2017 University of Maryland - Eastern Shore and University of Maryland Combined Research and Extension Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

The 2017 Accomplishment Report consists of the University of Maryland Extension (UME) at University of Maryland College Park (UMCP) and University of Maryland Eastern Shore (UMES), Maryland Agricultural Experiment Station (MAES), and Agricultural Experiment Station (AES) results and accomplishments. UME and MAES at the University of Maryland College Park are in partnership with AES at the University of Maryland Eastern Shore, and, as such, they coordinate their research and extension activities to the maximum extent possible.
The 2014-2019 UME Strategic Plan was developed based on extensive data collection that reached out to all stakeholder groups: faculty and staff, clientele, and partnering organizations. Based on the data, specific goals, objectives, and strategies in four major areas were identified: Identity, Innovation, Infrastructure, Marketing & Visibility. The programmatic foundation for the 2014-2019 Strategic Plan builds on the four impact areas from the 2009-2014 Strategic Plan: Agriculture and Food Systems, Environment and Natural Resources, Healthy Living, and Resilient Communities and Youth Development. Programming to address these areas is developed in the traditional disciplines of 4-H Youth Development; Agriculture; Family and Consumer Sciences; and Environment, Natural Resources, and Sea Grant. In 2018, listening sessions will be held across the four traditional program areas of Agriculture & Food Systems, Environment and Natural Resources, Family and Consumer Sciences, and 4-H Youth Development to update, if needed, program foci areas.

Similarly, MAES and AES developed its POW for 2014-2018 using the framework identified by NIFA. In addition, the College of AGNR's strategic plan identifies four core research areas that MAES is leading and those are agriculture, natural resources and environment, human health and nutrition, and international engagement.
The plan for UME emphasizes key outcomes, impacts in critical areas, and "marshaling our intellectual resources" into non-formal educational programs that work together to deliver measurable results for the economy, the environment, and the community. This approach parallels that of UMCP, UMES, MAES, AES, and the College of Agriculture and Natural Resources to achieve impact on the big societal issues important to Maryland and, ultimately, to the global community.

The UME focus areas (referred to as Initiatives 1-4) represent major programmatic initiatives that UME directs resources to accomplish. These focus areas are a broad-based method of dividing the critical needs identified by the planning process into manageable units. Key outcomes are the goals within each impact area. Focus Area leadership teams consist of field-based Extension Educators, Extension Specialists, and other program assistants who work together to provide overall statewide leadership for programmatic efforts. These teams are responsible for collectively achieving the goals, measuring the impacts using suitable evaluation methods and tools, and reporting findings to stakeholders. Focus teams are linked to each other through common target and primary audiences served, the topics and subjects taught, and outcomes and impacts achieved. Focus Area leadership teams, across the major programmatic initiatives, develop signature programs that are replicable, measurable, and recognized at the state and national levels.

The MAES and AES coordinate research projects in the challenge areas identified by the USDA-NIFA. The research focus ranges from plant and animal genomics to nutrients, health, environment, and economics of production systems. Both basic and applied research are conducted by the faculty and graduate students to cover the topics of important value to animal and plant production systems with both environmental and economic sustainability.

The four major program areas in the UME and MAES strategic plans are:

Initiative 1: LOCAL FOOD & AGRICULTURE SYSTEMS
Key Outcome: Agriculture and food production will be sustainable and profitable and produce a safe, abundant, affordable, and accessible food supply. This initiative is reported under Planned Program, "Global Food Security and Hunger."

Initiative 2: ENVIRONMENT AND NATURAL RESOURCES
Key Outcome: Individuals and communities will become stewards to manage the environment for the mutual benefit of people, ecosystems, wildlife, natural resources, and economic interests. This initiative is reported under Planned Programs, "Climate Change" and "Sustainable Energy."

Initiative 3: HEALTHY LIVING
Key Outcome: Youth, individuals, and families will make informed decisions about their health, finances, food, housing, and overall well-being. This initiative is reported under Planned Programs, "Childhood Obesity," "Food Safety," and "Family & Community Resiliency."

Initiative 4: RESILIENT COMMUNITIES & 4-H YOUTH DEVELOPMENT
Key Outcome: Improve human capacity to achieve desired community outcomes and be prepared to respond to uncertainties of economics, health, climate, and security. This initiative is reported under Planned Programs, "Childhood Obesity, Food Safety," and "Family & Community Resiliency."

Further complementing the UME and MAES AES program plans of work, the College of Agriculture and Natural Resources (CANR) engaged in an extensive strategic visioning process with listening sessions that collected over 40,000 data points that reflected important trends and issues affecting the college, the State of Maryland, industries, and society. This work resulted in five strategic initiatives for CANR: 1) Establish a healthy food system and ensure global food and nutritional security; 2) Ensure a clean and healthy Chesapeake Bay; 3) Advance innovative, profitable, and sustainable agricultural production systems; 4) Improve human, animal, and environmental health; and 5) Optimize urban environments through design, green technology, and community engagement.
The 2014-2019 University of Maryland Extension Strategic Plan carries forward the land grant university mission; the goals of the University of Maryland, College Park, the College of Agriculture and Natural Resources, and the University of Maryland Eastern Shore 1890 Extension Programs; and the spirit of the Smith-Lever Act. Also, MAES carries forward the responsibilities of the Hatch Act in finding solutions posed to agricultural systems following USDA-NIFA's national priority areas and according to the research strategic plan of the College of AGNR, while UMES implements the Evans-Allen Agricultural Research Program. The CANR, with its new strategic initiatives, complements and completes a college-wide, comprehensive approach to serving the residents of Maryland.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	107.0	14.5	54.0	24.3
Actual	127.0	18.5	46.0	23.6

II. Merit Review Process

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

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

2. Brief Explanation

The merit review processes did not change from 2016. On July 1 of each year, UME faculty and staff receive a memo from the Associate Dean/Associate Director of Extension outlining the process and requirements.
The merit review process for UME faculty occurs annually when the faculty member is formally evaluated by the Program Leader (Assistant Director). The Agriculture Program Leaders evaluate Agriculture Educators and Specialists; FCS Program Leader, the FCS Educators and Specialists; the Environment and Natural Resources (ENR) Program Leader, the ENR Educators and Specialists; and the 4-H Program Leader, the 4-H Educators and Specialists. Input is obtained from the Area Extension Director (AED). Emphasis is placed on program impacts and the difference made to constituents and the residents of Maryland during the preceding 12 months. Each faculty member is evaluated on individual merit. Documents used for the merit review are approved Individual Extension Plan (IEP), Curriculum Vitae, UMERS reports, and Teaching Effectiveness Summary. Faculty at UMES follow similar procedures with the inclusion of overall review from the Associate Extension Administrator for 1890 Programs.
All research faculty at UMCP have a departmental home, and while there are subtle differences between the departments, they all have a peer-review system wherein assigned faculty or a faculty committee review the annual performance criteria of each faculty member and assign a merit ranking. These criteria, from a research perspective are evaluated, in general, on grantsmanship, publications, the quality of the journal (based on a citation index) and invited and/or contributed scientific talks and seminars. These are also the same criteria that are used to evaluate promotion and tenure decisions. The peer committee recommendations are reported to the respective department chair who provides his/her input and then provides a final ranking and conducts the annual review. This process is followed for tenured, tenure-track, and research faculty appointments.
Faculty at UMES through the School of Agricultural and Natural Sciences (SANS) are being evaluated on a yearly basis using and Annual Evaluation document. Same criteria as mentioned above (grantsmanship, publications, the quality of the journal (based on a citation index) and invited and/or contributed scientific talks and seminars) are being used.

III. Stakeholder Input

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

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Survey specifically with non-traditional groups
- Survey of selected individuals from the general public
- Other (Community-based listening sessions)

Brief explanation.

Stakeholder participation is encouraged through local Extension Advisory Councils, 4-H Club leaders (volunteers), and various surveys (including needs assessments) targeted to UME clients. On an annual basis, approximately 50-75 surveys are conducted with UME clientele to solicit feedback and encourage participation in UME programs. Surveys are deployed either via paper or electronically, depending on the best strategy to reach the particular clientele. Social media strategies (Facebook, web sites, blogs, Twitter, Instagram) are also now being used to solicit feedback. Text messages are also being used to reach stakeholders.
Inclusive and diverse mailing lists are maintained by all Extension units. These lists include a variety of ways to reach stakeholders, either via mail, telephone, email, or a web site. Traditional methods (outside of using technologies) are still important strategies for soliciting stakeholder feedback. Extension Educators and Area Extension Directors are visible and accessible in local communities through face-to-face engagement.
Facilities where Extension programs are held are accessible and comfortable for a variety of stakeholders. Extension Educators use a variety of methods to accommodate Limited English Proficiency (LEP), physical disabilities, or other barriers to participation. Examples of these methods include using larger type for senior clientele; modifying recipes to accommodate dietary restrictions; and, modifying equipment.
The administrative officers of the MAES, AES, and UME sit on and attend a wide array of committees with the State's agricultural leaders. Such continuous contact with the agricultural leadership, including the Maryland Secretaries of Agriculture, Natural Resources and Environment, provides additional contact to keep current the research and education issues examined by research and extension in the State's two land-grant universities. The groups include the Maryland Agricultural Commission, the Maryland Grain Producers Association, the Delmarva Poultry Industry, the Southern Maryland Agriculture Commission, the Maryland Association of Soil Conservation Districts, Department of Housing and Community Development, Maryland Department of the Environment, and many other similar groups. Both research and extension faculty also seek stakeholder inputs through their participation and presentation of their projects to stakeholder audiences in state, regional, and national workshops and conferences.
In addition, UME administrative leaders connect with many other stakeholder groups outside of agriculture, such as with local departments of health and many nonprofit organizations that provide direct service to stakeholders, including public schools, and civic and community groups.

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

1. Method to identify individuals and groups

- Use Advisory Committees
- Use Internal Focus Groups
- Use External Focus Groups
- Open Listening Sessions
- Needs Assessments
- Use Surveys
- Other (Focus Groups)

Brief explanation.

End-of-class surveys are used to gather input from individuals attending UME workshops and other events. In addition, follow-up surveys are conducted with stakeholders across all of the major program areas who have attended programs. In 2017, a comprehensive agricultural needs assessment was conducted in the Western and Northern regions of Maryland and a statewide nutrition literacy survey was implemented to drive nutrition programming in the coming years. A needs assessment of participants in the UMES Small Farms program was conducted in 2013-14, and data are obtained each year during the annual Small Farms Conference. Other examples of collecting input from stakeholders are: key informant interviews with parents of 4-H'ers; surveys of beef producers in Maryland; survey of adults involved in school gardens and greenhouses; survey of farmers who attend farm food safety trainings; and 4-H youth and adults across Maryland involved in building social capital in communities.

Extension educators were trained in 2017 in various research/evaluation-based methods on how to solicit data from clientele, such as surveys (multiple formats, including paper-based, on-line, and via text messages) and focus groups--both face-to-face and on-line. Extension Educators are trained in and adhere to all University of Maryland Institutional Review Board (IRB) regulations regarding human subjects research. In addition, Extension Educators have received multiple training sessions on inclusion and diversity and how to reach out to ALL of Maryland's residents.

The UME Facebook page is used as a method to solicit feedback from our stakeholders, as well as feedback from the UME and UMES web sites. Other social media are used--including Twitter and Instagram to reach diverse audiences and hear their comments.

The administrative officers of the MAES, AES, and UME sit on and attend a wide array of committees with the State's agricultural leaders. Such continuous contact with the agricultural leadership including the Maryland Secretaries of Agriculture and Natural Resources and Environment provides additional contact to keep research and education issues examined by the research and extension in the State's two land grant universities. The groups include the Maryland Agricultural Commission, the Maryland Grain Producers Association, the Delmarva Poultry Industry, the Southern Maryland Agriculture Commission, the Maryland Association of Soil Conservation Districts, Rural Maryland Council, MARBIDCO, and many other similar groups.

A College-wide Advisory Council has been established by the Dean of AGNR that represents Research, Teaching, and Extension. Representatives of stakeholder groups were identified to serve on this Council on a rotating basis. This Advisory Council has started meeting and is highly engaged in the College's strategic visioning process.

The Dean of the School of Agriculture and Natural Sciences at UMES works with clientele and stakeholders representing a diverse group of audiences varying from limited and under-served communities to competitive private companies in to address new challenges and opportunities for community growth and resiliency through research, teaching and Extension as well.

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

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Survey of traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals
- Meeting with the general public (open meeting advertised to all)
- Survey of the general public
- Survey specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Survey specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public
- Survey of selected individuals from the general public
- Other (Focus Groups)

Brief explanation.

UME draws upon the expertise of approximately 170 UME Educators, Specialists, and administrators in ongoing, informal needs assessment that take place in meetings, workshops, conferences, open houses, and other events. UME field-based educators solicit feedback from local Extension Advisory Councils and other stakeholder groups. Survey work with all groups participating in programs is performed on a regular basis to assess needs as detailed in section 2A. Analysis of secondary data for Maryland is also used, including the updated data from the 2010 U.S. Census, the new 2012 agricultural Census data, USDA National Agricultural Statistics, Maryland Departments of Planning, Agriculture, Natural Resources, Economic Development, and Maryland Department of Health and Mental Hygiene (and many more) and environmental scanning at the national, regional, state, and local levels. In 2013-14, a national external environmental scan was undertaken by the UME strategic planning committee. That scan is scheduled to be repeated in the next strategic planning cycle scheduled to start in 2018-19, as well as feedback from stakeholder groups.

MAES and AES have identified state agencies such as the Maryland Department of Agriculture, Maryland Department of Natural Resources, and Maryland Department of Environment as stakeholders for the important role that they play in economics, environmental, diseases, and public policies related to diverse land uses. MAES and AES scientists also have identified USDA-ARS scientists from Beltsville, Maryland, and State College, Pennsylvania as stakeholders due to their common research interests. In addition, our own UME educators are the best research stakeholders because they often use the results of research conducted by the MAES and AES scientists to respond to questions from the public across the state. Therefore, MAES and AES collect input from all these entities by participating in joint committee meetings and other related communication platforms (e.g., workshops, conferences, etc.). MAES has also formed a Faculty Research Council composed of both research and extension faculty that will serve as another body of stakeholder input to identify research needs in 2016 and beyond.

The College of Agriculture and Natural Resources strategic initiatives process involved multiple stakeholder groups across the state in 2017 that were invited to participate and offer their ideas about the future of the college. Approximately 500 people participated in eight sessions that elicited over 40,000 individual data points to explore trends, strengths, areas for improvement, operational needs, and core values.

3. A statement of how the input will be considered

- In the Budget Process
- To Identify Emerging Issues
- Redirect Extension Programs
- Redirect Research Programs
- In the Staff Hiring Process
- In the Action Plans
- To Set Priorities
- Other (Strategic Plan Development)

Brief explanation.

Input from stakeholders was used to create the priorities for the UME strategic plan 2014-2019; determine statewide staffing plans for UME; develop new job descriptions for county and regional extension positions; develop new initiatives for the College and UME; allocate financial resources, primarily operating expenses for program and curriculum development; and, to assist in revamping strategic initiatives as needed to deal with current budgetary shortfalls and staffing challenges. MAES and AES used the information obtained from the stakeholders to focus on research issues that are important to the state with respect to production, marketing, economics, public-economic-environmental policies, biotechnology, ecosystem services, animal and human health, energy issues, etc. This information, combined with the national priorities set by USDA-NIFA was used to set the research priorities and monitor progress.
Brief Explanation of what you learned from your Stakeholders
During the process of gathering input from Maryland residents for the 2014-2019 strategic plan, stakeholders helped to shape four strategic goals for UME:

1. Identity: Solidify UME's identity as the provider of excellent research-based educational programs in defined priority areas that meet the needs of Maryland's diverse population and are consistent with organizational capacity.
2. Innovation: Create and foster a culture of innovation that anticipates and responds to current and emerging needs of the organization and Maryland residents.
3. Infrastructure: Invest in human capital and organizational systems that foster a culture of inclusion, excellence, and engagement among faculty, staff, volunteers, and stakeholders.
4. Marketing and Visibility: Effectively communicate who we are; what we do; and the social, environmental, and economic importance of our work to clientele, volunteers, and stakeholders.

As seen in many other states, Maryland's residents are concerned about the quality of their food, health, environment, families, and youth.

Brief Explanation of what you learned from your Stakeholders

During the process of gathering input from Maryland residents for the CANR strategic visioning process, stakeholders identified the five major initiatives they wanted the College as a whole to address. These data are the latest findings from Maryland residents and will help inform the new program strategic plan for UME.

1) Ensure a clean and healthy Chesapeake Bay

- Design land use management strategies to minimize negative environmental impacts.
- Develop storm water management technologies to improve water quality.
- Safely apply fertilizer, manure and other nutrients to protect soil health and water quality.
- Evolve in the face of climate change to address sea level rise and extreme weather.
- Create environmentally aware communities and promote increased interest and participation.

2) Establish a healthy food system and ensure global food and nutritional security

- Encourage entrepreneurship in food production, accessibility, availability and processing.
- Improve the health and well-being of populations through sharing knowledge of food production, processing, access and consumption.
- Inform policy based on sound research.

3) Advance innovative, profitable, and sustainable agricultural production systems

- Increase plant and animal productivity.
- Improve and conserve soil and water quality.
- Contribute to the success of agricultural businesses.
- Prepare the next generation for careers in agriculture.

4) Optimize urban environments through design, green technology, and community engagement

- Refine and improve the process and perception of urban expansion into rural areas.
- Improve understanding of agriculture and environmental awareness in urban areas.
- Improve the performance of built environments.

5) Improve human, animal, and environmental health

- Create sustainable energy solutions.
- Decrease chronic diseases and diseases transmitted from animals to humans.
- Promote and support healthy and livable communities through education.
- Manage and adapt to climate change.
- Investigate links between human, animal and environmental health.
- Analyze environmental and agricultural policy and inform decision makers.

IV. Expenditure Summary

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

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	3440139	1371433	3082876	1218090
Actual Matching	3440139	1371433	3139379	1093303
Actual All Other	7212497	0	243503	1151250
Total Actual Expended	14092775	2742866	6465758	3462643

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	0	0	0	1201689

V. Planned Program Table of Content

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Global Food Security and Hunger

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	10%	10%	15%	18%
112	Watershed Protection and Management	0%	0%	0%	6%
205	Plant Management Systems	10%	25%	10%	13%
211	Insects, Mites, and Other Arthropods Affecting Plants	0%	0%	0%	8%
212	Diseases and Nematodes Affecting Plants	0%	0%	0%	13%
215	Biological Control of Pests Affecting Plants	0%	0%	0%	4%
216	Integrated Pest Management Systems	15%	1%	10%	0%
301	Reproductive Performance of Animals	0%	3%	10%	13%
302	Nutrient Utilization in Animals	10%	0%	10%	0%
307	Animal Management Systems	0%	15%	0%	0%
311	Animal Diseases	10%	15%	10%	0%
403	Waste Disposal, Recycling, and Reuse	10%	0%	10%	0%
601	Economics of Agricultural Production and Farm Management	10%	15%	10%	0%
602	Business Management, Finance, and Taxation	5%	1%	10%	0%
608	Community Resource Planning and Development	0%	15%	0%	0%
704	Nutrition and Hunger in the Population	10%	0%	5%	12%
723	Hazards to Human Health and Safety	10%	0%	0%	13%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	28.0	4.0	16.0	10.3
Actual Paid	35.0	4.0	26.0	12.3

Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
1032041	411430	1541438	494100
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1032041	411430	1569690	403103
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
355651	0	121752	701627

V(D). Planned Program (Activity)

1. Brief description of the Activity

• AES, MAES, and UME will have a combined focus to ensure that Maryland agriculture and food production will be sustainable and profitable and produce a safe, abundant, affordable, and accessible food supply.
• Research coordinated through MAES and AES on crop and animal breeding, specialty crops, market analysis, economic sustainability, and policy analysis will be performed, while UME will be involved in local and regional efforts to assist agricultural and natural resource entrepreneurs.
• Research conducted through MAES, AES, and UME will generate vital information to increase productivity using genomics, breeding, and adaptation of alternate crops with economic and environmental sustainability.
• Through UME's Action Teams and MAES and AES research projects, the following planned program activities will be emphasized: IPM; Value Added & Specialty Crops; Grow It-Eat It; Annie's Project; Best Management Practices in Crop and Animal Agriculture; Technologies for the Genetic Improvement of Crops and Animals; Agronomic Fruit & Vegetable Production; Dairy Analysis; and Small/Beginning Farmers Program.
• On-line educational programs, field trials, twilight tours, seminars, workshops, on-farm research & demonstrations and individual farm consultations will be used to educate Maryland farmers, Agriculture industry professionals, Soil Conservation District personnel, USDA-NRCS conservationists and extension faculty.
• New research and technologies developed by the MAES and AES will be transferred via UME on-farm demonstrations and twilight tours.
• Training programs will be developed to improve nutrient management practices, IPM, diagnostic skills, identification and control of invasive species, water management practice improvements and reductions, biosecurity and animal health and the use of sheep and goats to manage unwanted vegetation.

2. Brief description of the target audience

• Farmers, including new and beginning farmers, and U.S. veteran farmers
• Female farmers
• Producers

- Retailers
- Plan growers and breeders

3. How was eXtension used?

Faculty contribute to Ask an Expert and learning communities. As a full member of eXtension.org, faculty and staff take advantage of membership benefits, including professional development and technology (such as Zoom).
Updated the eXtension Avian Influenza biosecurity Moodle courses for emergency responders, backyard flock owners, and 4-H/youth groups as well as the EDEN Avian Influenza and eXtension Avian Influenza CoP content pages and Avian Influenza Facebook page to reflect current trends and knowledge on AI epidemiology and modes of transmission. Through these efforts, ordinary citizens and Extension specialists are able to access current objective information on the transmission and spread of AI virus, thereby increasing awareness which would encourage them to practice strict biosecurity.

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	24377	835341	6572	0

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

Patent Applications Submitted

Year:	2017
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	19	35	54

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of educational programs offered

Year	Actual

2017	684

Output #2

Output Measure

- Number of applied research projects

Year	Actual
2017	20

Output #3

Output Measure

- Acres of land exposed to educational programming efforts

Year	Actual
2017	264500

Output #4

Output Measure

- Number of newsletters distributed

Year	Actual
2017	40

Output #5

Output Measure

- Number of agronomic and fruit and vegetable winter meetings

Year	Actual
2017	18

Output #6

Output Measure

- Number of nutrient management plans written

Year	Actual
2017	546

Output #7

Output Measure

- Number of individuals reached through Extension programs
  Not reporting on this Output for this Annual Report

Output #8

Output Measure

- Number of information pieces developed
  Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

Outcome #1

1. Outcome Measures

Increase in agricultural profitability attributable to extension and research efforts.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Corn, soybeans and wheat are the major agronomic crops grown in Maryland representing over 900,000 acres of cropland and valued at over $700 million (NASS 2012). In order to provide the most current education and research University of Maryland Extension provides winter agronomy meetings for Maryland farmers, crop advisors and agriculture professionals. The goal is to provide updates on products, research results and regulatory certifications to increase farm vitality through increased yields and profits. Farmers from the Lower Eastern Shore to Western Maryland participated in annual winter agronomy meetings to increase crop production knowledge, meet regulatory requirements and improve production practices.

What has been done
Maryland Winter Agronomy meetings were held, and 1,700 farmers producers, and students from the Lower Eastern Shore to Western Maryland were educated in 2017.

Results
Over 93% of the participants reported that the meetings benefited their farming operation and they will implement the information and production practices into their farms following the program. Taking Queen Anne's County Agronomy Day as an example, 92% indicated the information would be of benefit to them or their operation. Farmers indicated a savings of $20.23 per acre based on the knowledge and skills they gained from Extension programming throughout the year. Based on the 125,725 acres associated with the Agronomy Day program alone, the total estimated economic impact of the Queen Anne's agronomy programs annually is ($20.23*127,725 acres) = $2,543,417.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
205	Plant Management Systems
216	Integrated Pest Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
311	Animal Diseases
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
723	Hazards to Human Health and Safety

Outcome #2

1. Outcome Measures

Increase in small, part-time, female, veteran, and limited resource farmers

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

USDA's most recent 2012 Census of Agriculture found that in Maryland, 38 percent of all farms have women as the principal operators. Of the female principal operators, 30 percent are over the age of 65 and 63 percent are over 55 years old. It is estimated that during the next two decades, 70% of all farmland will change hands, with women possibly owning as much as 75% of all the land transferred. In Maryland, 41 percent of the farmers are over 65 and 61 percent are over 55 years old, illustrating the significant potential trend for more incoming women agricultural landowners. Furthermore, 58.7% of Extension educators surveyed felt that women audiences have educational needs that are somewhat or very different from those of their male farmer counterparts.

What has been done
Working with the National Annie's Project office at University of Iowa educators adapted curriculum for Maryland, Delaware and Virginia. Since 2008 Annie?s Project has expanded and reached 15 sites educating 482 farm women and acquiring $207,376 of grant and solicited funds. Classes are structured in eight weekly sessions. University Educators and Specialists along with government organizations and private industry deliver timely risk management topics. Educators collaborated to secure funding, organize the statewide program, instruct and serve as representatives for the national initiative.

Results
There were 93 participants in 2017 for Annie's Project. When surveying the participants from all previous years, 43% responded that Annie's Project has increased their profitability. The average Annie's project participant since 2008 has increased farm profitability between $2,165.31 and $3,780.84 with the average participant increasing by $3,123.96

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation

Outcome #3

1. Outcome Measures

Increase in the amount of agricultural land under best-management practices due to Extension programming efforts

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
According to the Maryland Water Quality Improvement Act of 1998, nutrients applied in any form should balance with plants' nutrient needs. In agricultural production systems, managing nutrients to meet, not exceed, crop needs may increase profitability and improve the health of the

Chesapeake By and its tributaries. The Agricultural Nutrient Management Program is to serve Maryland farmers through all 23 counties with nutrient management plan development, continuing education, and technical support for certified consultants and farm operators.

What has been done

Educators prepared nutrient management plans for 28 Manure Transport Project clients, allowing transportation and application of manure on 5,759 acres; wrote nutrient management plans or updated them to partially fulfill permit requirements for 190 CAFO or MAFO clients; conducted the Phosphorus Site Index for 214 clients on 1,174 fields encompassing over 19,700 acres; and wrote 546 new nutrient management plans for 233 Maryland producers for approximately 18,600 acres. This program also provided continuing education programs, workshops, pre-certification Exam training, and farmer training and certification.

Results

A long-term evaluation was conducted by UME to reveal increases in education, environmental stewardship and farm profitability. Farmers were asked their increase in profitability due to education received through the Nutrient Management Education program. Taking Harford county as an example, the mean of responses ranged from $6.25 to $8.74 with the average participant increasing profitability by $7.49 per acre. Acres were then analyzed with the average participant farming 255.88 acres and 625.27 acres with the average participant farming 421.09 acres. Using these averages a total dollar impact per participant of the program per participant is $3,153.96 (421.09 ac x $7.49). Total dollar impact of surveyed participants translates to a total of $652,865.85 (87,165 ac x $7.49). As a result of locally-delivered education programs, UME has increased farm profitability and increased the use of nutrient management.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
216	Integrated Pest Management Systems
601	Economics of Agricultural Production and Farm Management

Outcome #4

1. Outcome Measures

Increase in the number of people growing food for health and economic reasons

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A lack of access to fresh, healthy foods can contribute to poor diets and higher levels of obesity and other diet-related diseases. However, not all people can afford fresh and healthy foods purchasing from the grocery stores. Home and community gardens successfully addressed nutrition and food security issues on a grassroots scale. The Grow It Eat It program goal is to help one million Marylanders produce their own affordable and healthy food. The mission of this program is to help people improve human and ecological health by growing their own food using sustainable gardening practices.

What has been done

The focus of the Grow It Eat It program is to teach residents how to grow their own fruits and vegetables in an environmentally safe and sustainable way. Being able to grow your own food also encourages healthy eating and increased exercise. The GIEI program helps empower local residents to become more food secure while developing healthier habits. GIEI offers a variety of gardening classes and demonstrations for the public, assistance with starting school and community gardens, and school curriculum. Growing Healthy Habits is a gardening and nutrition education curriculum for schools that helps youth learn gardening skills and the value of growing your own food and eating more fruits and vegetables.

Results

In 2017, 25 Grow It Eat It classes regarding basic fruit & vegetable gardening were offered to adults and youth at public forums, schools, and the Master Gardener Basic Training course; Seven Growing Healthy Habits (GHH) after school programs were held at the Cumberland YMCA and Washington, Westmar, and Mt. Savage Middle Schools; 468 adults and youth received fruit & vegetable gardening training; and 96 unique contacts were made through the Growing Healthy Habits after school programs. When surveying attendees of the various GIEI classes, 100% of respondents agreed that they had increased their gardening skills and abilities to take care of themselves and/or their family.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
205	Plant Management Systems
216	Integrated Pest Management Systems
704	Nutrition and Hunger in the Population

Outcome #5

1. Outcome Measures

Increase in research findings that help to ensure global food security.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Fertility has a critical impact on dairy production because low pregnancy rate leads to reduced milk production, increased insemination and maintenance costs, and eventually culling of cows. Dairy fertility is a complex phenotype affected by many factors that include nutrition, management, environment and genetics. For the past 50 years, dairy production continued to increase but fertility experienced severe declines. This decreasing trend of reproduction performance has been reversed during the last decade since fertility was considered in selection.

What has been done
Research goals are to: 1) identify genomic regions associated with fertility by using sequence-based transmission ratio distortion test and GWAS; 2) identify and apply causal/tightly linked genomic variants and regions to the development of optimal strategies for genomic selection to improve dairy fertility. Specifically, work completed include 1) sequence-level imputation to over 27,000 Holstein bulls, 2) sequence-level testing of transmission ratio distortion, 3) GWAS of additive and non-additive effects in Holstein cows using YD phenotype, and 4) sequence-level GWAS of additive effects in Holstein bull using PTA phenotype.

Results
In 2017, the research team investigated and dissected the genetic contribution to dairy cattle fertility. As a result, additive genetic effects will now be the major contribution and focus of the research project. Also discovered were many genetic loci and variants that are associated dairy reproduction traits. The team will continue their research to identify mutations/markers underlying dairy fertility that are useful for national dairy genomic evaluation. Two graduate students were supported by this study and conduct research related to cattle genetics and bioinformatics. One postdoc and a visiting scholar were also involved in the project.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals

Outcome #6

1. Outcome Measures

Using Habitat Manipulation to Help Farmers Manage Multiple Pest Complexes in Vegetable Crops

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Vegetable growers often rely solely on pesticides to address their pest problems. This is partly credited to not enough effort being devoted to the creation and dissemination of more ecological pest management (EPM) solutions, new pest introductions causing growers to abandon EPM options in favor of pesticides, and EPM solutions being insensitive to growers' production constraints or cost. This applied research project aimed to develop economic and ecological sustainable pest management plans to alleviate weed and insect problems in solanaceous and leguminous vegetables. Yields and profits of these crops are impacted by several high-priority pests including herbicide resistant weeds and economically damaging insects.

What has been done
Two economically important crops, eggplant and snap beans, were used as model systems. Replicated field studies were conducted at two locations in Maryland to investigate the impact of inter planting eggplant with red clover or red clover-rye cover crop mixture on weeds, arthropods and yield in eggplant. An additional replicated field trial was conducted at the University of Delaware's Carvel Research and Education Center. Snap beans were used as the commercial

vegetable planted focusing on similar pest management strategies as the UM studies. Soil management was conventional tillage or no-tillage with cover crops (winter peas or cereal rye alone or winter peas with cereal rye) and pest management was either with or without synthetic pesticides.

Results

This research and associated policy change has contributed to an increase in stakeholders' knowledge and use of legume-grass cover crop mixture for managing crop pests and obtaining other beneficial services. Partnerships were established with stakeholders including 1890 land-grant university personnel to insure that IPM training meet the needs of all end users including under-served farming communities. This was achieved through collaborative efforts between the University of Maryland College Park, University of Delaware, Delaware State University and University of Maryland Eastern Shore (UMES) faculty. Data on pest levels, yield and production costs, as well as findings from economic analyses, were used to educate farmers on the economic and ecological benefits of IPM adoption. Farmers and especially disadvantaged farmers have begun to understand the benefits of IPM and their attitudes toward traditional vs. IPM practices are changing.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
601	Economics of Agricultural Production and Farm Management

Outcome #7

1. Outcome Measures

Developing Cultural Control Tactics for Spotted Wing Drosophila Management In Small Fruits

2. Associated Institution Types

- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Spotted wing drosophila (SWD) is a devastating invasive insect pest of soft-skinned fruits native to eastern Asia. It was first found in the mainland U.S. in 2008, and is estimated to cause $718 million of crop losses annually in the U.S. Most large-scale farmers now apply broad-spectrum insecticides weekly when fruit are ripe in an attempt to manage SWD. This is not an economically feasible management strategy for smaller scale farmers and has dramatically impacted the economic and environmental sustainability of soft skinned fruit production. Alternative management strategies are desperately needed.

What has been done

In this research project, field biology data were collected to better understand SWD distributions and habitat preferences within crops. These data will facilitate downstream development of cultural pest management strategies, which require a sound understanding of pest biology to implement successfully. Also evaluated were potential cultural control practices such as canopy management (pruning) and mulches to gather preliminary data on their efficacy and feasibility for use as management tactics

Results

Both the pruning and mulching experiments conducted indicate that SWD survivorship and infestation can be impacted by these practices. In particular, cultural practices that increase the duration of hot temperatures (>87°F) negatively impact SWD. Additionally, data obtained from this project was used to obtain funding for an expanded research project, with the ultimate goal of developing sustainable and effective alternate management strategies that will lower production costs, and increase marketable yields and profits for fruit farmers while maintaining environmental stewardship. This project directly reached 496 stakeholders in the Mid-Atlantic region through in-person participation in Extension meetings, field days, and conferences. In addition, multiple handouts and Extension publications that reached extended target audiences were produced. Survey responses (n=149) indicate that 78% of stakeholders find the SWD information presented to be beneficial for their operations and 69% of these respondents would share the information with others.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Diseases and Nematodes Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems

Outcome #8

1. Outcome Measures

Development of an Innovative Outreach Tool for Beekeeping Best Management Practices

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Honey bees are an essential part of the agrosystem because of their contribution to crop pollination. Of concern are the high rates of colony loss reported every winter. While many factors impact colony health, there is consensus that the largest contributor to losses is poor varroa management. Astonishingly, despite nearly 30 years of extension efforts, 58% of beekeepers do not use a varroa control product.

What has been done
Efforts were concentrated on the development of the extension tools that are now used to disseminate personalized recommendations on Best Management Practices to small-scale beekeepers. The "Bee Your Best" application walks beekeepers through a short series of questions, then evaluates how well they are performing best management practices and how they could improve. It took several months of testing and tweaking the wording so that the results are clear and indicative of the modeling results.

Results
Reducing colony loss through BMP adoption has indisputable value, both for the beekeeping and agricultural communities. This project tested different extension efforts to maximize the likelihood of BMP adoption, and hence, can inform innovative active outreach efforts in other systems. The web based application "Bee Your Best" is now available to the public online at https://bip2.beeinformed.org/bee-your-best/. The team will post a blog announcing the release of the app and will start testing the effectiveness of the app with beekeeping groups.

4. Associated Knowledge Areas

KA Code	Knowledge Area
211	Insects, Mites, and Other Arthropods Affecting Plants

Outcome #9

1. Outcome Measures

Spermatozoal Transcriptomes for Important U.S. Aquaculture Finfish: Requisite Foundation For Functional Genomics, Sperm Quality and Implications For Male Fertility

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Striped bass sperm are used to fertilize the eggs of white bass to produce the hybrid Sunshine Bass for the striped bass aquaculture industry. Currently, few sources of striped bass juveniles are available to growers that aren't obtained from wild- caught parents devoid of any genetic improvement in phenotypic traits of importance such as survival and growth. Genetically improved brood stocks of striped bass coupled with cryopreserved sperm from genetically improved, selected male striped bass could help producers make rapid increases, both biologically and economically, by expanding the seasonal availability of genetically improved fish for the producers, which will help lower their total economic costs of production.

What has been done
The research team has been able to isolate and develop sperm transcriptome profiles from striped bass and developed a novel method to evaluate sperm quality (identification of DMR in sperm DNA) of striped bass.

Results
With the research team's recent isolation of RNA from striped bass sperm (one of the first times that this has been achieved with fish sperm) it was demonstrated that there is a unique opportunity to develop the sperm's transcriptome profile from fish of importance and correlate these transcript levels with fertility in important aquaculture fish species. These profiles can assist farmers, researchers, managers, and administrators as they make difficult choices related to breeding and production of the next generation of food fish or the maintenance of genetic lines in high priority research facilities.

4. Associated Knowledge Areas

KA Code	Knowledge Area

301 Reproductive Performance of Animals

Outcome #10

1. Outcome Measures

Preventing Outbreaks of Avian Influenza Through Timely Dissemination of Practical Science-Based Information

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
More than 48 million birds have been lost due to infection caused mainly by a deadly mixed-origin H5N2 strain of highly pathogenic avian influenza (HPAI). While cases have not been reported on the East Coast, poultry growers and workers in major poultry production areas in the U.S. need to know how HPAI is transmitted so they can take the necessary measures to prevent it. To address these needs, this project developed, enhanced, and disseminated practical, credible, science-based information on avian influenza prevention, preparedness, and response.

What has been done
A six-minute avian influenza (AI) biosecurity video developed in this project has reached wide national and international audiences through presentations at scientific/professional meetings as well as through online (YouTube) access. Through these videos, knowledge and understanding of novel AI viruses have been enhanced. The videos are available in English and Spanish, and versions with Vietnamese, Korean, and Chinese (Mandarin) sub-titles.

Results
Through these efforts, ordinary citizens and Extension specialists are able to access current objective information on the transmission and spread of AI virus, thereby increasing awareness which would encourage them to practice strict biosecurity. Poultry industry and emergency response personnel are also able to update their AI emergency preparedness plans based on latest information on epidemiology (sources and modes of spread) of AI virus. Poultry industry and animal health agencies have been using the biosecurity videos to train their personnel and

other target audiences on practical biosecurity to prevent avian influenza outbreaks. These videos are available online for public access through the University of Maryland Extension YouTube channel, as well as on the Avian Influenza Extension Facebook page.

4. Associated Knowledge Areas

KA Code	Knowledge Area
311	Animal Diseases
601	Economics of Agricultural Production and Farm Management
723	Hazards to Human Health and Safety

Outcome #11

1. Outcome Measures

Increase in Livestock Profitability Attributable to Extension and Research Efforts.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Rapid changes in the USA's demographics during the last 25 years have resulted in an increased demand for lamb and chevon. USDA/NASS reported yearly chevon imports to exceed $129+ million. In 2013, 80,000 metric tons of lamb were imported to the USA. Demand is linked to ethnic holidays with varying celebration dates. It is challenging for producers to cater to consumers because sheep and goats are seasonal breeders

What has been done
The UMES Small Ruminants Farm established an ongoing demonstration project for the use of controlled internal drug release(CIDR). Ewes and does were separated into two groups, synchronized (CIDR) and not (control), for breeding in late spring (anestrus-season) or Fall (natural breeding season). At each breeding event, CIDRs were inserted for 12 to 18 days and at the time of removal, ewes/does were grouped for mating in single sire groups. Lambs were tagged, weighed, sexed, and liter size was recorded. Data was analyzed using Chi-square and analysis of variance.

Results
The studies indicated that the use of CIDRs has a potential in assisting small farmers to schedule breeding according to peak demand. This allows operators to prepare facilities, labor, and supplies accordingly to enhance sheep and goat survival and welfare and to increase profitability by reducing input costs and reducing losses. The results of this three year study have been communicated with producers through 1890 Extension outreach efforts.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
601	Economics of Agricultural Production and Farm Management

Outcome #12

1. Outcome Measures

Increase Research Findings in the Production Of Ethnic Specialty Crops In Sandy Soils With Added Biofertilizers

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The rise of ethnic diversity along the eastern coast of the United States has caused an increase in the demand for ethnic specialty crops. With the development of research based production practices for specialty crops, small farmers have the opportunity to sustain farming operations and increase profitability. Biofertilizer use may improve plant growth through the supply of plant nutrients and may sustain environmental health and soil productivity in mainly acidic, sandy soils.

What has been done
Studies involving callaloo and hibiscus biofertilizer were repeated for the 2017 growing season. A randomized design was used for planting with three treatments, (1) Control(no inoculum), (2) Azospirillum (AZO), and (3) Endo/Ectomycorrhizae(Endo/Ecto), and four replications each. Commercial fertilizer (20-20-20) was applied as needed. Fresh weight of callaloo and fresh and

dry weight of the hibiscus calyces were recorded and analyzed.

Results
Biofertilizers have less of a negative impact on the environment, but produced the same yield as chemical fertilizers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
601	Economics of Agricultural Production and Farm Management

Outcome #13

1. Outcome Measures

Increase research findings and standards development that promote pesticide operator health and safety

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Safe and judicious use of pesticides is important for global food availability and security. Health and safety while applying pesticides is of interest to individuals applying pesticides as well as to the plant protection industry and to pesticide safety education trainers.

What has been done
Studies were conducted to measure the thermo-physiological comfort of Personal Protective Clothing (PPE), to support revision of testing methods for clothing providing protection against chemicals (ISO 17491-4), and to replace existing commercial formulation used for testing with a surrogate test chemical.

Results
Development of international standards that are used for certification of protective clothing for pesticide operators. Three international standards are currently being balloted.

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety

Outcome #14

1. Outcome Measures

To increase research findings to enhance the production of pulses and spices in the Delmarva region to increase bio-diversity and profitability

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Cropping in the Delaware, Maryland, and Virginia (Delmarva) region is constrained by drought and sandy soils. Increasing bio-diversity is necessary for local farmers to increase food security and profitability.

What has been done
Experiments were conducted in the laboratory, greenhouse, and various field locations over four growing seasons.

Results
Valuable information was gained: the best legume species/varieties that are suitable to grow successfully in Delmarva (Crystal and Berkin Mung beans)were identified; the most effective nitrogen fixing bacteria, rhizobia and bradyrhizobia was determined and isolated to effectively nodulate and fix atmospheric nitrogen with the selected elite pulse crops; the best approach to control insect pest and microbial pathogens was identified; and, useful information was gained on the use of plastic mulch to control weeds and insect pests in chili pepper horticultural crops. This information was disseminated to about 50 local farmers annually who attended field days and at national conferences.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Overall, we have been able to meet our goals related to global food security and hunger, even though agricultural production exists in a dynamic environment that can change suddenly. UME has been able to hire tenure-track and professional track Extension Educators over the past year (continuing a trend from 2016), which has dramatically increased our ability to provide exceptional and needed programming for the State of Maryland. Both MAES and AES have also continued to engage in cutting-edge research on a state, multi-state, and international basis, leading to findings that address global food security for a world population that is estimated by the U. S. Census Bureau to reach nine billion by 2050.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

In 2015, the Women in Agriculture program was funded by Rural Maryland Council Grant (MAERDAF) and was evaluated in early 2016 and again in 2017 for annual results. A survey was sent to 972 registrants (324 responses 33% response rate). Of the participants: 66% were interested in the topic, 37% will use the information to help their clients, 29% will improve their farm business management, 74% are interested in marketing, 70% social media, 61% business planning, 53% in finance, 43% on legal issues. Results concluded a statistically significant increase after attending the Webinars. Participants report increasing knowledge by 48%. Those that reported no knowledge or slight knowledge increased by 64%.
Other results include: 56% plan to make a change as a result of the webinars, 93% visited the website, 56% visited Facebook, 55% visited eXtension.org, 32% are beginning farmers, 28% are service providers, 24% are exploring farming options, 44% are from Maryland, 10% from Delaware, 43% outside of the Mid-Atlantic (16 states represented).
In the past five years over 3,200 participants have attended University of Maryland Extension sponsored agronomy days. Over 88% of the participants report that the session will benefit their farming operation. Participants report information and production practices that will be implemented following the program. These include: Improved pest management practices (28%), Improved fertility management (45%), Improved crop production practices (47%), Use of risk management tools (16%), Regulatory information

(28%), A new product or practice (22%).

Winter agronomy meeting participants were asked the expected yield increase due to knowledge and skills gained from Extension programming. The average participant will increase yield per acre between 6.5% and 9.6%.

Agronomy meeting participants were also asked the expected profitability increase per acre due to knowledge and skills gained from Extension programming. The average participant increases profitability between $16.23 and $25.23 per acre. Using the average acres farmed per person (from UME survey) the overall average profitability is ($20.23*605ac) = $12,239.15 per person.

As a result of the "Food for Profit" workshops in Baltimore, Montgomery and Prince George's Counties, about one-third of the 53 total participants were introduced to an allergen strategy for the first time. Furthermore, there was a significant positive change in participants' understanding about packaging and labeling food products from before and after the "Food for Profit" workshop. This has the potential to help farmers and other residents develop a food product to incorporate as an additional revenue stream and even transform a side hustle into a lucrative career. In addition, it adds diversity to the Maryland food landscape which strengthens the economy.

Under the Agricultural Nutrient Management Program, nutrient management advisors:

• prepared nutrient management plans for 28 Manure Transport Project clients, allowing transportation and application of manure on 5,759 acres;

• wrote nutrient management plans or updated them to partially fulfill permit requirements for 190 CAFO or MAFO clients;

• conducted the Phosphorus Site Index for 214 clients on 1,174 fields encompassing over 19,700 acres;

• implemented the Pre-Sidedress Nitrate Test (PSNT) for 26 producers with a total of 2,484 acres. This resulted in an estimated reduction of over 5,400 pounds of nitrogen applied;

• implemented the Fall Soil Nitrate Test (FSNT) for over 130 fields in 7 counties. This resulted in an estimated reduction of over 34,000 pounds of nitrogen applied;

• wrote 546 new nutrient management plans for 233 Maryland producers for approximately 18,600 acres. The nutrient management advisors updated 6,309 plans for 1,530 clients farming approximately 264,500 acres.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Sustainable Energy

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	0%	35%	0%	0%
111	Conservation and Efficient Use of Water	0%	10%	0%	0%
112	Watershed Protection and Management	0%	10%	0%	0%
123	Management and Sustainability of Forest Resources	20%	0%	0%	0%
302	Nutrient Utilization in Animals	0%	20%	0%	70%
403	Waste Disposal, Recycling, and Reuse	40%	25%	50%	0%
511	New and Improved Non-Food Products and Processes	0%	0%	40%	30%
601	Economics of Agricultural Production and Farm Management	40%	0%	0%	0%
801	Individual and Family Resource Management	0%	0%	10%	0%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	6.0	1.0	4.0	4.5
Actual Paid	6.0	1.0	4.0	2.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
172007	68572	246630	97308
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
172007	68572	251150	197722
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
20666	0	19480	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Short course and training seminars for industry personnel and growers.
- Conduct basic and applied research in alternative fuel sources, energy saving techniques, recycling of green waste products, and precision agriculture.
- Contribute to trade and peer reviewed journal publications.

2. Brief description of the target audience

- Nursery, greenhouse, dairy farmers, poultry growers and managers
- In-state bioenergy industry.
- Research community at large.
- Farmers and producers.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1569	0	478	0

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

Patent Applications Submitted

Year: 2017

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	5	5

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Extension educational programs offered

Year	Actual
2017	20

Output #2

Output Measure

- Number of applied research projects

Year	Actual
2017	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increase in the number of educational programs offered to consumers.
2	Increase in the number of research projects on alternative energy sources and precision agriculture.
3	Research on Ecology of Wetlands to Improve Water Quality, Biofuel Production, Sustainable System Design, & Ecosystem Restoration
4	Research on Biomass Degradation by Enzymes of Saccharophagus Degradans
5	Research on uses of byproducts of biofuels
6	Watershed Diagnostics for Improved Adoption of Management Practices: Integrating Biophysical and Social Factors
7	Spatial Economic Modeling of Land Use and Watershed Management

Outcome #1

1. Outcome Measures

Increase in the number of educational programs offered to consumers.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Increase in the number of research projects on alternative energy sources and precision agriculture.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There appears to be resurgence in interest utilizing wood fiber as an alternative heating source for fireplaces, woodstoves and modern wood heating systems. Most recently there is a great interest in utilizing wood pellets as residential heating fuels. In addition, it appears as if Maryland homeowners want to utilize a fuel source that is produced locally to support local business and forest landowners, in an effort to support the green energy movement. However, the last in-depth residential firewood survey was performed by Maryland DNR, Forest Service, over 20 years ago.

What has been done
Maryland single family homeowners (7,000) were surveyed with reference to firewood and wood pellet usage. The addresses of 7,000 single family households were randomly selected from the Maryland Department of Planning database. The list was randomly stratified and sorted by County. For all the single housing units located in very low and low density zoning areas in Maryland, the percentage for each County was calculated.

Results
Overall it is expected that the survey results will help increase the level of knowledge among policy makers on the importance of forest products to the State of Maryland's economy and the

environmental benefits. This increase in knowledge will motivate them to put in place favorable policies that will benefit the forest landowners of the State and help homeowners gain better access to firewood. Also, results will assist in the development of educational programs focusing on firewood, invasive pests, forest management and the value of Maryland's forests to the State's economy and environment.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources
403	Waste Disposal, Recycling, and Reuse

Outcome #3

1. Outcome Measures

Research on Ecology of Wetlands to Improve Water Quality, Biofuel Production, Sustainable System Design, & Ecosystem Restoration

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Wetlands have long protected human societies from floodwater. Modern societies also use wetlands to clean waste- and storm-water. Wetlands are increasingly being used to receive waste from anaerobic digesters that use microorganisms to break down biodegradable material and produce energy. Developing coupled wetland-biodigestor systems are crucial to help the US to meet its increasing energy demands in a more sustainable way.

What has been done
The overall goal of this research was to better understand complex ecological processes of waste- and storm-water wetland systems to improve their ecological functioning and ability to provide important ecosystem services. This project specifically addressed the services of pollutant removal, infectious disease regulation, and biofuel production. Example project methods included vegetation studies, environmental data collection, mosquito studies, testing of coupled wetland-anaerobic digester systems, and modeling.

Results

The main activity during this final project year was writing the remaining manuscripts for publication, presenting findings at scientific conferences, and incorporating the findings from this project, from all project years, into university courses. A total of 35 students advanced their knowledge of the ecological processes related to wetlands in classes on Wetland Ecology and Wetland Restoration. Investigators mentored a total of two PhD and four MS students.

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

Research on Biomass Degradation by Enzymes of Saccharophagus Degradans

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There is an acute need to develop efficient enzyme mixtures to improve the digestion of lignocellulosic biomass to aid in the release of sugars. Current systems require uneconomical pretreatments or the retained hemicellulose and lignin blocks access of the cellulases to their substrate, thus limiting hydrolysis. Complicating this issue is the crystallinity of cellulose.

What has been done
The first steps in the research were to understand the biochemical activities of S. degradans contributing digestion of specific substrates and to elucidate the regulation of the source genes. With this knowledge, more effective enzyme mixtures were assembled and their expression engineered. In collaboration with researchers in the Department of Material Science and Engineering, methods were developed to enhance the enzymatic conversion of biomass into sugars and reduce the crystallinity of cellulose, a second barrier to digestion.

Results

Researchers accomplished: Production of enzymes for degrading biomass and clarification of the role of critical enzymes; identification of the first new family of cellulases found in over 10 years; a solvent system for preventing the recrystallization of cellulose biomass; detailed metabolic flux analysis of the movement of carbon during the metabolism of glucose and the enzymes involved; and, novel transporters for the import of hydrolytic products.

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

Research on uses of byproducts of biofuels

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The rapid expansion of fuel ethanol production has led to an increase in both the cost of corn and the production of corn byproducts. The livestock and poultry industries have a great interest in utilizing distiller's dried grains with solubles (DDGS) and we distiller's grains (WDG) to lower the cost and increase the health of meat.

What has been done
Testing alkali hydrolysis of corn distillers grains to convert most of the matrix-bound, unabsorbable phenolics into absorbable phenolics in animal GI tracts.

Results
Results indicated that phenolic compounds, especially phenolic acids and carotenoids and antioxidant capacities in corn are well concentrated into DDGS during the fuel ethanol production processing. Because the health benefits of phenolic acids and carotenoids have been well recognized, corn distillers grains co-products, especially DDGS, can be a good source to improve health and wellness of farm animals and their profitability.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
601	Economics of Agricultural Production and Farm Management

Outcome #6

1. Outcome Measures

Watershed Diagnostics for Improved Adoption of Management Practices: Integrating Biophysical and Social Factors

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The Chesapeake Bay is the most important estuarine ecosystem in Maryland. For the past three decades research and extension efforts have focused in alleviating degradation of the Bay by reducing point-source pollution loadings of sediments and nutrients entering the bay, but nonpoint-source pollution has been a challenge due to the source of pollution and the size and spatial heterogeneity of the Bay's drainage basin. NPS pollution is best tackled by applying best management practices (BMPs) over the landscape. However, land area, time, and monetary resources are limited. For local, county, and state governments to make efficient and effective resource allocations, they need to know where especially vulnerable watershed areas are so that they can focus their BMP adoption and implementation efforts there.

What has been done
A team of researchers from AGNR collaborated with colleagues from ENGR to study the potential effects of climate change on nutrient pollution and effectiveness of management practices. The research focused on an agricultural watershed of the Chesapeake Bay drainage basin to help watershed managers mitigate the effects of run-off, sediments, nitrogen, and phosphorous from farming. The work used hydrological models to identify areas in the watershed that produced the most pollution ("hotspots") under current climate conditions. It then developed a decision support

tool allocate the most appropriate management practices to "hotspots" given the local environmental conditions (land use, soils, topography). Models were subjected to weather from different climate scenarios that were downscaled from global climate models.

Results
The research indicated that areas that produced highest amounts of pollutants will grow substantially with climate change and that the allocation of management practices under current climate conditions would be in insufficient to mitigate pollution and meet Cheasapeake Bay TMDLs. The allocation of management practices needs to take into account the expected effects of weather under future climate change scenarios. As part of the project's 4-H Youth Development educational outreach efforts, a series of Chesapeake Bay and water quality-themed lessons have been developed for a target audience of middle school students. In order to make water quality education accessible to all students, most of the activities are designed to be adaptable for use with younger and older students.

4. Associated Knowledge Areas

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

Outcome #7

1. Outcome Measures

Spatial Economic Modeling of Land Use and Watershed Management

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Land-use change is a primary driver of the losses in biodiversity and ecosystem services at local to global scales. Developing spatially explicit projections of land-use change and their consequences has thus emerged as one of the eight grand challenges in environmental science. Yet our ability to forecast land-use change has been limited by the availability of spatial data and our understanding of nonlinear threshold responses in economic and ecological systems.

What has been done

Managing urban sprawl is critical to maintaining the integrity of agricultural and resource areas, particularly due to low-density exurban development. This project created data on the residential subdivision history in the Baltimore metro region from 1960 to 2007 to understand the economic factors affecting spatial land-use patterns and forecast land-use change. The study evaluated the effect of a major downzoning policy to preserve agricultural and forested land in the region. It was found
that the down-zoning policy did not affect the likelihood of development, but it did decrease the density of development. Also analyzed is the effect of the forest conservation regulations on residential development and forest cover change in the region.

Results

Results indicated that, after the FCA regulation, forest cover increased by 21% within subdivisions relative to the amount without the regulation. Parcels with the highest levels of forest cover continue to have significant forest losses, despite the FCA regulations. Because regions with the most intact forest cover are those least protected by the FCA regulations, land-use planners must conserve high priority forested areas using other approaches (e.g., purchase of development rights or conservation easements). The land-use change models were also integrated with the Chesapeake Bay watershed model to analyze the economic efficiency of regulatory and incentive-based policies on the fluxes of nutrient and sediment loads in urban areas of the Chesapeake Bay watershed. These results provided novel approaches to analyze the effect of land-use policies and their associated effects on water quality.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Programmatic Challenges

Brief Explanation

As in previous years, there is limited capacity across Extension and Research to address this planned program. However, it has been an area where some capacity has been built over the past years. For example, UME is hiring an energy specialist in 2018. The poultry, dairy, and green industry are very interested in alternative sources of energy and more energy savings techniques that make their operations more efficient and profitable. Research on the conversion of biomass to bioenergy has matured, but it is envisioned that with more

research funding Maryland scientists will move forward in developing economically and environmentally sound methods to convert biomass and waste into biofuels.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Climate Change

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	10%	0%	15%	18%
111	Conservation and Efficient Use of Water	10%	10%	5%	0%
112	Watershed Protection and Management	15%	25%	10%	65%
123	Management and Sustainability of Forest Resources	5%	0%	5%	0%
131	Alternative Uses of Land	10%	10%	5%	0%
132	Weather and Climate	0%	20%	0%	0%
133	Pollution Prevention and Mitigation	10%	15%	25%	17%
205	Plant Management Systems	15%	0%	10%	0%
216	Integrated Pest Management Systems	10%	0%	10%	0%
403	Waste Disposal, Recycling, and Reuse	5%	20%	15%	0%
608	Community Resource Planning and Development	10%	0%	0%	0%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	16.0	3.0	11.0	3.3
Actual Paid	16.0	3.0	11.0	2.8
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
688028	274287	369945	293436
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
688028	274287	376725	147378
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
567416	0	29220	135315

V(D). Planned Program (Activity)

1. Brief description of the Activity

• UME, MAES, and AES will have a combined focus to help producers plan and make decisions in adapting to changing environments, sustaining economic vitality, and taking advantage of emerging economic opportunities offered by climate change mitigation technologies.
• UME, MAES, and AES will also develop research and education programs that generate knowledge to develop agriculture systems that maintain high productivity in the face of climate changes and reduce greenhouse gas emissions.
• In an effort to meet these objectives, UME, MAES, and AES will develop research and action teams that will focus on: Alternative energy and biofuels; Aquatic resources; Biodiversity/ecosystem services; Energy conservation; Forest resources; Integrated Pest Management; Invasive and exotic species; Land use; Nutrient management; Recreational resources; Waste management; Waste utilization and resource recovery; Watershed restoration; and Wildlife resources.
• UME, MAES, and AES will conduct workshops, demonstrations, symposia, twilight tours, forums and research to educate producers, farmers and citizens about adapting management practices to benefit the environment and minimize climate change impacts.
• MAES, AES, and UME will develop and expand collaborative research and education programs with partners and stakeholder and develop new web based and media educational materials.

2. Brief description of the target audience

- Maryland citizens;
- Master Gardeners and Naturalists;
- Urbanites
- Land developer and owners;
- UME, MAES, and AES faculty;
- USDA-NRCS conservationists;
- Soil Conservation District personnel;
- EPA-Chesapeake Bay
- MDA program staff;
- MDE program staff;
- Producers;
- Farmers;
- Nursery and Greenhouse industry personnel;
- Forest landowners;

- 4-H youth;
- County planning and zoning program staff;
- AGNR industry;
- Nonprofits;
- Appropriate state and municipal government officials;
- Primary and Secondary Science Teachers;
- Media; and
- Maryland homeowners.

3. How was eXtension used?

Faculty contribute to Ask an Expert and learning communities. As a full member of eXtension.org, faculty and staff take advantage of membership benefits, including professional development and technology (such as Zoom).

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	29729	2961751	4169	97

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

Patent Applications Submitted

Year:	2017
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	3	13	16

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of educational programs (workshops, twilight tours, field days, courses) offered

Year **Actual**

2017	168

Output #2

Output Measure

- Number of applied research projects

Year	Actual
2017	2

Output #3

Output Measure

- Number of Master Gardeners, Naturalists, Bay-wise, Watershed stewards, and other trained volunteers to deliver educational programs

Year	Actual
2017	7500

Output #4

Output Measure

- Number of newsletters (electronic and paper) to the public

Year	Actual
2017	4

Output #5

Output Measure

- Number of individuals reach through Extension programs
  Not reporting on this Output for this Annual Report

Output #6

Output Measure

- Number of information pieces developed

Year	Actual
2017	20

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increased number of citizens and communities adopting practices of landscape ecology and understanding the relationship among pesticides, poor septic systems and environmental health.
2	Number of new crop varieties, animal breed, and genotypes with climate adaptive traits.
3	Increase in management and sustainability of forest and wildlife resources.
4	Increase in nutrient management planning, waste management systems, and use of composting technology.
5	Increase in research regarding agricultural waste management, composting, water quality, and environmental health.
6	Increased number of acres of best management practices (storm water, nutrient management) implemented
7	Watershed Diagnostics for Improved Adoption of Management Practices: Integrating Biophysical and Social Factors
8	Spatial Economic Modeling of Land Use and Watershed Management
9	Mitigation of Heat Stress in Broiler Chickens through Early-Life Thermal Conditioning
10	Research on the impact of climate changes on water quality of the Chesapeake Bay

Outcome #1

1. Outcome Measures

Increased number of citizens and communities adopting practices of landscape ecology and understanding the relationship among pesticides, poor septic systems and environmental health.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
According to Maryland's Department of Planning, Maryland lost 1,009,698 acres of resource land to development between 1973 and 2010. Of that, 845,978 acres (83.8%) were for residential use. Many residents, planners, and developers do not recognize the urban and suburban landscape as part of the greater ecosystem, and they have generally failed to incorporate environmental and ecological concepts into their landscape plans. This failure has led to very unhealthy and unsustainable communities and has been linked to climate change.

What has been done
The University of Maryland Extension Bay-Wise Landscape Management program helps residents in rural, suburban and urban settings reduce their negative impact on the environment through efficient use of nutrients and pesticides, water management, composting, alternative use of pesticides (IPM), native plants, rain gardens and other related landscape management techniques. MD Master Gardeners teach homeowners in their community about sustainable landscape practices and certify landscapes as conservation landscapes.

Results
In 2017, 82 Master Gardeners learned Bay-Wise best management practices (BMPs) in 5 Bay-Wise advanced training classes. This brings the total of trained Bay-Wise-trained Master Gardeners to 1,304, with 452 of them currently active on their local Bay-Wise Committees. In 2017, Master Gardeners volunteered 6,878 hours in Bay-Wise and environmental horticulture projects. This time is valued at $184,261.62 by Independentsector.org

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships

111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
132	Weather and Climate
133	Pollution Prevention and Mitigation
216	Integrated Pest Management Systems
403	Waste Disposal, Recycling, and Reuse

Outcome #2

1. Outcome Measures

Number of new crop varieties, animal breed, and genotypes with climate adaptive traits.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The U.S. has one of the world's most efficient poultry production systems and is currently an exporter of poultry products, including 3.6 MMT for broiler and 0.32 MMT for turkey to 116 and 91 export markets, respectively (Poultry & Egg Export Market Data, 2011), placing the U.S. second for broiler-export and first for turkey-export in the World. Considering the U.S. and global trends in poultry and egg production, consumption and international export/trade, control of disease and development of healthy animals that are able to thrive under various environmental conditions and rearing practices is of utmost importance.

What has been done
To improve poultry health, reduce disease-associated losses and keep poultry health management at a reasonable cost, studies have been made to advance understanding of the genetic bases for resistance and immunity to avian diseases. In this context, it is critically important to focus efforts on identification and characterization of genes affecting innate and adaptive immunity, as well as, on understanding the mechanisms underlying optimal immune system development and function and the influence that physiological and environmental factors have on these processes.

Results

A multistate group, in their on-going collaborative research activities, has rapidly enhanced understanding of the interactions between genetic background and disease resistance and the processes involved in natural defenses. These efforts also led to the development of reagents and tools for use in genetic selection, assessment of immune system development and function, and improvement of poultry health.

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate

Outcome #3

1. Outcome Measures

Increase in management and sustainability of forest and wildlife resources.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

There are 157,000 private forest landowners in Maryland who own 78% of the forest resources, which provide forest products, wildlife habitat, recreation, open space and other benefits to all Maryland citizens. Only an estimated 6% have a written forest stewardship plan to guide their activities, and fewer than 10% seek the assistance of a professional forester before harvesting timber. Many forest landowners have a greater interest in wildlife rather than timber production, but lack knowledge of how to use harvesting, tree planting, and other management practices to improve wildlife habitat. They also lack knowledge concerning whom to contact for assistance and they may be suspicious of government agencies. However, many will value advice from a peer or relative.

What has been done

The Maryland Woodland Stewards program selects volunteer opinion leaders in local communities and leverages limited Extension resources by building capacity through volunteerism. Using local networks and organizations, trained volunteers can demonstrate sound forest and wildlife management practices and connect other landowners with professionals and information that can help them reach their objectives. The program focused on concepts of

neighbor helping neighbor and education through demonstration.

Results
Maryland Woodland Stewards own and/or manage 69,040 forested acres, using sound forest and wildlife management practices learned through their Program Training. Maryland Woodland Stewards have reached out to Maryland's individual woodland owners and managers to teach them sound forest management practices that result in better overall forest health and more abundant and diverse wildlife.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
131	Alternative Uses of Land
132	Weather and Climate
205	Plant Management Systems

Outcome #4

1. Outcome Measures

Increase in nutrient management planning, waste management systems, and use of composting technology.

2. Associated Institution Types

- 1862 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Regardless of land use, improperly or excessively applied nutrients can leach into the groundwater or exit landscapes via runoff from precipitation and then migrate into Maryland's waterways. Once in the water, excess nutrients upset the Bay's ecological balance by causing algal blooms and contributing to eutrophication and degradation of wildlife habitat.

What has been done
The Agricultural Nutrient Management Program provides support to the nutrient management planning community through educational opportunities, technical support and software development. It also provides support to agricultural producers through the development of nutrient management plans.

Results
Nutrient management advisors wrote 546 new nutrient management plans for 233 Maryland producers for approximately 18,600 acres. The nutrient management advisors updated 6,309 plans for 1,530 clients farming approximately 264,500 acres. Fifty-nine (59) farmers were certified through the Farmer Training and Certification (FTC) initiative to write their own nutrient management plans. Three hundred forty-eight (348) certified farmers have maintained their certification by complying with continuing education requirements. To date, 650 farmers have been certified through this training initiative.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
132	Weather and Climate
133	Pollution Prevention and Mitigation
403	Waste Disposal, Recycling, and Reuse

Outcome #5

1. Outcome Measures

Increase in research regarding agricultural waste management, composting, water quality, and environmental health.

2. Associated Institution Types

- 1862 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Regardless of the types of land use, improperly or excessively applied nutrients can either leach into the groundwater or exit landscapes via runoff from precipitation and then migrate into Maryland's waterways. Once in the water, excess nutrients upset the Bay's ecological balance by causing algal blooms and contributing to eutrophication and degradation of wildlife habitat.

What has been done
AES performed research on the surface and subsurface movement of Nitrogen (N) and Phosphorous to sensitive water bodies in order to develop best management practices to meet regional water quality standards set by regulatory agencies.

Results
Woodchip bioreators were shown to be a cost-effective practice for N removal and best management practices were evaluated and strategies were developed for targeting placement of these systems.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
131	Alternative Uses of Land
132	Weather and Climate
133	Pollution Prevention and Mitigation
205	Plant Management Systems
216	Integrated Pest Management Systems
403	Waste Disposal, Recycling, and Reuse

Outcome #6

1. Outcome Measures

Increased number of acres of best management practices (storm water, nutrient management) implemented

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

According to the Chesapeake Bay Program (CBP), since restoration efforts began in the past several decades, the health of the Bay has shown some improvement in certain areas but overall, the ecosystem remains in poor condition. Despite the signs of improvement, the CBP states that the Bay's water quality remains very poor and can be attributed to excessive amounts of pollution entering the Bay from the many streams and rivers that drain to it. As population in the watershed continues to increase, natural areas are converted to more impervious surfaces in order to accommodate the needs of residents, businesses, and industry, thereby increasing storm water runoff and the transport of sediment and nutrients.

What has been done

The Chesapeake Bay Landscape Professional Certification program formalizes a set of conservation landscaping standards that strive to balance the environmental, economic, and social needs of the landscape, while providing an in-depth understanding of how human interaction affects the outdoor landscape and vice versa. The goal of this program is to create a trained workforce of landscaping professionals and firms that have the skills and expertise to design, install, and maintain small-scale conservation landscaping practices for efficient nutrient and sediment removal.

Results

Since the program began in 2016, CBLP has certified 158 Level 1 professionals, and 21 Level 2 advanced design and installation professionals. To date, 76 hands-on activity reports of 170 project indicate that practices have resulted in approximate annual reductions of 775 lbs of nitrogen, 370 lbs of phosphorus, and 509,929 lbs of sediment

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation
403	Waste Disposal, Recycling, and Reuse

Outcome #7

1. Outcome Measures

Watershed Diagnostics for Improved Adoption of Management Practices: Integrating Biophysical and Social Factors

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
For the past three decades, research and extension efforts have focused in alleviating degradation of the Chesapeake Bay by reducing point-source pollution loadings of sediments and nutrients entering the bay. However, land area, time, and monetary resources are limited. For local, county, and state governments to make efficient and effective resource allocations, they need to know where especially vulnerable watershed areas are so that they can focus their BMP adoption and implementation efforts in those specific areas.

What has been done
Researchers have studied the potential effects of climate change on nutrient pollution and effectiveness of management practices. The research focused on an agricultural watershed of the Chesapeake Bay drainage basin to help watershed managers mitigate the effects of run-off, sediments, nitrogen, and phosphorous from farming. The work used hydrological models to identify areas in the watershed that produced the most pollution ("hotspots") under current climate conditions. It then developed a decision support tool allocate the most appropriate management practices to "hotspots" given the local environmental conditions (land use, soils, topography). Models were subjected to weather from different climate scenarios that were down-scaled from global climate models.

Results
The research indicated that areas that produced highest amounts of pollutants will grow substantially with climate change and that the allocation of management practices under current climate conditions would be in insufficient to mitigate pollution and meet Cheasapeake Bay TMDLs. The allocation of management practices needs to take into account the expected effects of weather under future climate change scenarios. The work has been described in two peer-reviewed journal articles, numerous conference talks, a webinar for the USDA Northeast Climate Hub, and supported one student thesis. As part of the project's 4-H Youth Development

educational outreach efforts, a series of Chesapeake Bay and water quality-themed lessons has been developed for a target audience of middle school students.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management

Outcome #8

1. Outcome Measures

Spatial Economic Modeling of Land Use and Watershed Management

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Land-use change is a primary driver of the losses in biodiversity and ecosystem services at local to global scales. Developing spatially explicit projections of land-use change and their consequences has thus emerged as one of the eight grand challenges in environmental science. Yet our ability to forecast land-use change has been limited by the availability of spatial data and our understanding of nonlinear threshold responses in economic and ecological systems.

What has been done
This project created data on the residential subdivision history in the Baltimore metro region from 1960 to 2007 to understand the economic factors affecting spatial land-use patterns and forecast land-use change. The study evaluated the effect of a major downzoning policy to preserve agricultural and forested land in the region. Also analyzed was the effect of the forest conservation regulations on residential development and forest cover change in the region.

Results
Results indicated that, after the FCA regulation, forest cover increased by 21% within subdivisions relative to the amount without the regulation. Parcels with the highest levels of forest cover continue to have significant forest losses, despite the FCA regulations. Because regions with the most intact forest cover are those least protected by the FCA regulations, land-use planners must conserve high priority forested areas using other approaches (e.g., purchase of development

rights or conservation easements). The land-use change models were also integrated with the Chesapeake Bay watershed model to analyze the economic efficiency of regulatory and incentive-based policies on the fluxes of nutrient and sediment loads in urban areas of the Chesapeake Bay watershed. These results provided novel approaches to analyze the effect of land-use policies and their associated effects on water quality. It was found that the down-zoning policy did not affect the likelihood of development, but it did decrease the density of development.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
131	Alternative Uses of Land

Outcome #9

1. Outcome Measures

Mitigation of Heat Stress in Broiler Chickens through Early-Life Thermal Conditioning

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Heat stress in chickens can occur in the summer, when temperatures often exceed 95°F in the regions of the United States where most broiler chickens are raised. Notable effects of heat stress on broiler production include increased death of chickens in the flock and reduced feed intake and growth by the birds that survive. In addition to the financial costs, heat stress in commercial poultry operations represents a serious issue of animal well-being. Thermal conditioning using temporarily elevated brooding temperatures during early development imparts long-term resistance to heat stress in broiler chickens, so that they can survive and grow at higher temperatures during a heat wave.

What has been done
A researcher has been working on management approaches to minimize the effects of heat stress on broiler growth and mortality. Increasing the brooding temperature at 3 days of age to 100° for 24 hours can improve performance and decrease mortality under heat stress conditions as the birds approach market weight. Efforts are underway to optimize the protocol and

understand how this early life conditioning improves performance later on.

Results
Reducing the degree of stress responses to heat stress through thermal conditioning would improve animal well-being, decrease mortality rates, and increase feed consumption and growth rates at higher temperatures, thereby reducing the effects on poultry production brought about by climate change.

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate

Outcome #10

1. Outcome Measures

Research on the impact of climate changes on water quality of the Chesapeake Bay

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The Chesapeake Bay ecosystem is of utmost importance for the well being of the economies and citizens of the Mid-Atlantic region. River waters carry a considerable amount of inorganic and organic nutrients into the Bay. The plume region (the mixing interface between the riverine/estuarine and shelf waters) at the outflow of the Bay to the Atlantic Ocean is critical for the fish nursery habitat quality and ecosystem health. Understanding the effect of river flow and wind on the distribution of nutrients form a base for understanding the impact of climate change on water quality of the Bay.

What has been done
A model to assess the nutrient and phytoplankton variability in the Chesapeake Bay outflow plume(CBOP)impacted by river flow and wind was developed, calibrated, and validated. Nutrient distribution and chlorophyll a data were compared with field analysis data and satellite imagery.

Results

The study highlighted multiple mechanisms in regulating CBOP phytoplankton distribution. The peak phytoplankton biomass appeared during April to May and biomass in the far-field and offshore waters was more extensively influenced by streamflow than nutrient loading.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Childhood Obesity

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
703	Nutrition Education and Behavior	50%	34%	0%	0%
704	Nutrition and Hunger in the Population	5%	33%	0%	0%
724	Healthy Lifestyle	35%	33%	0%	0%
801	Individual and Family Resource Management	10%	0%	0%	0%
	Total	100%	100%	0%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	10.0	1.5	5.0	0.5
Actual Paid	10.0	1.5	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
344014	137143	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
344014	137143	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
41331	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Develop/implement training for cafeteria/food service workers using Walk the Line curriculum.
- Workshops and professional development for Growing Healthy Habits, Farm-2-School, and Walk the Line.
- Develop and implement training for School Wellness Champions in pilot test sites focusing on sustainable wellness policies that support healthy lifestyles.
- Create effective materials and programs that meet standards of health literacy.
- Investigate taste preference and trying new fruits and vegetable measures for statewide evaluation.
- Educational programs for cafeteria and food service workers and school administrators.
- Educational programs targeting pre-schoolers and their parents through train-the-trainer approach for child care and pre-school teachers.
- Up For the Challenge curriculum implemented for school-age youth in 3 sites targeted to geographically dispersed military families/youth.
- Contribute articles and expertise to eXtension.org Community of Practice for Food, Fun, and Fitness
- Develop Social Marketing and Social networking strategies to engage target audiences in Healthy Living dialogue
- Conduct applied research to inform educational program interventions.

2. Brief description of the target audience

- School-age youth
- Parents of school-age youth
- Teachers
- Cafeteria/Food service workers
- School administration
- Providers of before and aftercare
- Limited Income Mothers and Children
- Food Stamp recipients
- Geographically dispersed military families
- Childcare providers

3. How was eXtension used?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	3133	0	23322	0

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

Patent Applications Submitted

Year:	2017
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of educational programs offered

Year	Actual
2017	1703

Output #2

Output Measure

- Number of applied research projects

Year	Actual
2017	6

Output #3

Output Measure

- Number of schools and child-care partnerships in childhood obesity prevention programs

Year	Actual
2017	85

Output #4

Output Measure

- Number of school gardens developed
  Not reporting on this Output for this Annual Report

Output #5

Output Measure

- Number of schools and pre-school/early education sites engaged in Smarter Lunchroom programs

Year	Actual
2017	14

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increase in fruit and vegetable consumption among preschoolers and youth
2	Increase in school cafeteria workers' awareness, knowledge, and skills regarding healthy eating practices
3	Increase in preschoolers and youth who include physical activity in daily routine
4	Increase in preschoolers and youth who report eating more healthy foods

Outcome #1

1. Outcome Measures

Increase in fruit and vegetable consumption among preschoolers and youth

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In 2012, the Centers for Disease Control and Prevention, reported that more than one third of children and adolescents were overweight or obese and at greater risk for type 2 diabetes, high blood pressure and high cholesterol. The researchers concluded that children and adolescents should be targeted for nutritional interventions focusing on amounts and types of fruits and vegetables to consume. Therefore, FSNE reduces childhood obesity through improved diet programs and exposure to healthy foods for the entire family.

What has been done
Grow It, Try It, Like It! is a garden-themed nutrition education program that introduces children in schools, pre-school and daycare centers, afterschool programs and community agencies to three fruit-- peaches, strawberries, and cantaloupe, and three vegetables--spinach, sweet potatoes, and crookneck squash. Lessons are based on the "Imaginary Tasty Acres Farm" where participants color the map showing Crookneck Squash Row, Spinach Lane, Sweet Potato Hill, Cantaloupe Corner, Peach Tree Orchard, and the Strawberry Patch as each unit is covered. The program includes hands-on, planting, and nutrition education activities, and it also links activities with resources for use at home.

Results
Almost one-half of youth (42%) who participate in Grow It, Try It, Like It try one or more vegetables for the first time during the program, with almost ¼ of youth (27%) trying at least 2 new vegetables. Teachers who are trained to implement Grow It, Try It, Like It in their classrooms report a significant increase in their modeling of healthy behaviors, including drinking water and choosing fruits or vegetables as snacks. Overall, 78% of youth who participate in FSNE lessons reported feeling confident in their ability to prepare their favorite fruit or vegetable and 80% more teachers reported their students speak positively about fruits and vegetables after FSNE

programming.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

Outcome #2

1. Outcome Measures

Increase in school cafeteria workers' awareness, knowledge, and skills regarding healthy eating practices

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Simple changes in how foods are displayed and promoted can impact the likelihood that kids will eat them. FSNE's Smarter Lunchrooms program helps shape school cafeteria environments to encourage students to select and eat healthy foods. Based on research and practices designed by Cornell University's Behavioral Economics in Childhood Nutrition Programs Center, FSNE provides training, hands-on assistance, and materials to cafeteria staff, helping them make subtle changes in how and where healthy foods are presented on the lunch line. Facilitating taste tests, offering incentives for trying new foods, and training lunchroom staff on positive verbal nudging create a positive school culture around healthy eating.

What has been done
Trainings on Smarter Lunchroom strategies, materials, and technical assistance for implementing interventions have been provided to elementary schools in Maryland. William Paca Elementary School in Harford County received monthly (Oct. 2016-May 2017) cafeteria tastings that were offered during the lunch period and 377 students participated.

Results

Smarter Lunchrooms helps generate interest in new menu items, promote farm-to-school produce, and connect to classroom content. Combined with FSNE classroom-based nutrition education, school gardens, parent engagement, and school-based worksite wellness programs, FSNE shapes school environments that promote lifelong health. Approximately 71% of participants at FSNE schools reported role modeling healthy eating in front of their students and 90% of them reported drinking water in front of their students. Before Smarter Lunchrooms programming, 57% of respondents agreed that there are simple things that they could do to encourage students to select and eat fruits and vegetables, as compared to 86% after the training.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

Outcome #3

1. Outcome Measures

Increase in preschoolers and youth who include physical activity in daily routine

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Because children spend so much time at school, schools have a unique opportunity to help children become more healthy and active. The Institute of Medicine has called on school leaders to offer more opportunities for children to be physically active before, during and after the school day.

What has been done
FSNE educators in Champions for Healthy Kids program collaborated with local agencies to provide free nutrition education training in Maryland including Nutrition Nuggets and Growing Healthy Habits, and certificate of completion for 2 or 3 continuing education hours in the Maryland

State Department of Education (MSDE) Core of Knowledge Content Area to Child Care and After School Care Providers.

Results

This program engaged children in hands-on nutrition activities, encouraged children to try new foods, fostered parent involvement, and increased physical activities among participants each day. Child Care and After School Care Providers learned methods to improve the environment for their program participants and became the healthy role models for the children in their schools or cares. Prior to FSNE programming, 71.5% of elementary school parents reported that their child engaged in more than 60 minutes of physical activity per day during the week, as compared to 80% of parents at the post-test.

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

Increase in preschoolers and youth who report eating more healthy foods

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The data from 2015-2016 showed that nearly 1 in 5 school age children and young people (6 to 19 years) in the United States has obesity. Eating and physical activity behaviors is one of the key factor to cause the childhood obesity. The Centers for Disease Control and Prevention (CDC) recommends that changes in the environments where young people spend their time, like homes, schools, and community settings can adopt policies and practices that help young people eat more fruits and vegetables and more healthy foods.

What has been done

Read for Health is a nutrition education curriculum that uses language arts as a vehicle to teach nutrition and physical activity for youth from Pre-K through 5th grade. These health messages are then reinforced through activities, food tastings, and newsletters sent home to families. Lessons are designed around a children's book read aloud to deliver a nutrition or physical activity message. Children will be prompted to discuss their feelings and ideas on the topic. Each lesson includes a food tasting or activity so that the children have the opportunity to try new foods or engage in physical activities in new and creative ways.

Results

Over 400 teachers were trained to deliver Read for Health lessons in 2017, and they passed along healthy eating information to their students' parents or care givers, extending the reach of FSNE into students' homes. They also used the Read for Health curriculum to change their teaching practices, and to encourage positive nutrition behaviors among their students ? they became role model healthy behaviors for their students, provided more opportunities to taste fruits or vegetables in their classrooms, and asked students to share examples of their healthy eating and physical activities at home and school with their classmates. After participating in Read for Health, 91% of youth reported liking whole grain foods and they reported significant increases in preferences for foods that they tried during the program, including carrots, onions, peppers, and whole wheat bread. 42% of youth tried at least one new healthy food during their time in the nutrition education programs, with approximately 27% of all students having tried at least 2 new foods.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

In the 2017 program year, Maryland FSNE educators reached a total of 30,196 youth through nutrition education programs: 37% of youth participants were preschool-age (N= 11,274), 62% were elementary or middle-school aged (N=18,662) , and 1% were high school-aged youth (ages 14 and above; N=260).

Seventy-eight percent of youth who participate in FSNE lessons reported feeling confident in their ability to prepare their favorite fruit or vegetable at home. Youth who participated in FSNE's gardening programs reported an increase in the amount of time they engaged in physically active behaviors. Prior to participating in FSNE programming, 82% of youth reported engaged in behavior that made them sweat, made their legs feel tired, or made them breathe hard at least three times during the week prior to completing the survey. After the program, 87% of youth reported the same degree of physical activity. The greatest increase in physical activity occurred among those youth who reported engaging in physical active behaviors at least 5 or more times per week. 42% of youth tried at least one new healthy food during their time in the nutrition education programs, with approximately 27% of all students having tried at least 2 new foods.

Additionally, 71% of teachers at FSNE schools reported role modeling healthy eating in front of their students. Prior to FSNE programming, 71.5% of elementary school parents reported that their child engaged in more than 60 minutes of physical activity per day during the week, as compared to 80.0% of parents at the post-test.

Furthermore, local FSNE educators reported that 87% of all FY17 collaborating sites had at least one new or improved change to the nutrition environment, and 76% of sites had at least one new or improved change to the physical activity environment.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Food Safety

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources	10%	0%	100%	0%
205	Plant Management Systems	10%	0%	0%	33%
211	Insects, Mites, and Other Arthropods Affecting Plants	0%	0%	0%	34%
404	Instrumentation and Control Systems	10%	0%	0%	0%
501	New and Improved Food Processing Technologies	20%	0%	0%	0%
502	New and Improved Food Products	20%	0%	0%	0%
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	10%	0%	0%	16%
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	20%	100%	0%	17%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	10.0	1.5	5.0	5.7
Actual Paid	15.0	1.5	5.0	6.5
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
344014	137143	924863	333246
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
344014	137143	941814	345100
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
41331	0	73051	314308

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Develop technical assistance programs for UME
- Develop and/or adapt food safety materials and resources for UME Educators
- Collaborate with local, regional, and national partners
- Develop safe food educational materials/ resources and disseminate USDA food safety materials to consumers and producers
- Develop food preservation educational materials/resources and disseminate to consumers via workshops and media
- Conduct trainings and workshops, including train-the-trainer workshops
- Conduct evaluations
- Promote and support Maryland Farm to School and other agricultural literacy programs
- Conduct data analysis, needs assessments, environmental scans, and asset mapping
- Network internally and externally with collaborators, partners, and affiliates
- Raise community and stakeholder awareness of local food issues
- Contribute to relevant eXtension Communities of Practice
- Develop online food safety modules
- Conduct social marketing awareness education focusing on food safety
- Conduct basic and applied research to inform program development regarding food borne illnesses and beneficial and safe compounds in the food.
- Protect fresh produce from pathogens during production
- Control Salmonella in poultry products
- Control Vibrio in shell fish
- Establish baseline data for the presence of certain pathogens in retail beef and veal in our region
- Developed plant headspace volatile organic compound (VOCs) collection apparatus.

2. Brief description of the target audience

- Consumers: Youth, adults, older adults
- Commercial: Fruit and vegetable producers and food processors
- Commercial: Seafood and meat producers and processors
- Food service workers, childcare workers, community-based organizations
- Service agencies related to food production, promotion, consumption, protection, education
- Regulatory agencies and risk assessors

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	22242	14055	5890	0

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

Patent Applications Submitted

Year: 2017

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	21	21

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of educational programs offered

Year	Actual
2017	54

Output #2

Output Measure

- Number of applied research projects

Year	Actual

2017	3

Output #3

Output Measure

- Number of fruit and vegetable growers using good agricultural practices
  Not reporting on this Output for this Annual Report

Output #4

Output Measure

- Number of food processing operations using good manufacturing and sanitary practices
  Not reporting on this Output for this Annual Report

Output #5

Output Measure

- Number of instruments or equipment developed

Year	Actual
2017	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increase in people who gain basic food safety knowledge and skills
2	Increase in fruit and vegetable farmers adopting good agricultural practices
3	Increase in applied research projects
4	Increase in processors using good practices
5	Development of a nano-biohybrid BioMEMS device that can recognize and capture a putative pathogen,
6	Risk Identification for Toxoplasma Transmission in Pasture-Raised Animals
7	Sonochemical Processes for Inactivation of Spoilage Micro-organisms on the Surface of Fresh Produce & Food-Contact Surfaces
8	Research on organic crop managment
9	Research on the prevalence of foodborne pathogens and antibiotic residues
10	Research on environmentally sustainable alternative management practices for kudzu bug

Outcome #1

1. Outcome Measures

Increase in people who gain basic food safety knowledge and skills

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Annually, foodborne illnesses affect an estimated 48 million Americans, which roughly translates into an economic burden of $55.5 billion dollars. Specifically in Maryland, a case of foodborne illness can cost an individual between $1,476-$2,591towards health related costs and loss of productivity due to foodborne illnesses-costs that are often preventable. Those most susceptible to foodborne illness are: children age birth to five years of age; pregnant women; immunosuppressed (e.g. cancer patients); and adults 50+ years of age. Family & Consumer Sciences (FCS) educators remain a valuable resource to educate consumers and retailers, regarding safe food handling behaviors as part of the farm-to-fork continuum, within their local community.

What has been done
FCS educators teach food preservation as part of the states Grow It Eat It campaign that encourages Marylanders to grow and eat their own food gardens. Understanding safe and evidence-based food preservation techniques and having an appreciation of the food science behind the process can prevent unnecessary foodborne illnesses (especially Clostridium botulinum, or botulism) from occurring.

Results
Approximately 111 participants (including youth and adults) took part in one of 17 food preservation workshops. Over 51 hours of direct course instruction were provided in Baltimore Co., Harford Co., Baltimore City, Prince George's Co., and Walter Reed Medical Center-USO. New partnerships were made with University of Maryland Food Science lab, and the partnership with Walter Reed's USO continues for a 3rd year. During 2017, the net income of the GIEIPI workshops brought in $1,103.77. Participants' confidence to operate a water bath canner, knowledge of what foods should be pressure canned and the social norms of using family

recipes, and intent to use current laboratory-tested recipes, to use UME as a community resource for food preservation, and to check pressure canner lids annually significantly increased after attending the workshops.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #2

1. Outcome Measures

Increase in fruit and vegetable farmers adopting good agricultural practices

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Vegetable and melon production make up 7% of the crops grown on the Eastern Shore of Maryland. Of these vegetable and melon crops, 61% are grown on the Eastern Shore of Maryland. Vegetable growers face multiple production challenges, such as diseases, weeds, insects, soil health, food safety regulations, cover crops, and changing market values, all of which affect a grower's yield, profitability, and long-term goals.

What has been done
The annual Eastern Shore Vegetable Grower Meeting was held in Cambridge, MD. Meetings such as this allow vegetable growers to hear about new regulations and research going on at local universities, research farms, and institutions. While this information is also made available online or in print afterward, by having these meetings farmers can ask questions directly to the researchers and extension specialists. This also gives researchers and extension specialists a chance to interact directly with grower so that their work stays relevant to the growers needs.

Results
The end-of-day evaluations returned positive responses with 73% of participants indicating that the information presented was beneficial to them. When asked about production practices presented during the program, participants reported that 22% plan to implement improved pest management and fertility management practice, 20% plan to use improved crop production practices, and 16% plan to try a new product or practice. Over 34% felt that the extension programs they went to throughout the year helped them save or earn $21-30 per acre.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
205	Plant Management Systems
404	Instrumentation and Control Systems
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #3

1. Outcome Measures

Increase in applied research projects

2. Associated Institution Types

- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
With recent changes to the Maryland Alcoholic Beverage Laws farmers and other entrepreneurs have had an increasing interest in growing ingredients locally to produce beer.

What has been done
This program was developed at the Western Maryland Research & Education Center based on information gathered from key informants about the need to provide Maryland-based research on

varieties and cultural practices for the production of hops and barley.

Results

In the second season, growers have been exposed to IPM, increased fertility opportunities, and new varieties not grown in Maryland before, as well as a better feel for the needs and requirements of post-harvest handling. Several Maryland hop producers have selected varieties to plant on their farms based on the trials.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
205	Plant Management Systems
501	New and Improved Food Processing Technologies
502	New and Improved Food Products

Outcome #4

1. Outcome Measures

Increase in processors using good practices

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In the United States, produce between 2001-2010 has attributed to 17% of foodborne outbreaks. From 1998-2008, 46% of the illnesses were attributed to commercially sold produce, which include high risk foods such as leafy greens and berries. A partnership with University of Maryland Extension, University of Maryland College Park, and Maryland Department of Agriculture prepares small produce farmers for the Food and Drug Administrations (FDA) Food Safety Modernization Act, the Produce Safety Rule, and the continuing voluntary grower training for Good Agricultural Practices (GAPs)/ Good Handling Practices (GHPs).

What has been done
In 2017, a series of GAP programs were offered for producers of all sizes to gain understanding of Good Agricultural Practices. The November release of the new FDA regulations provided the springboard for offering producers the Produce Safety Alliance approved curriculum so that they can be in compliance with the regulations. Faculty from the University of Maryland are certified trainers for the Produce Safety Alliance curriculum.

Results
Fifty-one growers participated in the workshops. The growers indicated they had a better understanding of the GAP process and the majority began writing a Food Safety Plan for their farm. However, creating and supporting Maryland's local farmers and food producers continues to be a burgeoning market. With FDA's FSMA implementation, farm producers will need to comply and GAP training will become increasingly important to Maryland produce farmers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #5

1. Outcome Measures

Development of a nano-biohybrid BioMEMS device that can recognize and capture a putative pathogen,

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Food borne disease is a prevalent challenge to public health and consumer confidence, which causes an estimated of 48 million illnesses, including 3,000 deaths, and costs 5 to 6 billion dollars each year in the United States. To enhance safety and biosecurity, there are extensive needs for rapid and cost-effective detection of some of the leading pathogens, including Salmonella, Listeria monocytogenes, and E. coli.

What has been done

This nano-biohybrid project aimed to develop a novel method for pathogen detection that will provide a rapid, low cost assay with unparalleled capability of combining bacterial viability and high specificity detection in a single device. It is anticipated that this novel biosensor with programmable assembled nanomaterials can achieve rapid and cost-effective detection of bacteria viability with high specificity in agricultural and food systems.

Results

Development of a nano-biohybrid BioMEMS device that can recognize and capture a putative pathogen, and sense with two entirely new sensing modalities: 1) detection of systems-level redox-activities by a new electrochemical method; 2) detection of virulence-related quorum sensing activities by advanced biotechnological methods, is the major goal. In 2017, the team fabricated an anti-Escherichia coli (E. coli) antibody coated magnetic nano-particle (MNPAB) and performed characteristic analyses. Results indicated that the fabricated MNPAB was suitable to be further applied and investigated in capturing cells and amplifying quorum sensing signaling. A Post-doc and three graduate students were trained on fabrication and characterization of magnetic and redoxactive hydrogel film and its application in sensing live E.coli cells, and to analyze the physicochemical properties of MNPABs.

4. Associated Knowledge Areas

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

Outcome #6

1. Outcome Measures

Risk Identification for Toxoplasma Transmission in Pasture-Raised Animals

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Toxoplasma gondii is responsible for 24% of all deaths attributed to foodborne pathogens in the U.S. with an estimated 327 deaths per year. Of the major meat animal species, pigs and lambs are shown to frequently harbor T. gondii. Pigs and lambs that are reared with complete or partial pasture access have substantially greater opportunities for exposure to T. gondii as compared to animals managed in confinement systems that use stringent biosecurity practices.

What has been done
We have conducted a nationwide survey of retail organic, free-range pork and lamb samples using the serological and bioassay in mice to detect the presence of Toxoplasma gondii in these meat products. Organic pork and lamb meat samples from retail stores of 25 Metropolitan Statistical Areas (MSAs) around the country were collected and processed from 10 randomly selected supermarkets, grocery outlets, or wholesale club stores (60 samples from one MSA) and tested for sero- and tissue prevalence of T. gondii using ELISA and bioassay in mice, respectively). A total of 1,500 pork and lamb samples were collected and tested.

Results
A wide variation in prevalence was observed in each animal category. Animals raised outdoors or that have outdoor access had a higher prevalence as compared with animals raised indoors. Risk estimates of various meats were analyzed by a farm-to-retail qualitative assessment which included evaluation of farm, abattoir, storage and transportation, meat processing, packaging and retail modules. It was found that exposure risks associated with meats from free-range chickens, non-confinement raised pigs, goats and lamb are higher than those from confinement-raised pigs, cattle, and caged-chickens. For fresh meat products, risk at the retail level was similar to that at the farm level unless meats had been frozen or moisture-enhanced. A dose-response model establishes the relationship between the magnitude of exposure to the hazard and the probability of occurrence of an adverse health effect. The dose-response relationship for human exposures to T. gondii-infected meat is unknown because no human data are available.

4. Associated Knowledge Areas

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

Outcome #7

1. Outcome Measures

Sonochemical Processes for Inactivation of Spoilage Micro-organisms on the Surface of Fresh Produce & Food-Contact Surfaces

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Post-harvest spoilage of fresh whole and cut produce is a significant challenge that impacts sustainability, economics and nutritional aspects of fresh produce. Despite significant advances in hurdle technologies including combinations of produce washing and cooling, chemical sanitation and fumigation, refrigerated storage and modified atmospheric packaging, currently over 30% of the fresh produce in North America is wasted and microbial spoilage is one of the leading factors influencing the shelf-life of fresh produce.

What has been done
To address this critical challenge, this project evaluates a synergistic interaction of ultrasound (US) with (a) sonocatalytic materials to develop novel food-contact surfaces that can minimize or eliminate the risk of cross-contamination and biofilm formation, and (b) microbubbles combined with sonocatalytic food-grade materials to improve inactivation of spoilage microorganisms on fresh produce and wash water while maintaining the quality of fresh produce by avoiding mechanical damage.

Results
The project measured the influence of ultrasound for enhancing removal of both human and plant pathogens from fresh produce surface and assessed the combination of ultrasound and chlorine for improving sanitation of fresh produce. In addition, training opportunities for three postdoctoral scholars and two graduate students was provided.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #8

1. Outcome Measures

Research on organic crop managment

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Use and demand for organic produce is on the rise by consumers. Poultry litter is being used as a fertilizer, but potential contamination with pathogens and environmental impact of nutrients are of concern.

What has been done
Poultry litter was compared to other treatments with respect to food safety and economic analyses of harvested tomatoes. Ripe tomatoes were analyzed to determine if Salmonella and E. coli were present. Nutrient studies were conducted for ginger, carrots and kale using various nutrient regimes applied to each crop.

Results
Neither Salmonella, nor E.coli were detected in tomatoes. Cost-benefit ratio and profitability index for the two tomato cultivars and different nutrient treatments showed that growing organic Debarao plum tomatoes was most profitable. The ginger produced mature rhizomes for harvest with the three nutrients tested. The nutrients used in the carrot trial did not show any significant effect on the yield of the cultivars. The kale had problem with non-uniform germination, but all produced marketable leaf biomass.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

Outcome #9

1. Outcome Measures

Research on the prevalence of foodborne pathogens and antibiotic residues

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The United States is the third leading seafood consuming nation in the world. Imports of seafood in the US increased from 50% in 1980 to 91% in 2013. Continuous growth of the U.S. importation of seafood increases the concerns over seafood safety. No detailed data about food safety of imported vs. domestic seafood exists.

What has been done
One isolate from each positive sample (n=127) was tested for the presence of Salmonella virulence genes invA, pagC, spvC, spvR by PCR. One Vibrio parrahaemolyticus isolate from each positive sample (n=14) was tested for two virulence genes. One V. vulnificus isolate from each positive sample (n=6) was also analyzed for a virulence gene. Pulsed-field gel electrophoresis (PFGE) patterns for Salmonella isolates recovered from seafood were completed using a molecular method.

Results
Salmonella and V. vulnificus isolates recovered from seafood can possess virulence genes and have potential to cause salmonellosis and V. vulnificus infections. Potential food safety hazards associated with seafood warrant further large-scale studies.

4. Associated Knowledge Areas

KA Code	Knowledge Area
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #10

1. Outcome Measures

Research on environmentally sustainable alternative management practices for kudzu bug

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Nationally, Maryland ranks 21st in soybean production with an annual value of over $227 million. The invasive kudzu bug (Magacopta cribraria) has emerged as the top yield-limiting pest of soybeans in the U.S. Maryland is the northern limit of the Kudzu bug invasion. Currently, chemical insecticides are the only effective control strategy. Economically viable, socially acceptable, and environmentally friendly, alternative management tactics are needed to protect soybean production from this rapidly invading pest.

What has been done
Four legume varieties were presented to M. cribraria to determine a preferred host with the potential for development of a trap crop. Additionally, serial conidial concentrations of field collected entomopathogenic fungal strains were assessed against adult and nymph green stink bugs.

Results
These preliminary tests suggest that M. cribraria does prefer certain legume crops (pigeon pea)over others (mung bean, red kidney beans, and soybeans). More than 70% of the nymphs treated with pink strains of the field collected entomopathogenic strains died within three days of infection.

4. Associated Knowledge Areas

KA Code	Knowledge Area
211	Insects, Mites, and Other Arthropods Affecting Plants

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Public Policy changes
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Family & Consumer Sciences

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
504	Home and Commercial Food Service	10%	0%	0%	0%
607	Consumer Economics	30%	0%	0%	0%
723	Hazards to Human Health and Safety	10%	0%	0%	0%
724	Healthy Lifestyle	30%	50%	0%	0%
801	Individual and Family Resource Management	20%	50%	0%	0%
	Total	100%	100%	0%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	20.0	3.5	13.0	0.0
Actual Paid	18.0	3.5	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
412817	164572	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
412817	164572	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
6063792	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Full development and implementation of Smart Choices Curriculum for Consumers focusing on making 'smart choices' related to health insurance; continue training Extension educators across the country to be certified to teach "Smart Choices."
- Develop, pre-test, pilot-test, and implement Smart Use Curriculum focusing on maximizing the use and understanding of health insurance.
- Conduct "Smart Choice" train the trainer and consumer workshops for targeted consumer groups (farm families, etc).
- Create and publish scholarly work in support of Smart Choice curriculum and associated health insurance literacy efforts.
- Conceptualize and initiate small working forum to explore the idea of developing a "Health Extension" program in collaboration with the UMD medical community.
- Piloting, testing, and implementation of Financial Nuggets Curriculum for parents and youth.
- Plan, organize, and conduct Personal Finance Seminar for Professionals (professional development for personal finance specialists, educators, and practitioners from across the country).
- Develop, pilot, and test adapted Small Steps to Health and Wealth in the Workplace; partner with Shore Health to implement SSHW on the Shore and beyond.
- Develop, review, test, and finalize on-line modules to support MD State Retirement Program participant education.
- Train Community Health Workers in MD and DC
- Promote green cleaning as a component of healthy homes
- Conduct healthy living programming at Senior Centers focusing on healthy eating and increased physical activity.
- Develop and implement educational programs focusing on safety on the farm and at home.
- Development of FCS Volunteer Program to support key programming outreach and education.
- Conduct statewide survey of nutrition health literacy of Marylanders.

2. Brief description of the target audience

- Extension Educators
- People who need to purchase health insurance
- Professionals/Practitioners
- Childcare providers
- Youth/4-H
- Families with specific health hazards
- Older adults
- Military families
- General audiences
- Athletes, coaches, medical professionals
- University-wide faculty
- Community Partners
- Federal/State Partners
- Professionals/Practitioners

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	41579	365819	5498	723

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

Patent Applications Submitted

Year: 2017

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	2	0	2

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of educational workshops offered

Year	Actual
2017	575

Output #2

Output Measure

- Number of adults and youth with increased financial literacy

Year	Actual
2017	757

Output #3

Output Measure

- Number of adults and youth with increased health literacy

Year	Actual
2017	1566

Output #4

Output Measure

- Number of youth with increased safety awareness

Year	Actual
2017	0

Output #5

Output Measure

- Number of adults and youth with increased understanding of healthy and safe home environments

Year	Actual
2017	0

Output #6

Output Measure

- Number of youth and adults with increased nutrition/healthy eating understanding

Year	Actual
2017	0

Output #7

Output Measure

- Number of applied research projects

Year	Actual
2017	4

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increase in children and youth who report eating more of healthy foods.
2	Individuals who report increased ability to set financial goals, make savings plans, establish emergency funds, and decrease debt
3	Increase in individuals who report the adoption of healthy eating practices (including eating more fruits and vegetables, choosing high fiber foods, choosing more whole grains)
4	Increase in people reporting the adoption of healthy home practices
5	Increase in reported confidence and capability to make smart health insurance decisions
6	Increased research findings that contribute to individuals and families well-being and quality of life.

Outcome #1

1. Outcome Measures

Increase in children and youth who report eating more of healthy foods.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Childhood obesity remains a significant public health concern in Maryland and the U.S., especially among minority populations. Eating behaviors including low intakes of fruits and vegetables and high intakes of energy-dense foods are risk factors for childhood obesity. Latinos are the largest and fastest growing ethnic population in the United States. By the year 2025, 1 in every 4 youth in the U.S. will be Latino according to US Census

What has been done
The Latino Fathers Promoting Healthy Youth Development program aims to prevent overweight and obesity in Latino adolescents by increasing the frequency of positive paternal (or other male caregiver) parenting practices related to the food and physical activity environment in the home (role modeling, availability, expectations, communication) which will ultimately improve EBRBs (Energy Balance Related Behaviors) and weight status of children.

Results
The primary outcomes include improvements in youth EBRBs and weight status from baseline to immediate post-intervention and 3-months post-intervention in the intervention compared to the control group. Improvements in youth EBRBs include decreased intake of SSBs and sedentary activity and increased intake of fruits, vegetables, and breakfast consumption. The secondary outcomes included increases in parenting behavior scale scores (parenting practices) between intervention and control parents immediate post-intervention. These include making healthy foods and opportunities for physical activity available, role modeling positive EBRBs, setting expectations for improvements in youth EBRBs and improved father-child communication.

4. Associated Knowledge Areas

KA Code	Knowledge Area

724	Healthy Lifestyle
801	Individual and Family Resource Management

Outcome #2

1. Outcome Measures

Individuals who report increased ability to set financial goals, make savings plans, establish emergency funds, and decrease debt

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Baltimore (City & County combined) jail is one of the largest municipal jails in the nation with one of the highest recidivism rates. More than 73,000 people go through the Baltimore Central Booking and Intake Center every year and over 35,000 people are committed to the Baltimore City Detention Center annually. After release, inmates are often faced with poor employment prospects and lack of financial literacy.

What has been done
In 2017, Baltimore County invited UME and scheduled classes for its male inmates to attend the Inmates Small Business Ownership program. The program occurred in Baltimore County Correctional Center in spring, summer and fall 2017 and will continue in 2018. Inmates learn basic concepts of economics, business and finance. The program helps to reduce recidivism in that inmates can create their own employment upon release as opposed to seeking employment where their background checks may prevent them from getting jobs.

Results
This program is changing the mindset of inmates. They see small business as an occupation that can easily be done after incarceration. In surveys, 98% of inmates indicate that they acquired new knowledge in business, learned to set and manipulate prices, derive revenue, total revenue, profit, and total profit for their small businesses; 95% of inmates indicated that they would be able to start a small business after incarceration with as little as $50; 2% indicated that they would go back to school after incarceration to become community business teachers; and, 90% would recommend this program to all inmates.

4. Associated Knowledge Areas

KA Code	Knowledge Area
607	Consumer Economics
724	Healthy Lifestyle
801	Individual and Family Resource Management

Outcome #3

1. Outcome Measures

Increase in individuals who report the adoption of healthy eating practices (including eating more fruits and vegetables, choosing high fiber foods, choosing more whole grains)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Directors and staff at developmentally disabled sites in Carroll County were concerned about clients' susceptibility to chronic disease due to obesity, poor eating habits, and lack of physical activity. These clients choose easy, processed foods, usually high in sugar, fat and sodium, which leads to poor health and ultimately to chronic disease. These foods are low on the satiety index, they are less filling, causing clients to eat larger portions.

What has been done
In the Gardening for Nutrition with Developmentally Disabled Adults program, the students are able to use seeds and seedlings to plant fruits and vegetables in the garden, maintain and harvest what they have planted, and then try healthy dishes or tastings of the fruits and vegetables. The program also encourages physical activity as they work in the garden.

Results
The program has grown to four sites, from 8 clients to 24 clients in gardening and from 15 clients to 62 clients in the food prep classes. Clients who did not want to eat any or very few fruits and vegetables are now trying everything offered and some are asking for seconds or to take the raw produce home to eat there. Testimony from staff indicate that clients who participated in the programs were more apt to request healthier foods and to try things they had not tried in the past. At two of the sites, they requested help to put in raised beds so that their non-mobile clients could

learn on-site and so that their kitchen would have more fresh fruits and vegetables to offer clients during meals and snacks.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
801	Individual and Family Resource Management

Outcome #4

1. Outcome Measures

Increase in people reporting the adoption of healthy home practices

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Healthy living conditions for Maryland residents are influenced by air quality, water quality, and safety, both indoors and out. For residents to understand how to minimize risks, they must be able to understand and use information related to making health decisions.

What has been done
Specific aims of the Healthy Homes Program are to (1) increase awareness of strategies that foster healthier and safer environments by directly educating homeowners and indirectly reaching this audience by training the professionals that work with homeowners on a regular basis; and (2) develop key partnerships and collaborations, both internal and external to UME, to leverage common goals and resources.

Results
The Healthy Homes Program currently consists of two professional development trainings (one for community health workers, another for daycare workers), and a homeowner education clinic that tests the private drinking water of participants and provides information on maintaining well and septic systems. The professional development trainings were devised by Healthy Housing Solutions, Inc. (HHS), a subsidiary of the National Center for Healthy Housing, which trains local partners to conduct their courses. The well and septic programming, titled the Chesapeake Water

and Septic Homeowners Education (WaterSHEd) project, has been developed internally and added as a component to UME's Healthy Homes Program.

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety
724	Healthy Lifestyle

Outcome #5

1. Outcome Measures

Increase in reported confidence and capability to make smart health insurance decisions

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Health insurance literacy is the ability to choose and use health insurance. However, research has shown that once people enroll in health insurance, few people maximize their benefits. This leads to lapses in payment, lack of value recognition or large out of pocket costs.

What has been done
Three modules have been developed: Smart Actions for Using Your Health Insurance, Understanding and Estimating Costs, and Your Essential Health Benefits. All three have been piloted in Maryland, with nationwide train-the-trainers occurring for Smart Actions and the Estimating Costs modules.

Results
The Smart Use Health Insurance has and will continue to reach hundreds of Marylanders. The pilot results show that people have a statistically significant increase in knowledge after participating in the Smart Actions workshop, and the new data from Estimating Costs is showing the same results. Further, programs are being updated to reflect policy changes for health insurance as those changes occur.

4. Associated Knowledge Areas

KA Code	Knowledge Area
607	Consumer Economics
724	Healthy Lifestyle
801	Individual and Family Resource Management

Outcome #6

1. Outcome Measures

Increased research findings that contribute to individuals and families well-being and quality of life.

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

4-H Youth Development

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
806	Youth Development	100%	100%	0%	0%
	Total	100%	100%	0%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	17.0	0.0	0.0	0.0
Actual Paid	27.0	4.0	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
447218	178286	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
447218	178286	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
122310	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

1. 4-H community clubs will be conducted focusing on activities that support youth learning science and technology, healthy living, and citizenship

2. 4-H school enrichment programs
3. 4-H Operation Military Kids programs
4. Camping programs
5. State and county fairs
6. Demonstrations
7. Adventures in Science programs
8. Other special interest clubs and activities, such as Health Rocks!

2. Brief description of the target audience

- All youth in the State of Maryland
- All youth who are children of military parents
- All adults with an interest in becoming 4-H volunteers
- Businesses who would be interested in financially supporting 4-H programs
- Community partners

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	4601	106520	77087	58442

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

Patent Applications Submitted

Year:	2017
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	2	0	2

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of community club programs offered
  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Number of members enrolled in school-based clubs, community clubs, 4-H military programs, and camps

Year	Actual
2017	74946

Output #3

Output Measure

- Number of youth engaged in Science, Engineering, and Technology

Year	Actual
2017	0

Output #4

Output Measure

- Number of youth engaged in building citizenship skills

Year	Actual
2017	0

Output #5

Output Measure

- Number of youth involved in healthy lifestyles

Year	Actual
2017	0

Output #6

Output Measure

- Number of adult 4-H leaders

Year	Actual
2017	4363

Output #7

Output Measure

- Number of youth enrolled through the Health Rocks program
  Not reporting on this Output for this Annual Report

Output #8

Output Measure

- Number of Youth Enrolled in 4-H Adventure in Science program
  Not reporting on this Output for this Annual Report

Output #9

Output Measure

- Number of youth enrolled in Ag in the Classroom

Year	Actual
2017	15182

Output #10

Output Measure

- Number of youth enrolled in animal health and quality experiences

Year	Actual
2017	11958

Output #11

Output Measure

- Number of youth enrolled in biological sciences experiences

Year	Actual
2017	4302

Output #12

Output Measure

- Number of youth enrolled in civic engagement experiences

Year	Actual
2017	3013

Output #13

Output Measure

- Number of youth enrolled in communications and expressive arts experiences

Year	Actual
2017	2520

Output #14

Output Measure

- Number of youth enrolled in community and volunteer service experiences

Year	Actual
2017	7994

Output #15

Output Measure

- Number of youth enrolled in environmental education

Year	Actual
2017	7410

Output #16

Output Measure

- Number of youth enrolled in foods and nutrition education related to health

Year	Actual
2017	27812

Output #17

Output Measure

- Number of youth enrolled in leadership and personal development

Year	Actual
2017	6362

Output #18

Output Measure

- Number of youth enrolled in personal safety education

Year	Actual
2017	353

Output #19

Output Measure

- Number of youth enrolled in plant sciences education

Year	Actual
2017	12295

Output #20

Output Measure

- Number of youth enrolled in technology and engineering education

Year	Actual
2017	7201

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increase in youth reporting adoption of healthy eating behaviors
2	Increase in youth who intend to engage in community projects and community leadership positions
3	Increase in the number of youth and adults adopting animal science practices that demonstrate increased knowledge of raising animals in a responsible, ethical, and ecologically viable manner
4	Increase in the number of youth who report aspirations to pursue science-related fields in college
5	Increase in youth who intend to pursue science-related careers
6	Increase in youth who practice environmentally responsible behaviors
7	Increase in youth and families who report becoming more literate in concerns surrounding global hunger and its relationship with agriculture, understanding of food systems, and the relationship of agriculture, food, nutrition, and the economy.

Outcome #1

1. Outcome Measures

Increase in youth reporting adoption of healthy eating behaviors

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
A 2015 article by the Baltimore Sun states that "the lack of proper nutrition, food deserts, a lack of physical activity, poor school nutrition and limited education contribute to the problem of childhood obesity." These can lead to youth suffering from social and psychological problems such as low self-esteem which includes bullying, a feeling of sadness, hopeless and stigmatization.

What has been done
In order to mitigate this situation, youth are engaged in healthy living and healthy behaviors workshops. The aim is to engage youth in a safe and engaging environment and to also increase their knowledge about health and nutrition. Ten program directors in Baltimore city were trained to deliver the curriculum and implemented age-appropriate lessons to youth.

Results
Approximately 237 youth completed the nutrition and health rocks curriculum. Observations showed an increase in knowledge and improved attitude towards nutrition and staying away from drugs and alcohol. This is a first step to maintaining a healthy sustainable lifestyle.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #2

1. Outcome Measures

Increase in youth who intend to engage in community projects and community leadership positions

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Youth Development is a process that prepares young people to meet the challenges of adolescence and adulthood through a coordinated, progressive series of activities and experiences which help them gain skills and competencies. It is important that youth know and understand their leadership capabilities as they will someday be the individuals that are in the positions that will be making the decisions for their communities. It is imperative that 4-H is educating and leading them in the right direction to meet the future needs of the community.

What has been done
The Maryland 4-H program operates a camping program around the state. Many different camping opportunities are available for youth from ages 5-13. Each camp is tailored differently to meet the many needs of a diverse population. Camps come in all varieties to include STEM, archery, rifle, residential and day programs. Camp teaches kids how to be active participants, ask questions, ask for help, and try new things.

Results
Evaluation of the Maryland 4-H camping programs revealed that over 90% of the campers respected others different from themselves and felt respected themselves at camp; that they realized they were responsible for their own behavior and that they tried to do what was expected of them; and, that they thought carefully when making decisions.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #3

1. Outcome Measures

Increase in the number of youth and adults adopting animal science practices that demonstrate increased knowledge of raising animals in a responsible, ethical, and ecologically viable manner

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There is an ever increasing focus of attention by consumers and producers alike in the production and availability of safe and healthy animal products. Additionally, both groups want to ensure that livestock, companion, and performance animals are raised, cared for, and handled using responsible practices that assure animal well-being. Youth members of 4-H and FFA programs engaged in animal projects must understand the visible and important roles they have as representatives of animal agriculture and must strive to preserve the public's trust in agriculture and in both youth organizations

What has been done
The Maryland and West Virginia 4-H and FFA Animal Husbandry & Quality Assurance (AH&QA) Program is an on-line training program which enables youth to fulfill state Quality Assurance training requirements via internet from their home, school or local library. The Intermediate/Senior program is divided into two parts; Part 1 contains information for exhibitors across all species and Part 2 contains species specific information on Beef, Camelids, Dairy, Goats, Horses and Ponies, Poultry, Rabbits, Sheep, and Swine.

Results
Retrospective Post-Pre evaluations conducted with youth participants in 2011 (n=3,960) and 2012 (n=1,581) showed self-reported knowledge gains in the areas of: important role youth have in animal agriculture, public concerns about animal welfare and animal product safety, proper handling of animals, proper use of animal medications, importance of ethical behavior, animal care, common animal diseases, animal health, and animal nutrition. Assessment of AH&QA "Check Your Knowledge" pre-tests and "What I Learned" post-tests completed between 2010-2017 (n=~20,000) show knowledge gained in youth understanding of labeling and administration of medications, biosecurity measures, animal health checks, ethical care and exhibition, and more.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #4

1. Outcome Measures

Increase in the number of youth who report aspirations to pursue science-related fields in college

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The National Center for Education Statistics reports that the average cost of college is $21,728 a year across all types of institutions. Because of this enormous cost, the average American now owes $37,172 in student loans when they graduate. Some estimates put Maryland college barrowers as the highest in the nation. With many youth wishing to pursue higher education, this increased cost is burdensome and often times a barrier in low-income and rural families.

What has been done
The University of Maryland Extension 4-H animal science program has long been involved in producing some of the highest quality animal science students in the nation. One backbone of this training is the livestock judging program which holds workshops and events at the local, county, state, regional and the national level to educate youth in critical thinking, decision making, verbal communication and prepares participants for individual and team competitions.

Results
In 2017, eight state livestock judging practices were held for over 297 attendees. One state livestock judging contest was held for 107 Maryland youth and 30 out of state contestants. Four youth participated on the Maryland state livestock judging team that competed at the national 4-H contest. Maryland ranked 9th nationally out of 34 teams. Additionally, 50% of the team members also accepted full-tuition scholarships to continue judging at the junior college level which the College Board values at $13,760. Over the past 11 years 21 students have accepted such scholarships totaling in excess of $134,624. The 4-H livestock judging program has been

effective in teaching youth valuable life skills and offering a way for gifted agriculture students to pursue a college degree while decreasing the financial burden of higher education for families.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #5

1. Outcome Measures

Increase in youth who intend to pursue science-related careers

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Somerset County has one of the lowest high school graduation rates in Maryland, and the lowest percentage of adults with college degrees (+/-19%). These students, especially those with STEM interests, are in environments with the highest risks for dropping out of high school and college, and are at the highest risk of unemployment and welfare-dependency. Especially for middle and high school students, providing exposure to different career pathways and the benefits for staying in school, working hard, and pursuing STEM education will increase their chances of graduation and getting higher degrees.

What has been done
New STEM-oriented 4-H robotics clubs have been created in Somerset County. These programs meet year-round, weekly or bi-weekly depending on the time of year. As part of both their tournament and 4-H obligations, they perform outreach to the community to demonstrate their work and how these technologies and research will affect everybody's future.

Results
After starting these new clubs in 2017, the number of Somerset 4-H members has already increased by about 30%. The students have mostly come from new families who have never been in 4-H and have not had the chance to participate in after-school programs of any kind. The

clubs continue to grow in their attendance, averaging 9-13 students each meeting. Community leaders and organizations have also begun to show support for the clubs by making donations of food, money, and other equipment, allowing the grant money to stretch farther.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #6

1. Outcome Measures

Increase in youth who practice environmentally responsible behaviors

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
With the continued focus in the scientific community on climate change, drinking-water quality, and the health of the Chesapeake Bay, there exists a significant need for youth educational opportunities that focus on these topics.

What has been done
The 4-H STEM team undertook an initiative called the "Wonders of Watersheds" (WoW) to provide opportunities for students to learn about environmental topics via engaging, experiential, and in-depth hands-on activities. The program explored issues regarding the Chesapeake Bay watershed region and explored what actions youth could take to improve the health of watersheds.

Results
The WoW program took place over the summer of 2017 and reached almost 200 students primarily from the 4 lower Shore counties of Maryland. Over 92% of students responded that they learned new things in science after completing the WoW program, while almost 94% said they did in fact learn more about watersheds because of the program. Specifically, related to the chemistry and water quality lessons, over 52% of students said they learned "a lot" about the science of

water. Over 70% of students said they learned "a lot" about how to take better care of the Chesapeake Bay.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #7

1. Outcome Measures

Increase in youth and families who report becoming more literate in concerns surrounding global hunger and its relationship with agriculture, understanding of food systems, and the relationship of agriculture, food, nutrition, and the economy.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There is growing agricultural illiteracy in the U.S. A survey conducted by U.S. Farmers & Ranchers Alliance found that 72% of consumers know nothing or very little about farming and ranching. However, in order to maintain a safe and affordable food system that can feed the growing human population, it is vital that our citizenry understand the economic, environmental, and health significance of agriculture.

What has been done
University of Maryland Extension is working to grow the existing Kids Growing with Grains initiative, which currently provides agricultural based field trips to 4th grade students and class-room based instructions to 3rd grade students. The curriculum is designed to engage students in exploring the intersection of agriculture, food, nutrition, and the environment.

Results
Student evaluations have been developed in 2017 to determine the degree to which programming increases youth knowledge of concepts taught through the Kids Growing with Grains curriculum, such as environmental, nutrition, and agricultural content, what constitutes a balanced diet, and how to make healthy food and environmental choices. Evaluations will also assess what youth intend to do, such as sharing information about healthy eating with their families, taking action to

improve their environment and to improve their health and nutrition.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Of the youth enrolled in UME 4-H (n=74,946):

- 97% report that 4-H is a place where adults care about them.
- 87% report that 4-H is a place where they're encouraged to plan for their future.
- 92% report that 4-H is a place where you have a chance to be a leader.
- 93% report that 4-H is a place where you feel you belong.
- 97% report that 4-H is a place where you learn ways to help your community.

Key Items of Evaluation

VI. National Outcomes and Indicators

1. NIFA Selected Outcomes and Indicators

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