were 0.2 m high, 36.6 m long and 0.9 m wide with 1.5 m spacing between the centers of beds. Beds were covered by the white plastic mulch (1.25 mil) with drip irrigation. The experiment was conducted in a randomized complete block design with four replicates of 10 plants of each variety. Plants were maintained in the center of the bed with spacing of 0.9 m between plant to plant. We used iron T-post and twine to construct vertical trellis system. Beds were irrigated using a drip irrigation system installed under the plastic mulch. Irrigation scheduling was based on measurements of soil moisture. Prior to preparing beds, soil was fertilized with 30 lbs. of N/acre. The soil at UMES has optimum levels of phosphorus (178 ppm; Mehlich-3) and potassium (154 ppm). Four weeks after planting, plants were fertigated with 5 lb N/acre/biweekly (May to October). Lateral branches were removed from the first 10 nodes to induce more branching</p>	
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		<p>with female flowers. Fruits were first harvested in the 4th week of July and last harvesting was completed by the first week of November. Ten plants were used for the measurement of length and number of nodes on the leader vine biweekly. The date of first flowering and fruiting on leader vine and lateral branches was recorded to calculate flower initiation time and fruit growth days. Total above ground dry mass was calculated at the end of harvesting season by drying the above ground part of the 10 vines. Fruit number, length, diameter, and weight were recorded after weekly harvest. Harvested fruits were classified as marketable and non-marketable (deformed or scarred) and used for recording marketable and non-marketable yield. Postharvest water loss, water content and fruit dry matter was also determined. Yellow sticky traps were installed on the trellis and number of trapped insects were counted every week. Incidence of diseases was monitored every week and recorded in terms of infected/damaged leaves. Fruit production slowly increased in July and reached its maximum in September and thereafter declined. India Hybrid showed higher fruit yield (5.5 Kg/plant) in comparison to Mini Hybrid-225 (4.05 Kg/plant). Similarly, average fruit weight was also higher in the India Hybrid (Fruit weight: 110 g /plant) in comparison to Mini Hybrid-225 (Fruit weight: 65 g /plant). However, Mini Hybrid-225 produced more fruits (62.3/plant) per plant in comparison to India Hybrid (50.5 /plant). Total plant dry matter showed non-significant among the varieties. However, the number of leaves were higher in India Hybrid than Mini Hybrid-225 throughout the season. Postharvest life of fruits at room temperature was higher in India Hybrid (10 days) in comparison to Mini Hybrid-225 (7 days). Target leaf spot or <i>Corynespora</i> blight (<i>Corynespora cassiicola</i>) was the major disease in bitter gourd through mid- September. Disease appeared in the form of yellow spots on the leaves, which later developed into small holes by mid- September. We did not observe any economic losses by Target leaf spot in bitter gourd. However, both the varieties are susceptible to this disease. In vitro application of Nano-zinc-oxide completely inhibited the fungal hyphal growth at 25 mM concentration. Objective 2, demonstration of Bitter gourd cultivation to initiate local bitter gourd</p>	
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		production, was initiated by providing freshly harvested bitter gourd fruits to local growers, local grocery stores and UMES communities. More than 75 people cooked the vegetable and showed interest in purchasing bitter gourd from the local market. One woman and veteran farmers will grow bitter gourds in the current season. Local Grocery stores owner provided feedback that people are looking for fresh bitter gourd fruits.	
20.	Food Safety On farm/laboratory assistance, farmers market outreach, farm food safety and gap certification EP	Conventional air or sun drying is a problem in MD due to hot and humid conditions. Farmers need critical information such as foodborne illness, food safety, and pathogen cross-contamination. Technical information and assistance were offered to farmers in helping develop safe herbs drying technology, organized food safety meetings/workshops, value-added & new food safety regulations, and water activity measurements. Two farmers submitted several samples for testing in the lab for measuring the water content level to confirm that the drying process was effective. Eleven farmers were given needed information about food safety regulations, produce farm registration, value-added processing, processing license requirements, and product development, produce disease, and farmland sale avenues. Farmers were instructed in Good Agricultural Practices (GAP) and standards. Three farm family members participated in cross-contamination awareness and identifying unsafe practices and troubleshooting solutions sessions. Fourteen farmers increased their knowledge of farm food safety after attending the 8-hour GAP training. Fifteen farmers (100%) increased their awareness about new food safety programs. Similarly, 37 farmers increased their awareness of state and federal regulations about food safety standards.	Safe, Secure, Abundant Food Supply (No. 4)
21.	Food Safety Agriculture Law Education Initiative EP	Producers in Maryland are grappling with food safety laws as well as certification requirements from their buyers. Such training pieces are required under the Federal Food Safety Modernization Act for those producers covered by FSMA's Produce Safety Rule. UMES Extension PSA-certified trainers, Agriculture Law Education Initiative (ALEI) at the University of Maryland, the University of Maryland Cooperative Extension, and Maryland Department of Agriculture jointly	Safe, Secure, Abundant Food Supply (No. 4)

		<p>offered online Produce Safety Alliance (PSA) - Certified Food Safety Modernization Act (FSMA) Produce Safety Rule Grower Training for farmers throughout Maryland. Producers whom the FSMA Produce Safety Rule covered are required to complete the training. For others, buyers often seek the certification. Almost 93 people at 4 Grower Training events in 3 counties in Maryland participated in an online program.</p> <p>The training ensured that those that completed the training comply with the law. In addition, increasing a food safety culture across the state helps lessen the risk of food-borne illness for Maryland's residents. Broadly, the activities influenced healthy living, local food & agriculture systems, handling food safely, crop production, and farm management.</p>	
22.	<p>Family Nutrition and Health Food and nutrition education to help underserved families and youth improve diets and nutrition practices EP</p>	<p>The percentage of people living in deep poverty in 2018 in Wicomico, Somerset and Worcester Counties were respectively, 49.5%, 48.1%, and 47.5%. There is a need for emphasizing a healthy lifestyle among low-income families in order to prevent chronic diseases.</p> <p>Extension – Expanded Food and Nutrition Education (EFNEP) Program provided direct nutrition education to youth and adult participants. It organized eight sessions (lessons) about healthy lifestyle and chronic disease prevention knowledge and skills for adults and 5 lessons for youth. A total 1,680 youth and 2,616 adults were contacted directly.</p> <p>Of the total adult participants, more than 75% showed improvement in food resource management practices, such as planning meals, comparing food prices, and sticking to a food budget; and more than 90% improved in nutrition practices, such as making healthy food choices, reading nutrition labels, and eating breakfast. Approximately 80% of youth participants improved their abilities to choose foods according to Federal Dietary Recommendations or gained knowledge.</p>	<p>Human Health, Nutrition, & Wellness (No. 5)</p>
23.	<p>Family Nutrition and Health Helping preschool children understand the importance of healthy lifestyle practices EP</p>	<p>In Maryland, the obesity rate among children ages between 2 and 4 was 15.7% in 2016. Approximately 8% of 1,041, 3-4 years old children are overweight/obese. There is a need for introducing comprehensive nutrition education for Head Start preschoolers.</p>	<p>Human Health, Nutrition, & Wellness (No. 5)</p>

		<p>Extension - Family and Consumer Sciences (FCS) Program collaborated with the Head Start program to reach the Preschoolers and their caregivers in Somerset, Wicomico, and Worcester Counties. Seven Head Start Centers were reached. Preschoolers were contacted through 4 lessons/semester (Fall and Spring). The lessons provided each preschooler with a healthy lifestyle and chronic disease prevention knowledge and skills through stories, music, and visual tools. Gardening sessions were organized to teach them the origin of food that we eat every day. The program provided a direct nutrition education program to 2,460 preschoolers through direct contacts.</p> <p>The evaluation results indicated that 50% showed improvement in understanding the importance of eating fruits and vegetables and moving the body to exercise. In addition, more than 80% understood the origin of food. Teaching the preschoolers 3-4-year-old helped the community to start chronic disease prevention early.</p>	
<p>24.</p>	<p>Family Nutrition and Health Developing communities where people work together for a healthier life-culture of health initiative EP</p>	<p>The tri-county area of the Lower Eastern Shore (Somerset, Wicomico, and Worcester) is characterized by a high prevalence of obese children and adolescents, and evidence of severe poverty.</p> <p>The Extension-FCS program and Well Connected Communications (WCC) project collaboratively initiated strong relationships with community leaders to implement engagement processes. In collaboration with a multi-sector health council developed in selected communities, Princess Anne-Eden (Somerset County); Fruitland (Wicomico County); and Pocomoke (Worcester County), implemented “Healthy Street – Healthy Me” and “Make Fruits Available to All” projects. In 2020, the team conducted indirect teaching and engagement activities including social networking, mental health, and healthy lifestyle knowledge and skills to engage youth and adults to actively help their community members facing challenges related to the pandemic. The team in partnership with governmental organizations, government agencies, and churches worked together to help families put food on their tables through food drives.</p> <p>Partnerships in each of these communities increased. In each community, approximately 12 partners were engaged in the community planning</p>	<p>Human Health, Nutrition, & Wellness (No. 5)</p>

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		<p>process. Local community partners included city government, chambers, businesses, nonprofits, farmers, schools, Universities, community economic development, etc. Indirect contacts were made with approximately 3,990 youth and 5,115 adults through teaching and community engagement activities. Youths and adults were able to conduct the maintenance training of six mini-fruits orchards, develop 3 community group therapy gardens, and participate in social events to help improve the relationships between parents and children. Youths and adults were also involved in food drives that served approximately 1,050 families by the end of December 2020. These activities indicated that strong relationships among community local stakeholders and strong partnerships between youths and adults increased the culture of health in the community. Developing the action plans together increased community engagement.</p>	
<p>25.</p>	<p>4-H STEM Brown Bag Event EP</p>	<p>School closing during the pandemic was a big challenge in educating school students. Many of them did not have learning environments and materials at home. Moreover, giving hands-on learning became an opportunity as well as a challenge.</p> <p>The UMES Extension, 4-H STEM introduced experiential learning through its slogan 'learning by doing' approach using the virtual platform and presented 6 different 4-H STEM (Science, Technology, Engineering, and Mathematics) virtual activities and presentations. They reached out to 163 youth ages 5-14 years. Each youth was given all the materials in a 4-H brown bag to allow them the ability to follow along with each one - hour presentation. All participating youths were supplied low-cost activity materials through a pickup point and/or through the mail. Similarly, a survey was distributed to 38 childcare centers and youth educators asking about the educational needs and virtual capabilities of childcare centers in the Wicomico, Worcester, and Somerset Counties. Twelve responses to the survey were received. A 2020 Horizon's summer program was established in Wicomico County. The 4-H STEM faculty members organized 6 virtual hands-on programs/activities/presentations.</p> <p>Over 800 4-H STEM Brown Bags were packed with all the materials for 6 different activities such as: Make a Marshmallow Catapult, Density Diver,</p>	<p>Family & Community Resiliency (No. 7)</p>

		<p>Physics of a Roller Coaster, Soil & People and Soil “People”, Owl Pellet Dissection, and Straw Bottle Rockets.</p> <p>The Extension 4-H STEM faculty reached the 163 youth by offering 6 hours of virtual 4-H STEM programming. The 163 participating youths were given necessary materials to follow an experiential hands-on 4-H STEM activity. A 4-H STEM connection was made with 31.5% childcare centers and youth organizations in 3 counties (Somerset, Wicomico, and Worcester).</p>	
26.	4-H STEM Outreach EP	<p>A majority of youth do not have access to quality Science, Technology, Engineering, and Mathematics (STEM) programs, and few have started seeing such disciplines as a facilitator for their future. Currently only 81% of Asian-American and 71% of Caucasian high school students attend a high school with a full range of math and science courses. Access for American Indian, Native-Alaskan, African American, and Hispanic students is lagging far behind. Only 16% of American high school seniors have been found to be proficient in math and interested in pursuing a STEM related career. Partnerships (with schools and camps) and special events (fairs, workshops, and festivals) were organized throughout Wicomico County and nearby counties. These partnerships and special events focused on aspects of STEM education including agriculture, environmental science, marine science, climate science, and physics (e.g. STEM Challenges, DNA Extraction, Fingerprinting, and Projectile Motion).</p> <p>In total, 1,213 youth participated in STEM outreach programming. A majority of them strengthened their knowledge about the use and importance of STEM careers. Equally, they have shown interest in pursuing college education related to STEM disciplines.</p>	<p>Family & Community Resiliency (No. 7)</p>
27.	Agriculture Law Education Initiative EP	<p>The majority of Maryland farmers are in their fifties, and the State will be experiencing a large transfer of ownership of agricultural land in the next ten to twenty years. All categories of farms in Maryland (small hobby farms and/or large commercial operations) have to contend with some risk management issues to sustain and pass on their farms. Terrestrial producers on the Eastern Shore and throughout the State are grappling with issues like compliance with evolving labor, environmental, and food safety regulatory requirements, while the aquaculture industry is</p>	<p>Family & Community Resiliency (No. 7)</p>

		<p>contending with theft and property-rights protection challenges. All Maryland's agricultural industry continues to contend with the challenges brought on by the COVID-19 pandemic, including keeping apprised of changes in worker protection laws and farm support programs, public health restrictions for customer-facing farms, or dealing with the unexpected loss of farm family members or workers.</p> <p>The University of Maryland Carey School of Law, the University of Maryland College Park School of Agriculture and Natural Resources, and the University of Maryland Eastern Shore School of Agricultural and Natural Sciences (the only 1890 Institution partnering on such an initiative) jointly launched Agriculture Law Education Initiative (ALEI) with a mission to educate Maryland's producers about the laws that impact their agricultural businesses. The collaborative effort is committed to identifying Maryland's producers' legal needs and devising strategies to meet them by raising awareness of the various legal concerns that affect Maryland's producers' agriculture businesses and educating them about how the laws impact their operations.</p> <p>The focus areas of the initiative are i) Crop production (specialty crop and commodity crop growers, horticulture and nurseries, tree and sod farms), ii) Livestock production (poultry, aquaculture, small ruminants, beef, and dairy farms, equestrian farms, and llamas), iii) Farm management (business formation, intellectual property protection, farm financing, risk management, commercial liability protection, and regulatory compliance (labor, zoning, food safety, etc.), and iv) Legal education. Three teams, respectively, Environment & Natural Resources (forested land, conservation easement areas, conservation working land areas), regulatory compliance (nutrient management, emissions for Confined Animal Feeding Operation, etc.), Family & Consumer Sciences (food safety), and 4-H Youth Development (farm management) worked together to achieve the mission. In 2020, the team participated in approximately 18 programs. It provided information to more than 550 people about topics ranging from food safety and farm labor to hemp regulations and COVID assistance programs for farmers. In addition, the team contributed 13 articles to the University of</p>	
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		<p>Maryland Risk Management Blog on various topics (laws for raising honeybees, wage and hour laws for farm employers, and heirs' property) and eight articles for regional agricultural newspapers (new Waters of the U.S. rule and ALEI's resources for COVID-related assistance programs, etc.). The presentations, blog posts, newspaper articles, and articles posted on ALEI's website reached farm audiences and members of both rural and urban agricultural communities and provided them with relevant, current information about the various legal risks that influenced agricultural operations.</p>	
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OPTIONAL Youth Development Expenditures (dollars)	
State and/or Institution:	FY 2020 Expenditures (\$)
1862 Smith-Lever	
1890 Extension	