2016 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 2016 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.

In 2013, a new strategic planning process was undertaken to develop a 2014-2019 UME Strategic Plan. Building on University of Maryland Extension's strong programmatic foundation, the UME Strategic Planning Committee conducted extensive data collection in 2013 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.

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."

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.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	90.0	15.0	54.0	28.0
Actual	128.0	12.5	56.0	33.3

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 2015. 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

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.
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, 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

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 2016, a comprehensive agricultural needs

assessments was conducted in the Western and Northern regions of Maryland and will be implemented throughout the rest of the state. A needs assessment of participants in the UMES Small Farms program was conducted in 2013-14. Extension educators were trained in 2016 on how to conduct focus groups in communities to reach out and engage in localized needs assessments. 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 order 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

Brief explanation.

UME draws upon the expertise of approximately 170 UME Educators, Specialists, and administrators in ongoing, informal needs assessment. 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. For example, in 2014 and in 2016, needs assessments were conducted for Maryland's Eastern Region, Western Region, and Northern Region. In 2016, a statewide 4-H camp needs analysis and assessment was conducted. Parents were specifically targeted to provide feedback about the 4-H Camping Program. 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 has started a strategic initiatives process that is going into 2017. Multiple stakeholder groups across the state have been invited to participate and offer their ideas about the future of the college.

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.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
3442946	1371434	3092145	1565868

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	3442947	1371433	3092146	1572218
Actual Matching	3442947	1371433	3092146	1551667
Actual All Other	7025206	0	347934	989491
Total Actual Expended	13911100	2742866	6532226	4113376

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	0	0	0	1208038

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%	17%
205	Plant Management Systems	10%	25%	10%	17%
216	Integrated Pest Management Systems	15%	1%	10%	16%
301	Reproductive Performance of Animals	0%	3%	10%	17%
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%	16%
723	Hazards to Human Health and Safety	10%	0%	0%	17%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	28.0	4.0	16.0	11.1
Actual Paid	35.0	4.0	26.0	8.1
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**
1032884	411430	1546073	751907
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1032884	411430	1546073	642648
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
7025206	0	347934	301428

V(D). Planned Program (Activity)

1. Brief description of the Activity

• UME, MAES, and AES have a combined focus to ensure that Maryland agriculture and food production is 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 was performed, while UME was involved in local and regional efforts to assist agricultural and natural resource entrepreneurs.
• Research conducted through MAES, AES, and UME generated vital information to increase productivity using genomics, breeding, and adaptation of alternate crops with economic and environmental sustainability.
• Through UME's Focus Teams and MAES and AES research projects, the following planned program activities were 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 were 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 were transferred via UME on-farm demonstrations and twilight tours.
• Training programs were 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
- Female farmers
- Producers
- Retailers
- Plant growers and breeders
- Socially disadvantaged farmers
- Small farm operators

- Pesticide operators
- Crop protection industry

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

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	23023	4226342	6185	39

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

Patent Applications Submitted

Year:	2016
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	16	5	21

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of educational programs offered

Year	Actual
2016	663

Output #2

Output Measure

- Number of applied research projects

Year	Actual
2016	15

Output #3

Output Measure

- Acres of land exposed to educational programming efforts

Year	Actual
2016	257046

Output #4

Output Measure

- Number of newsletters distributed

Year	Actual
2016	40

Output #5

Output Measure

- Number of agronomic and fruit and vegetable winter meetings

Year	Actual
2016	18

Output #6

Output Measure

- Number of nutrient management plans written

Year	Actual
2016	597

Output #7

Output Measure

- Number of individuals reached through Extension programs

Year	Actual
2016	265

Output #8

Output Measure

- Number of information pieces developed

Year	Actual
2016	92

Output #9

Output Measure

- Needs Assessments

Year	Actual
2016	7

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increase in agricultural profitability attributable to extension and research efforts.
2	Increase in small, part-time, female, and limited resource farmers
3	Increase in the amount of agricultural land under best-management practices due to Extension programming efforts
4	Increase in the number of people growing food for health and economic reasons
5	Increase in research findings that help to ensure global food security.
6	Research on Genes for Strawberry Fruit Development
7	Research on Natural Enemies of the Brown Marmorated Stink Bug in Soybean Fields
8	Research on ROS-mediated ABA/drought Signaling in Plants
9	Research on Preservation of Genotypes
10	Increase in livestock profitability attributable to extension and research efforts.
11	Increase research findings and standards development that promote pesticide operator health and safety
12	Increase research findings in the production of ethnic specialty crops in sandy soils with added biofertilizers

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
2016	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 and the Organic Grain Production program.

What has been done
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. In 2016, over 480 farmers attended sessions. Of those attending over 58% have been farming more than 20 years with the average farmer tilling 605 acres. Over 208 producers from the Mid-Atlantic region have attended the Organic Grain Production workshop and received timely emails and monthly newsletters.

Results
Agronomy meeting participants were 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 the overall average profitability is ($20.23x605 ac) = $12,239.15 per person. he average participant increases profitability between $16.23 and $25.23 per acre. Producers attending the Organic Grain Production program, using the average acres farmed per person, achieve an overall average profitability of ($20.23*771ac) $15,602.39 per person.

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, and limited resource farmers

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
According to the 2012 Census of Agriculture, there are approximately 12,200 number of farms in Maryland. About 80% of these farms are classified as small farms with sales of $100,000 or less. Despite of the growing interest among the diverse populations who want to enter into farming, farmers continue to face numerous challenges such as: rising production costs and insufficient farm business management skills in addition to other uncontrollable factors. Consequently, there is a strong need to provide educational programs and training to equip farmers with the knowledge and skills needed to own and operate a farm business successfully.

What has been done
Through the Small Farmers program at UMES, trainings, workshops, and conferences are conducted to provide farmers (including small and limited-resource, under-served, and the new

and beginning farmers) with educational information, demonstration and other relevant training and technical assistance. The programming provides opportunities to participants with access to various seminars and equip them with tools and strategies to increase farm profitability while promoting sustainability. Topics provided include alternative agriculture, farm business and marketing, beginning farmer resources, etc.

Results
Over the year, there were a total of 16 activities conducted with approximately 695 participants. Of these participants, only 47% provided their gender and ethnicity background. From the information collected, there were 30% Caucasian, 21% African-American, 3% Hispanic/Latino, 2% Asian/Pacific Islander, and 1% American Indian/Alaskan Native. From the information provided, 44% of the participants? genders were unspecified with the remaining 34% male and 22% female. From these participants, about 80% increased their knowledge in farm programs and services that can benefit them.

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
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Agricultural production in the Mid-Atlantic Region is integral to local, regional, national, and even international food systems, so maintaining and improving the productivity and competiveness of this industry is critical for both producers and consumers. This area too is also under many

environmental challenges and those operating within the agricultural industry in the region need to be educated on best practices to minimize negative impacts on soil, air, and water quality and human health.

What has been done

The Mid-Atlantic Crop Management School was established in 1995 as a joint venture between the University of Delaware, University of Maryland, Virginia Tech, West Virginia University, and USDA?s Natural Resources Conservation Service. The 2016 school drew 335 participants

Results

A total of 114 participants completed a program evaluation at the completion of the school. Crop school participants that responded to the survey consult on more than 337,000 acres in the Mid-Atlantic region. These respondents estimated the economic value of the information they received at the crop school was up to $29/acre, making the overall economic impact of the 2016 school (based on the 114 survey respondents) to be an estimated $9.9 million. Overall, the Mid-Atlantic Crop Management School helps those in the agriculture industry retain desired and necessary certifications making them more competitive and successful in their careers while at the same time offering valuable education to help improve area agricultural operations and protect the environment.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
According to a National Gardening Association survey, 35% of U.S. households (42 million) in 2013 were doing some type of food gardening. This represents a 17% increase from 2008. The rate of increase was 63% for millennials. Residents depend on UME for science-based, safe, and effective food gardening recommendations and practices.

What has been done
UME's Grow It Eat It program completed its 8th successful year in
2016. Master Gardeners (MGs), trained by UME field faculty, taught 116 classes to approximately 3,000 residents. Over 20,000 packets of organic lettuce seed was given out to youth and adult gardeners around the State to promote food gardening. Master Gardeners gave technical assistance and taught sustainable gardening practices to 26 community gardens and 42 school/youth gardens.

Results
The Grow It Eat It (GIEI) website had 218,259 unique page views and 272,097 page views in 2016; 23% and 22% increases, respectively, over 2015. The GIEI blog had 267,494 page views in 2016, an 88% increase over 2016. There were 56 new blog posts. Home and Garden Information Center consultants and MGs answered 9,500 food gardening questions by e-mail, and face-to-face at plant clinics.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
205	Plant Management Systems
216	Integrated Pest Management Systems

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
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Development of sensing and processing technologies based on nanoscale phenomena becomes increasingly relevant for our society as we continue to advance our knowledge of biological phenomena related to food, agriculture, environment and energy.

What has been done
Researchers constructed and characterized self-assembled nanostructures and developed biological interfaces and sensing systems that incorporated microfabrication and nonotechnology. Focus was on the design and fabrication of novel biosensor platforms using conventional and state-of-the-art fabrication facilities.

Results
Researchers have successfully developed nanoparticles from BLG (beta-lactoglobulin) and CBLG (cationic BLG developed by their lab) and their potential asnutraceutical/drug carriers were evaluated. This research sheds light on the development of protein-based nanoencapsulants and their performance upon oral administration. Researchers developed a tyrosinase-aided cross-linking procedure in order to replace the toxic cross-linking agents in protein-based nanoparticle formation. The cross-linking efficacy was compared to that of conventional glutaraldehyde-based process. Also accomplished was the 1) Development and characterization of cationic beta lactoglobulin (CBLG) via a simple peptide coupling reaction; 2) Preparation of beta lactoglobulin (BLG) and CBLG nanoparticles loaded with a model drug (curcumin), using an organic solvent desolvation process; (3) Investigation of curcumin-loaded BLG and CBLG nanoparticles in a series of biological processes that are relevant to oral administration.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
723	Hazards to Human Health and Safety

Outcome #6

1. Outcome Measures

Research on Genes for Strawberry Fruit Development

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual

2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
More research is needed to lead to new genes and tools in creating fertilization-independent (parthenocarpic) fruit and to gain understanding of the molecular mechanisms underlying fruit initiation (fruit set).

What has been done
Researchers used mining of fruit transcriptomes (RNA-seq) to attempt to identify candidate genes that may stimulate fruit set even in the absence of fertilization (parthenocarplic fruit). Researchers also used RNAI to knockdown key genes in the auxin and GA signaling pathway to test their regulation of fruit set.

Results
Although researchers made RNAi-based knocked down of about 10 genes in the auxin biosynthesis and signaling pathways, transgenic strawberries did not exhibit any phenotypes. One possibility is that the genes chosen to knock down may have other homologs with redundant functions. A second possibility is that the RNAi approach may not be very effective. Researchers are currently developing CRISPR/CAS9 genome editting for strawberry and hope that this new approach will work. Researchers have also chosen additional candidate genes for CRISPR/CAS9-based knockout.

4. Associated Knowledge Areas

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

Outcome #7

1. Outcome Measures

Research on Natural Enemies of the Brown Marmorated Stink Bug in Soybean Fields

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual

2016 0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Several studies have been conducted to determine the occurrence of parasitism and predation of stink bug eggs in a variety of cropping systems. However, these studies mainly investigated the impact of natural enemies on N. viridula, E. servus, O. p. pugnax, and P. maculiventris. Practically no information is available on the activity of biological control agents of the brown marmorated stink bug (BMSB), Halyomorpha halys Stahl in Maryland.

What has been done

Research was conducted to determine: 1) the impact of marigold on parasitism of BMSB eggs and population density of spiders and other biological control agents in soybean, and 2) the impact of the presence of marigold on soybean seed quality and yield.

Results

Researchers determined that flowering plants were not required to enhance parasitism of local stink bug species as populations were already heavily parasitized. However, there was no increased parasitism of BMSB eggs in soybean plots neighboring marigold or buckwheat. It is believed that parasitoids attacking stink bug eggs in soybean plots where trials were located are not very effective in successfully parasitizing BMSB eggs. Thus, there were no impact of their presences on soybean seed quality and yield.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
216	Integrated Pest Management Systems
601	Economics of Agricultural Production and Farm Management
704	Nutrition and Hunger in the Population

Outcome #8

1. Outcome Measures

Research on ROS-mediated ABA/drought Signaling in Plants

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Water stress is one of the major environmental problems in agriculture. As global temperatures rise, it is anticipated that variability in amounts and distribution of precipitation, water demand, and susceptibility to drought will increase. Abscisic acid (ABA) plays a major role in plant adaptation to water stress by inducing stomata to close leading to a reduction in transpirational water loss during drought. As more than 95% water is lost through stomatal pores, an understanding of the mechanisms by which ABA regulates stomatal apertures in response to environmental stress is a vital component to moderating water loss from plants.

What has been done
Researchers investigated the MAPK signaling network that regulates ROS-mediated ABA/drought response in plants with following objectives: 1) Characterize the regulatory mechanism for the guard cell-specific MPK9 and MPK12 and their substrates; 2) Characterize a MAP kinase and phosphatase module regulating ABA/drought responses in rice; and, 3) Determine the drought response and water use efficiency of loss-of-function and gain-of-function mutants for rice guard cell MAP kinases and phosphatases.

Results
We have identified and characterized proteins interacting with MPK9 or MPK12. A protein interacting with MPK9 is a galactose oxidase/kelch repeat super family protein, and interestingly, its expresson in leaves and guard cells is negatively regulated by ABA. The gene encoding this protein is under analysis. We have also identified two protein complexes containing MPK12. Their molecular sizes are 150 kDa and ~450 kDa, respectively. We are currently trying to identify proteins in the complexes. In addition, we have generated MPK12 mutant proteins with a point mutation. Our unpublished data suggest that they may function as constitutively active forms of MPK12. We also have identified and characterized several rice MPK9 and MPK12 orthologs that are highgly expressed in guard cells. We have obtained genetic mutants for the rice MPK genes and are currently analyzing them.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

Outcome #9

1. Outcome Measures

Research on Preservation of Genotypes

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Historically, sperm cryopreservation has served as the hallmark of genetic preservation for endangered and genetically valuable mammalian species. Recent developments in stem cell technologies suggest that embryonic stem cells (ESC) and spermatogonial stem cells (SSC) may provide innovative solutions for the preservation of genetic diversity.

What has been done
The specific aims of this project are focused primarily on using a computer modeling system to optimize conditions for propagation of pluripotent stem cells derived from cat and goat spermatogonial stem cells (SSC) and from cat embryos. Knowledge gained can be used to preserve genetic biodiversity of endangered species through application of innovative stem cell technologies.

Results
Markers for identification of cat spermatogonial stem cells (SSC)were validated and used to follow maintenance of SSC during in vitro culture. Methods to enrich SSC for cat testis were established and conditions which support cat spermatogonial stem cells developed. Antibodies which identified pluripotent markers, OCT4, SOX2, and NANOG, in the cat were validated and used to determine expression of these key pluripotency factors in the inner cell mass (ICM) of in vitro produced cat blastocysts. Expression of these critical transcription factors was shown to rapidly decrease upon explant culture. Cytokines which enhanced proliferation and maintenance of pluripotency markers were identified. The establishment of stem cells in these domesticated species will ultimately lead to the preservation of rare and endangered genotypes.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
311	Animal Diseases

Outcome #10

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 Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	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
Sheep with CIDR showed higher pregnancy rates during anestrus breeding cycles than goats. CIDR Synchronization reduced a 60 to 90 day lambing and kidding period to 10 days. This allowed operators to prepare facilities, labor, and supplies accordingly to enhance sheep and goat survival and welfare.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals

Outcome #11

1. Outcome Measures

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

Not Reporting on this Outcome Measure

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 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	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
Two elite biofertilizers were identified from eight original treatments from the preliminary greenhouse experiments. The two subsequent field studies examined yield of Amaranthus virdis Linn and Hibiscus sabdariffa L. at two locations using the two biofertilizers. Twelve farmers were recruited to participate in crop trails for the 2017 growing season. Amaranth and hibiscus production and marketing guidelines and data sheets were generated for the trials.

Results
In 2016, there was no significant difference between the control and treatments for both studies, which indicates that either treatment can be used to produce a quality yield.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

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, 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

A new program (within the last five years) has been Women in Agriculture. Educational outreach has occurred in multiple formats: face-to-face workshops, webinars, conferences, and through the use of social media. In 2016, Wednesday Webinars attracted 508 unique registrants per year on a variety of topics in farm and risk management. Evaluation results show that the clientele are predominantly female, while 82% are White, 11% are African American, 30% were between the ages of 45-54, 22% were between the ages of 55-64, 36% were college graduates, and 33% have Master's degree. There were 16 states represented in the webinars. Approximately 32% of those attending the webinars were beginning farmers. Of those who responded to the evaluation:

- 48% increased their knowledge;
- 37% will use the information to help their clients;
- 56% planned to make some change based on knowledge gain;
- 29% will improve their farm business management;
- 74% are interested in marketing, 70% in social media, 61% in business planning, 53% in finance, and 43% in legal issues;

Results were statistically significant.

A multi-faceted Extension education program to help Maryland dairy farms analyze the economics of their businesses is conducted so that they can look at alternatives for reducing expenses to increase profitability. From 1994 to 2016, income, expense, and profit data have been collected from over 80 participating farmers (Average of 30 annually with farms being dropped and added yearly.) These data are then summarized to show averages of specific income and expenses line items on a per cwt, per cow, and total farm basis. The most profitable 20% and least profitable 20% (profit per cwt.) are also averaged to help farmer understand successful and unsuccessful management practices. Two different types of dairy farms are also analyzed. These types include conventional confinement operations and grazing operations. Individual farmers can compare their farms to the Business Analysis averages to determine their competitiveness in the dairy industry. Other publications are distributed to dairy farmers to assist them in long-term planning and in analyzing alternative production methods. Economic discussions are conducted at pasture walks. One-on-one consultations are conducted to assist farmers with their specific problems. Interdisciplinary work and team teaching with field and campus based faculty is employed.
During the course of this Extension program, participating farmers developed a better understanding of their farm operations. These comprehensive consultations helped farmers pinpoint their strengths and weaknesses and make better decisions to improve management. Dairy farmers are able to evaluate the impacts on the farm of herd expansion, facility updates, alternative cropping patterns, and other changes in the farm business. Farms were able to complete required profit and cash flow analysis for loan applications.

The Mid-Atlantic Crop Management School was established in 1995 as a joint venture between the University of Delaware, University of Maryland, Virginia Tech, West Virginia University, and USDA's Natural Resources Conservation Service. The school addresses the continuing education needs of the CCA clientele group and also provides an opportunity for other regional agricultural clientele to receive continuing education for state required certification programs. The 2016 school was held from November 15-17 in Ocean City, Maryland. The 2016 school drew 335 participants including crop consultants, extension educators, farmers and farm managers, agribusiness professionals, soil conservationists, and state department of agriculture and environmental personnel. A total of 114 participants completed a program evaluation at the completion of the school. Participants indicated that the material presented in individual sessions was generally clear and well organized (1,479/1,631 respondents; 91%). In addition, 83% of respondents (1,358/1,631) indicated that they gained knowledge in the CCA core competency areas by attending the sessions at Crop School. Of those completing the evaluation, 75% (1,224/1,631) indicated that they planned to use this information in the future (e.g., implement or advise clients to implement BMPs, etc.). Crop school participants that responded to the survey consult on more than 337,000 acres in the Mid-Atlantic region. These respondents estimated the economic value of the information they received at the crop school was up to $29/acre, making the overall economic impact of the 2016 school (based on the 114 survey respondents) to be an estimated $9.9 million. Overall, the Mid-Atlantic Crop Management School helps those in the agriculture industry retain desired and necessary certifications making them more competitive and successful in their careers while at the same time offering valuable education to help improve area agricultural operations and protect the environment.

Working with the University of Delaware Cooperative Extension, University of Maryland Extension partnered to put on a workshop and webinar for poultry farmers on Delmarva

focusing on poultry farm electrical safety. Evaluation results are as follows: 98% rated the workshop good to excellent, 49% of attendees had been engages in poultry/farm production for more than 20 years, 96% indicated after attending this workshop they were more aware of what electrical hazards to look for in their chicken houses or on their farms, 85% would acquire the proper tools necessary to check electric voltage, 98 indicated the information would be a benefit to them or their operation.

University of Maryland Extension programming is developing rural entrepreneurs through such programs as one-on-on coaching support, the resources on the Agricultural Marketing and Maryland Rural Enterprise Development Center, Annie's Project, and Value-added food processing training support the continued growth in direct product sales. University of Maryland Extension has developed an Entrepreneurial Coaching program that provides trained Agricultural Service Providers as business coaches in a one-on-one coaching session. Twenty coaches have been trained with UME coaches in each of the Clusters Fifteen new and beginning farmers were coached and 37 existing business owners were coached on possible business start-ups or changes. Visitors to MREDC website to downloaded 124 copies of the business planning workbook posted there. This program was recognized as a National Finalist under the category of "programs of Excellence" for Small and Beginning Farmers and Ranchers at the 2016 NACAA/ PIC annual Meeting in Little Rock , Arkansas.

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. In 2016, over 480 farmers attended sessions. Of those attending, over 58% have been farming more than 20 years with the average farmer tilling 605 acres. Over 93% 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 (29%), improved fertility management (47%), improved crop production practices (46%), use of risk management tools (12%), regulatory information (31%), a new product or practice (26%). 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 the overall average profitability is ($20.23x605 ac) = $12,239.15 per person.

The UMES Small Farm Program:

- Has attracted over 600 participants in the past 5 years.
- Participation in state and USDA government programs has increased among small and beginning farmers.
- Over 10 new partnerships formed with local/state agencies and community organizations to support small farm programming initiatives.
- The Small Farm Conference has been an impetus in helping new and underserved farmers achieve their dream of farm ownership.
- As part of the questionnaire survey, 39-40% of the conference participants indicated they 'quite often' utilize the information and/or training received compared to the 8% who felt they 'rarely do.'
- In the areas of General Farm Business Management and Direct Marketing, over 85% felt

the information and training received was very beneficial to their farming operation.
The UMES Small Farm Bus Tour:

- Overall, this educational program has been one of our most successful events coordinated by the program attracting both limited resource producers, aspiring farmers and landowners, as well as, agricultural service providers who work with farmers. Since 2012, over 140 participants have benefited from this educational event.
- Seventy-five percent (95) of participating producers stated their knowledge and skills in direct marketing has increased, especially in areas of using social media to market products, branding and advertising, community supported agriculture, and developing new market outlets.
- The farm bus tour has provided a network system for new and beginning farmers to connect and learn from seasoned more experienced producers.
- Approximately 45% of the farmer participants stated that they have either diversified their operations by growing new alternative enterprises or have incorporated sustainable farming practices as result of participating in the educational farm tours.

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%	23%
111	Conservation and Efficient Use of Water	0%	10%	0%	0%
112	Watershed Protection and Management	0%	10%	0%	27%
302	Nutrient Utilization in Animals	0%	20%	0%	35%
403	Waste Disposal, Recycling, and Reuse	40%	25%	50%	0%
511	New and Improved Non-Food Products and Processes	0%	0%	40%	15%
601	Economics of Agricultural Production and Farm Management	60%	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: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	6.0	1.0	4.0	5.0
Actual Paid	6.0	1.0	6.0	2.2
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**
172147	68572	247372	114072
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
172147	68572	247372	186796
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	96134

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Short course and training seminars for industry personnel and growers.
- Conducted basic and applied research in alternative fuel sources, energy saving techniques, recycling of green waste products, and precision agriculture.
- Contributed 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.
- Fuel ethanol and distillers grain production industry, livestock feed industry, animal and poultry industry, meat industry, food ingredient industry, farmers
- Researchers in animal and poultry nutrition
- Students in agricultural and food sciences
- Middle and high school teachers
- Governmental agencies related to grain, fuel ethanol, and animal production

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

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1488	0	453	0

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

Patent Applications Submitted

Year:	2016
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	0	7	7

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Extension educational programs offered

Year	Actual
2016	24

Output #2

Output Measure

- Number of applied research projects

Year	Actual
2016	2

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, Biofueld Production, Sustainable System Design, & Ecosystem Restoration
4	Research on Biomass Degradation by Enzymes of Saccharophagus Degradans
5	Research on Integrated Multi-Tropic Aquaculture (IMTA) Systems
6	Research on uses of by-products of biofuels

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
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In the United States, previous digester research has focused exclusively on industrialized systems that are capital and management-intensive, and with an average cost of $1.0 million, are inaccessible to medium and small-scale farmers (USEPA, 2006). Of the 114 existing digesters in the United States, 88 are located on dairy farms. Due to capital requirements, the U.S. EPA recommends digester installation for herds with more than 500 cows, which puts this beneficial technology out of the hands of the overwhelming majority of Maryland stakeholders (USEPA, 2006).

What has been done
The "Low-cost Anaerobic Digesters for Dairy Manure Treatment and Renewable Energy Production" research project is to provide low-cost treatment options for small to medium-scale farmers that produce renewable energy and reduce environmental degradation and greenhouse gas emissions.

Results

The long-term results of this research will be an energy analysis that determines the energetic costs of the digester system and quantifies the contributions of climate, logistics, and design requirements to the total input, and determines the degree to which environmental sustainability and societal benefits are derived.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
302	Nutrient Utilization in Animals
511	New and Improved Non-Food Products and Processes

Outcome #3

1. Outcome Measures

Research on Ecology of Wetlands to Improve Water Quality, Biofueld 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
2016	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 roject 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
2016	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 Integrated Multi-Tropic Aquaculture (IMTA) Systems

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Global population increase is straining food production, especially meat. Therefore robust and sustainable food production systems are needed. Aquaculture, particularly that of shrimp, is touted as the most socially, environmentally, and economically acceptable alternative. Aquaculture reduces reliance on heavily stressed fisheries and terrestrial meat production. Unfortunately, traditional aquaculture poses serious environmental hazards if improperly managed. Integrated multi-trophic aquaculture (IMTA) is an alternative to traditional aquaculture that uses seaweeds and other extractive species to reduce environmental impacts, inputs, and risks (financial and health) associated with fed-monoculture systems.

What has been done
Major components for the IMTA biorefinery were designed for protyping. IMTA components were then constructed and retrofitted in the Agriculture Research Facility (UMES) to include: Semi-enclosed and Raceway Shrimp and Seaweed tank systems, PhytaPlatform 150 Algal Photobioreactor (PBR) system, diesel to biodiesel generator conversion. Artificial seawater was

prepared (24ppt) and maintained 79 ±5 C using 1500 watt titanium heaters. Gracilaria sp. were harvested from Assawoman Bay, Md. Post Larva (PL) shrimp were stocked and fed a blend of crumbled soy meal with dried harvested Spirulina. Shrimp and algae were sampled regularly to determine effects of culture conditions on survival and growth. Nitrate, Ammonium, and Phosphate levels were measured regularly from both culture conditions using Hach spectrophotometer and LaMotte Smart3 Colorimeter.

Results

1. Biorefinery approach demonstrated ability to sustainably produce seafood whilst mitigating financial, environmental, and social risks faced by growers.
2. There was a significant impact of culture condition on shrimp survivability, seaweed growth, and water quality ($P<0.05$).
3. There was a significant bioremediation effect of IMTA biorefinery system on nutrient levels ($P<0.05$). Monoculture nutrient levels were consistently higher throughout culture period.

4. Associated Knowledge Areas

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

Outcome #6

1. Outcome Measures

Research on uses of by-products of biofuels

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	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 wet distiller?s grains (WDG) to lower the cost and increase the health of meat.

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

Results
Determined the optimized combination of the condition variables to maximize the amounts and antioxidant capacity of bioavailable phenolic compounds in alkali-hydrolyzed corn distillers grains.
Alkali hydrolysis significantly increased the amounts and antioxidant capacities of bioavailable phenolic compounds in corn distillers grains.
As concentrations, incubation time and temperature increased, the amounts of bioavailable phenolic compounds in corn distillers grains increased.
Response surface analysis showed the optimal combination of alkali hydrolysis condition variables at NaOH concentration (2.55 mol/kg corn distillers grain), incubation temperature (69 ⁰C) and time (3.0 hours).

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
511	New and Improved Non-Food Products and Processes

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

There is limited capacity across Extension and Research to address this planned program. However, it has been an area where capacity has been built over the past years. 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

Current digestion research sites include dairy and poultry agricultural digesters in Maryland, dairy and swine agricultural digesters in Costa Rica, human waste digesters in Haiti, palm oil effluent digesters in Sierra Leone, and anaerobic digesters coupled with

microbial fuel cells for use in developing countries.

Key Items of Evaluation

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%	45%
111	Conservation and Efficient Use of Water	10%	10%	5%	0%
112	Watershed Protection and Management	15%	25%	10%	43%
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%	12%
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: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	16.0	3.0	11.0	4.2
Actual Paid	16.0	1.0	9.0	1.9
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**
688589	274287	371057	264118
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
688589	274287	371057	241438
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	301865

V(D). Planned Program (Activity)

1. Brief description of the Activity

• UME, MAES, and AES had 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 developed research and education programs that generated 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 developed research and action teams that 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 conducted 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 developed and expanded 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

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	28193	67328	3954	122

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

Patent Applications Submitted

Year:	2016
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	0	5	5

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

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

Year **Actual**

2016	347

Output #2

Output Measure

- Number of applied research projects

Year	Actual
2016	2

Output #3

Output Measure

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

Year	Actual
2016	7500

Output #4

Output Measure

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

Year	Actual
2016	4

Output #5

Output Measure

- Number of individuals reach through Extension programs

Year	Actual
2016	32150

Output #6

Output Measure

- Number of information pieces developed

Year	Actual
2016	21

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	Research on Emerging Disease Vectors
8	Research on Flood Risk Management

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
- 1890 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
As local governments and developers look to meet Total Maximum Daily Loads (TMDLs) and new Environmental Site Design (ESD) regulations, and municipalities experience a growing need to retrofit existing stormwater Best Management Practices (BMPs) on residential and business properties, there is an increased demand for individuals and firms trained in proper conservation landscaping practices.

What has been done
The Chesapeake Bay Landscape Professional Certification program provides education 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
To date, 85 people have been certified as Chesapeake Bay Landscape Professionals. The CBLP Certification Program will fill this void and provide local governments, nonprofits and private citizens with a trustworthy label they can use to understand the skills and abilities of the professionals they hire to install small-scale conservation landscaping practices. This certification allows certified professionals to brand and market themselves as conservation landscapers who have proven expertise in this niche market.

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
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 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Tomato growers in the mid-Atlantic have problems producing high quality tomatoes for market. Tomatoes are one of if not the most lucrative crops to grow if growers and produce good quality fruit. In most growing seasons this is difficult to do consistently.

What has been done
A three year research/outreach project was initiated to discover what was causing the problems with growing marketable fruit. Work was conducted on research farms, high tunnels green houses and on growers farms.

Results
Over the last few years, the results of the research have been transferred to vegetable growers in Maryland along with many other states in the eastern US-Ohio, NY, PA, WV, DE. VA. Based on grower surveys more than 60% of growers have or will implement the suggested changes to improve tomato fruit quality. Based upon on-farm trials of growers that have implemented the

changes, growers increase their net income per tomato acre by $500/season. Over the last 3 years this has resulted in an average net increase in income for all growers that implemented the changes of over a half million dollars.

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
205	Plant Management Systems
403	Waste Disposal, Recycling, and Reuse

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 Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	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
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
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Researchers in the University of Maryland's Department of Environmental Science and Technology and Plant Science and Landscape Architecture have on-going projects designed to improve the understanding and management of nutrients in crop production. The long term goal

of planting cover crops is to develop systems that pay for themselves by recycling nitrogen (and other valuable nutrients like sulfur) from deep in the soil profile.

What has been done
Researchers conducted a study to determine at what depths forage radish, cereal rye, and clover could recover nitrogen. A naturally occurring nonradioactive isotope of nitrogen that can be traced through the plant-soil system, N-15, was applied at 3.3 and 6.6 feet soil depth for September 1 and October 1 planting dates.

Results
Preliminary data indicate that both forage radish and cereal rye cover crops were able to access the N-15 that was buried at 3.3 feet deep if they were planted September 1 but not when planted on October 1. Very small quantities of N-15 were removed by any of the species where the tracer was placed 6.6 feet deep. Field work was completed in fall 2016 with corn harvest. Analysis of the corn for N-15 will allow greater understanding of nitrogen cycling between the soil, various cover crop species, and the subsequent corn crop.

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 #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
2016	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
The College of Agriculture and Natural Resources' nutrient management programs continued to conduct research on nutrient utilization in crop production and animal nutrition, as well as educate the public on fertilizer management and sustainable horticultural practices.
AES is performing research on the surface and subsurface movement of Nitrogen and Phosphorous to sensitive water bodies in order to develop best management practices to meet regional water quality standards set by regulatory agencies.

Results
Research and education efforts allow the College and AES to meet nutrient management initiatives to continue to improve and protect the health of the Chesapeake Bay and Maryland's tidal and non-tidal waterways while maximizing the state's economic potential. In addition, a reduction of nutrient loads have been consistently observed when subsurface application methods have been employed.

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
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 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
To restore Bay water quality to an acceptable level, Watershed Implementation Plans (WIP) were developed based on Total Maximum Daily Loads (TMDL) intended to reduce nutrient and sediment loads throughout the Bay's watershed. The WIPs require counties and municipalities to reduce pollutant loads from all sectors by 60% in 2017 and completely meeting the goals by 2025. Along with efforts by the state, counties, and municipalities to meet WIP deadlines, meeting the reduction goals and timeline will require action from communities and individuals.

What has been done
To address the communities' needs, the University of Maryland Sea Grant Extension employs 5 Regional Watershed Restoration Specialists that work in specific regions of the state to extend research-based information. They assist in developing partnerships among state and local governments and organizations, help identify and prioritize nonpoint-source pollution challenges, assist partners in implementing on-the-ground projects that result in measurable improvements in water quality, and assist in realizing funding opportunities to achieve these efforts.

Results
Stormwater and/or grant-related assistance was provided by the Mid- and Upper-Shore Specialist to 29 new partners and 36 existing partners including federal and state agencies, county and municipal government, non-governmental organizations and non-profit agencies, companies, individual landowners, and homeowner associations. The Specialist specifically provided grant-related technical assistance to 18 organizations that resulted in proposals totaling $1,769,482 for water quality restoration projects being submitted for consideration. These projects were estimated to have an annual reduction of 849.9 pounds of Total Nitrogen, 110.9 pounds of Total Phosphorus, and 86,203.3 pounds of Total Suspended Solids.

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

Research on Emerging Disease Vectors

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Despite ongoing extraordinary medical advances infectious diseases are on the rise worldwide and account for a quarter of all human mortality and morbidity. After the recent West Nile virus (WNV) epidemic that swept through the US within 5 years impacting thousands and killing many, there has been a recent confirmed case of locally-transmitted dengue fever in New York, as well ongoing epidemics in Texas and Florida. Additionally, for the first time in the Western Hemisphere, local transmission of chikungunya has been detected in the Caribbean.

What has been done
A key component of project is the development of simulations to understand the most effective timing and type of vector control to use in the face of an outbreak threat. In addition, researchers will gather environmental predictors of biological optimals for each species that could aid surveillance efforts.

Results
To date, research has compared seasonal changes in summer and winter temperatures among common artificial container habitats in the field (i.e., used tire, plastic cup, pottery planter, plastic corrugated tubing, plastic bucket) using data loggers. Data was also collected on Ae. albopictus oviposition activity. Preliminary data from the first year of the study indicate potentially important variation in the seasonal temperature profiles among different container types that may affect larval survival and development in the summer, and egg survival in the winter.

4. Associated Knowledge Areas

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

216 Integrated Pest Management Systems

Outcome #8

1. Outcome Measures

Research on Flood Risk Management

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Recently, flooding events and intensity have increased perhaps due partly to climate change. However, people residing in locations with flood potential do not take the issue seriously, and thus, are at great risk. Factors that can influence participation and/or perceptions of risk include household income, home ownership, ethnicity, education, social status, disabilities, English as a second language, age, and gender.

What has been done
To test the effectiveness of the Google Earth and HAZUS DSS methods in communicating flood risk and risk-reduction strategies, researchers visited communities participating in the FEMA DFIRM updates. Because demographic factors may influence the results of the study, a qualitative analysis of the composition of meeting participants was conducted.

Results
The study was performed and it was found that a less complicated method of flood risk communication that involved the stakeholders can do as well or better than a more complicated and expensive method currently used by FEMA.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
608	Community Resource Planning and 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

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The Watershed Stewards Academies graduated 54 new Master Watershed Stewards as well as provided assistance to previous program graduates with their community outreach and restoration activities. Their combined efforts of class, capstone, and community projects resulted in the completion of 86 new projects totaling 19,080 square feet of BMPs treating 80,840 square feet of impervious surfaces. In all, they planted 8,696 native plants, educated 1,746 individuals, and engaged 741 volunteers to complete projects including bioretention areas, a micro-bioretention facility, rain gardens, a 1,300 gallon cistern, rain barrels, stormwater planter boxes, community assessments, stream surveys, a green roof demonstration, impervious surface conversion, and native tree, shrub, and wildflower plantings.
As part of their class and capstone projects, the 9 volunteer participants in the Cecil County WSA engaged 1,300 members of the community, held 1 rain barrel workshop, distributed 20 rain barrels, installed 4 rain barrels, constructed 2 micro-bioretention facilities, and created a conservation planting area that resulted in an annual load reduction of 7.51 pounds of Total Nitrogen, 0.41 pounds of Total Phosphorus, and 553.67 pounds of Total Suspended Solids. Additionally, they secured $6,777 in grant funding to complete their projects.

UME's Grow It Eat It program completed its 8th successful year in 2016. Master Gardeners (MGs), trained by UME field faculty,taught 116 classes to approximately 3,000 residents. The GIEI website had 218,259 unique page views and 272,097 page views in 2016; 23% and 22% increases, respectively, over 2015. The GIEI blog had 267,494 page views in 2016, an 88% increase over 2015. There were 56 new blog posts. Home and Garden Information Center consultants and MGs answered 9,500 food gardening questions by e-mail, and face-to-face at plant clinics. Master Gardener demonstration gardens produced and distributed 10,055 pounds of produce to food banks and pantries.

Since its inception in 1990 the Home and Garden Information Center (HGIC) has been a national model for centralizing gardening and pest management education and information

and answering public queries 24/7. In 2016, HGIC ranked first in the U.S., among "experts" answering home horticulture questions via eXtensions's "Ask an Expert."Evaluation of service: clientele who receive answers are randomly contacted by eXtension to take an online survey. Responses were submitted by 28.3% (n=3,110) of HGIC clientele (2008-present). Over 980 respondents reported that the answer they received had an economic benefit to them (66% reported a benefit of $0-$249; 21% reported abenefit of $250-$999; 9% reported a benefit of $1,000-$2,499). The HGIC and GIEI Twitter and Facebook followers increased 9% over 2015 (8,163 total). Approximately 10,708 people were following HGIC and GIEI social media (blog,YouTube, Instagram, Twitter, Facebook, Pinterest) in 2016.

Other statistics for HGIC include:

- 5,669 questions answered via web-based Ask an Expert service.10% of total questions were posed by out-of-state residents.
- 5,800 subscribers to HGIC e-newsletter (9% increase over 2015)
- 2 million total YouTube views and 2,332 total HGIC YouTube channel subscribers from 2009-2016. 141,785 new views for HGIC's 136 videos in 2016.
- HGIC website recorded 551,000 unique page views and 769,298 page views in 2016; 85% and 72% increases, respectively, over 2015.

UME faculty worked with state agencies and political leaders through a variety of committees and one-on-one interactions to help revise state leasing laws. They provided input and guidance for the development of programs that included low interest loans and grants, seed production training and assistance for continuous planting of leases and educational events designed to provide knowledge of hatchery supported shellfish aquaculture. In 2010, a revised leasing program went into effect that resulted in 6,100 acres of Bay being placed in active production by 175 growers (December 2016). During the past five years, data reflecting the number of leases and acreage, as well as harvests, have risen annually.
In 2010, a revised leasing program went into effect that resulted in 6,100 acres of bay being placed in active production by 175 growers (Dec 2016). During the past five years, data reflecting the number of leases and acreage, as well as harvests, have risen annually. In 2010, a revised leasing program went into effect that resulted in 6,100 acres of bay being placed in active production by 175 growers (Dec 2016). During the past five years, data reflecting the number of leases and acreage, as well as harvests, have risen annually.

Key Items of Evaluation

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%	100%
801	Individual and Family Resource Management	10%	0%	0%	0%
	Total	100%	100%	0%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	10.0	1.5	5.0	1.0
Actual Paid	10.0	1.5	0.0	0.3
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**
344295	137143	0	66320
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
344295	137143	0	52551
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Developed/implemented 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.
- Developed and implemented training for School Wellness Champions in pilot test sites focusing on sustainable wellness policies that support healthy lifestyles.
- Created effective materials and programs that meet standards of health literacy.
- Investigated 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.
- Contributed articles and expertise to eXtension.org Community of Practice for Food, Fun, and Fitness
- Developed Social Marketing and Social networking strategies to engage target audiences in Healthy Living dialog
- Conducted applied research to inform educational program interventions.

2. Brief description of the target audience

- School-age and preschool youth
- Parents of school-age youth
- Children enrolled in childcare centers
- Parents of children enrolled in childcare centers
- 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?

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

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	2952	1329	22117	830000

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

Patent Applications Submitted

Year:	2016
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	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
2016	1292

Output #2

Output Measure

- Number of applied research projects

Year	Actual
2016	1

Output #3

Output Measure

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

Year	Actual
2016	1329

Output #4

Output Measure

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

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	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
5	Policy, Practice, & Physical Environment Changes

Outcome #1

1. Outcome Measures

Increase in fruit and vegetable consumption among preschoolers and youth

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Overweight and obesity have become two of the most critical health issues. Over the past 20 years, the percentage of overweight children has doubled while overweight adolescent numbers have tripled. In 1997, the prevalence of overweight children in Maryland ages 2 to 5 years increased from 8.2% to 14%. A study conducted by Ball et al., (2007) reported that 74% of all children ages three to six years are in some form of non-parental care and 56% are in center-based child care programs. Results from the Early Childhood and Child Care Study shows that children consume about 50 to 100% of their Recommended Dietary Allowance while attending a childcare facility.

What has been done
The 1890 Extension Program at UMES collaborated with the Head Start Program to develop education to childhood obesity prevention in the Tri-County area (Somerset, Wicomico, and Worcester) on the Lower Eastern Shore of Maryland. The program targets preschoolers at the Head Start Center in Princess Anne. The team developed 4-weekly lessons that include stories, dance, visual tools, food demonstrations, and gardening, as well as introduced fresh fruits and vegetables in the lunch menus. The preschoolers learned how to share the positive messages related to healthy lifestyle with their caregivers at the schools and at home.

Results
A total of 300 preschoolers, 50 families, 18 teachers and teacher-aids, and 5 Head Start staff were involved. Of these participants, 90% of the preschoolers became familiar with fresh fruits and vegetable in their menus and improved their intake. A 100% of the Head Start teachers and staff indicated they made changes and improved their food choices, particularly in their fruits and vegetables consumption. About 50% of the parents indicated that the preschoolers made them buy and eat new fruits and vegetables, thus changing their families' lifestyle and eating habits.

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
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Smarter Lunchrooms is an evidence-based approach to encouraging selection of healthy foods in the school cafeteria. By making simple, low- to no-cost changes in how food is arranged, displayed, and marketed on the service line, students are 'nudged' toward healthy choices. FSNE's Smarter Lunchrooms programming facilitates adoption of healthy eating behaviors by linking environmental changes in the school cafeteria to nutrition education in the classroom.

What has been done
Drawing on research and materials from the Cornell Center for Behavioral Economics in Child Nutrition Programs, FSNE Smarter Lunchrooms sites receive training on Smarter Lunchrooms strategies and materials and technical assistance for implementing interventions.

Results
After FSNE programming, 94% more teachers report regularly selecting fruits and vegetables for classroom tastings and activities that complement the healthy foods being offered in the cafeteria. Teachers also report healthier classroom and school environments in which healthy foods are used for classroom lessons, signage that promotes healthy foods, health information is regularly shared with parents or caregivers, and tasting opportunities are provided to youth.

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
- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
According to the CDC, "The percentage of children with obesity in the U.S. has more than tripled since the 1970s. Today, about one in five school-aged children (ages 6-19) has obesity."

What has been done
Champions for Healthy Kids provides training for Out of School Youth program providers who are interested in learning methods to improve the out of school environment for their program participants. Role modeling healthy behaviors, healthy food choices, physical activity, and reduced screen time are some of the focus areas of this 2 or 3 hour training, eligible for Maryland State Department of Education (MSDE) Continuing Education credits.

Results
After FSNE programming, more parents report that their children engage in at least 60 minutes of physical activity on weekends. In addition, 60% of parents reported engaging in physical activity in front of their children as compared to 44% before engaging in FSNE programs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The 1890 Extension Program at UMES collaborates with the Expanded Food and Nutrition Education Program (EFNEP) to address food and nutrition to low income families in the Lower Eastern Shore of Maryland, targeting the Somerset, Wicomico, and Worcester Counties. According to the 2014 Maryland Statistical Handbook (2015 Maryland Department of Planning), Somerset County holds the highest poverty level in Maryland (28.5%), followed by Wicomico in sixth place (16.5%), and Worcester County in 13th rank (13.1%). There has been studies to show evidence that poverty in early life was linked to later childhood obesity in a recent study of 1,134 children in 10 U.S. cities (Lee et al., 2014). More specifically, children who experienced poverty by two years of age were 1.66 times more likely to be obese by 15.5 years of age than children who did not experience early poverty.

What has been done
Nutrition educators facilitated and provided educational programs to schools and child-care partnerships to address healthy eating and active lifestyles to a diverse and low-income population through nutrition education, food demonstrations, and gardening. The program developed five sessions in collaboration with 11 summer programs on and off campus.

Results
Through this collaboration, a total of 900 youth participants aged 6 to 18 years old were reached each year (70% Blacks, 26% White, 4% Hispanic, and 5% other). Among the participants, 60% were in grade 1 to 5; and 28% in grade 6 to 8, and 12% in grade 9 to 12. Participants were taught

foods choices, food resources management, food safety, gardening, and exercise skills. Out of 900 participants reached each year, 90% completed the program. Because of this program, 85% increased their intent to eat a variety of foods; 90% increased their knowledge of the essential of human nutrition; 86% increased their ability to select low-cost nutritious foods, and 90% improved their practices in food preparation (making your own healthy snacks) and food safety.

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

Policy, Practice, & Physical Environment Changes

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
When implementing community healthy living programming, it is critical to consider the interaction between people and their environments and the role this interaction plays in community functioning. A systems approach recognizes that humans live in, and are exposed to, multiple environments and situations that may affect their behavior and beliefs.

What has been done
The FSNE program influenced or encouraged collaborators to implement a number of changes to their policies, practices, and physical environments in an effort to create access and appeal for healthy choices among low-income Marylanders.

Results
The majority of FSNE sites implemented multi-component interventions targeting healthy eating (77% of sites) and physical activity (54% of sites). Extension Educators identified the following

support efforts across Maryland: 69 local champions who support improved access to nutrition and physical activity opportunities; 31 active, site-specific wellness councils or committees; 15 county-level health promoting partnerships; and, 45 sites with policies that require students to spend at least 50% of their time in physical education classes.

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

- 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

In the 2016 program year, FSNE provided education to participants through multiple curricula emphasizing healthy eating and physical activity behaviors. With the social-ecological model as a framework, 26,398 participants (22,117 youth and 2,952 adults-often the parents/caregivers of the youth participants) received direct education from FSNE educators and/or trained partners. FSNE also extended the reach of its direct education by making more than 830,000 contacts through educational print materials and text messages.

Seventy-eight percent of youth who participate in FSNE lessons report feeling confident in their ability to prepare their favorite fruit or vegetable at home, an increase of 7% from before the program.

At the end of the school year, over 3/4s of teachers report that their students are willing to try new fruits and vegetables as compared to 1/2 of teachers at the pre-test. Forty-seven percent more teachers report that their students speak positively about fruits and vegetables after FSNE programming. Almost 70% of teachers at FSNE schools report role modeling healthy eating in front of their students, an increase of 17% from the beginning of the school year. After FSNE programming, 94% more teachers report regularly selecting

fruits/vegetables for classroom tastings and activities that complement the healthy foods being offered in the cafeteria. Forty percent more teachers report parents serve as advocates for healthy eating in the classroom and the broader school 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%	50%
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%	25%
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	20%	100%	0%	25%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	10.0	1.5	5.0	6.7
Actual Paid	10.0	1.0	15.0	3.0
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**
344295	137143	927644	375801
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
344295	137143	927644	428234
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	290064

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Developed technical assistance programs for UME
- Developed and/or adapted food safety materials and resources for UME Educators
- Collaborated with local, regional, and national partners
- Developed safe food educational materials/ resources and disseminate USDA food safety materials to consumers and producers
- Developed food preservation educational materials/resources and disseminate to consumers via workshops and media
- Conducted trainings and workshops, including train-the-trainer workshops
- Conducted evaluations
- Promoted and supported Maryland Farm to School and other agricultural literacy programs
- Conducted data analysis, needs assessments, environmental scans, and asset mapping
- Networked internally and externally with collaborators, partners, and affiliates
- Raised community and stakeholder awareness of local food issues
- Contributed to relevant eXtension Communities of Practice
- Developed online food safety modules
- Conducted social marketing awareness education focusing on food safety
- Conducted basic and applied research to inform program development regarding food borne illnesses and beneficial and safe compounds in the food.

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

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

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	21093	6755	5586	0

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

Patent Applications Submitted

Year: 2016

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	1	0	1

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of educational programs offered

Year	Actual
2016	93

Output #2

Output Measure

- Number of applied research projects

Year	Actual
2016	6

Output #3

Output Measure

- Number of fruit and vegetable growers using good agricultural practices

Year	Actual
2016	60

Output #4

Output Measure

- Number of food processing operations using good manufacturing and sanitary practices

Year	Actual
2016	60

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	Research on organic crop management
6	Research on the prevalence of foodborne pathogens and antibiotic residues

Outcome #1

1. Outcome Measures

Increase in people who gain basic food safety knowledge and skills

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In Maryland, a case of foodborne illness can cost an individual between $1,476-$2,591 towards health-related costs and loss of productivity due to food-borne illnesses--costs that are often preventable. Those most susceptible to food-borne illness are: children age birth to five years of age; pregnant women; immuno-suppressed (e.g. cancer patients); and adults 50+ years of age.

What has been done
University of Maryland Extension works to address food safety issues at each step of the farm-to-fork continuum. Food preservation workshops are offered as part of the Grow It, Eat It, Preserve It! series. This workshop gives home canners the science and hands on experience to prevent foodborne botulism.

Results
During 2016, 24 food preservation workshops took place, amounting to 72 hours of direct course instruction provided in Baltimore Co., Harford Co., Baltimore City, and Walter Reed Medical Center. Hill Forest Fruit Farm was a major partner. To date, no foodborne botulism related to home canned food in Maryland has been reported. Overall, $145,096 was potentially saved if one case of foodborne illness was prevented per food handler completing the course (56 participants x $2,591).

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
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In November 2015, the U.S. Food and Drug Administration (FDA) released new regulations associated with the Food Safety Modernization Act (FSMA) that govern the produce industry. Produce farms that have gross sales greater than $25,000 of fruits and vegetables may need to comply with the regulations. Therefore, it is evident that producers need to be more aware of GAPs and the changing regulatory environment which includes an emphasis on water quality.

What has been done
In 2016, a series of GAP programs was 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
Five producer training programs were offered in early 2016 that were attend by over 60 growers. The growers indicated they had a better understanding of the GAP process and the majority began writing a Food Safety Plan for their farm.

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

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
A recent report from Economic Research Service estimates that the organic food market is the fastest growing sector in the US food industry. Products from mixed farming including meat, egg, and fresh produce are in greater risk in cross-contamination as they are grown in the same facility. In this project, the prevalence of major foodborne bacterial pathogens such as Salmonella and Campylobacter jejuni/coli will be evaluated.

What has been done
To determine the prevalence of Salmonella and Campylobacter in MCLS and compare the data with conventional practices, this research will evaluate the prevalence of enteric bacterial pathogens in the gut of common meat animals and their surrounding environments and composting facility. This will include raw manure, composted animal manure, floor samples, feed and water. Every week, the fecal and other samples will be collected for microbiological analysis. In addition with detection of enteric bacterial pathogens, we will also perform molecular profiling of common microbial populations in the cecal contents by denatured gradient gel electrophoresis (DGGE).

Results

This is a new research project. The full findings of this project, performance of traditional as well as using of pomace in mixed crop-livestock systems against prevalence of foodborne pathogens, impact on composting animal waste, and economic cost-benefit analysis will be discussed in several workshops held in Salisbury, Fredrick, College Park and Baltimore, MD.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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 #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
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In 2007, the General Assembly approved a pilot program allowing a few Maryland farmers to make raw milk cheese that is properly aged for 60 days. The program was initially set to expire in five years, but the time limit was lifted in 2009 because farmers were having trouble getting banks to lend them money for cheese making ventures with a fixed end date.

What has been done
In the spring of 2015, a small group of producers and agriculture support specialists met to discuss the idea of forming a Maryland Cheese makers Guild to provide a common voice on regulatory issues and educational and marketing opportunities to help support the industries growth.

Results
The Maryland Cheesemakers' Guild provides representation of cheesemakers concerns for regulatory and business development issues to decision makers in Maryland; educational opportunities for producers to improve the quality and quantity of their product; participation in marketing and promotional events such as the Maryland Wine Festival, several local fair events, and the Governor's Buy Local Cookout; develop their website for member support plus launch a social media presence; and, design, publish, and distribute consumer promotion materials.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
501	New and Improved Food Processing Technologies
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

Research on organic crop management

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Use and demand for organic produce is on the rise by consumers. Complicated certification requirements make it necessary to determine best management practices when using poultry litter.

What has been done
Data were collected for food safety and economic analyses of harvested tomatoes. Ripe tomatoes were analyzed to determine if Salmonella and E. coli 0157:H7 were present.

Other nutrient studies were conducted for ginger, carrots and kale on the organic site. Various nutrient regimes were applied to each crop.

Results

Neither Salmonella, nor E.coli 0157:H7 was detected in tomatoes from these two sites.
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 #6

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
2016	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. Currently, there is a lack of knowledge about the prevalence of foodborne pathogens and antibiotic residues in imported and domestic seafood.

What has been done

Extraction of antimicrobials from seafood were successfully conducted and experiments were conducted to identify multi-drug residues (MDR) in imported and domestic seafood (shrimp, tilapia and catfish). Fourteen antimicrobials were tested. Pulsed-field gel electrophoresis patterns and virulence factors for Vibrio, Salmonella, and Campylobacter species recovered from frozen

seafood (catfish, shrimp, and tilapia) were partially completed using molecular methods.

Results

Ten seafood groups (7 shrimp and 3 tilapia) from the original 54 groups (catfish, shrimp, and tilapia) revealed detectable amounts of 3 types of sulfonamides. Sulfamethazine was detected in 2 groups of shrimp and 1 of tilapia. Sulfathiazole was detected in 4 shrimp and 2 tilapia groups. Sulfamethoxazole was detected in 2 shrimp groups only. The second test was a validation test and in which the 10 above groups were tested at the level of individual samples that formed them. No detectable amounts of any of the antimicrobials were detected on individual samples. The results emphasized that there is no correlation between antimicrobial resistance of the pathogens (Vibrio, Salmonella, and Campylobacter) isolated from the same seafood samples and the antimicrobial restudies. Analysis of data of Pulsed-field gel electrophoresis and virulence factors is underway.

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

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

Limited budgets have resulted in limitations in the laboratory equipment and hiring of graduate students to conduct further research in the overall food safety area at UMCP's College of Agriculture and Natural Resources.

Food Safety is an area of critical importance to the nation. UME has hired more Educators with expertise in food safety, but is an area where continued capacity-building is needed.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

On a pre/post-survey of Grow It, Eat It, Preserve It Baltimore County clientele, with an optional 6 month follow up survey for participants to enroll in at the time of the workshops, 50 pre/post surveys were completed out of 56 initial adult respondents. The majority were female (90%), identified as White, Caucasian, Non-Hispanic (66%), between the ages of 45-64 (52%), and in a household making $75,000 or more (N=54%). Most (44.9%) participants did not preserve any produce in the past year, and for the majority (92%), this was their first

food preservation workshop in the past 12 months. A statistically significant difference in respondents' confidence to operate a water bath ($p<0.05$) and pressure canner ($p<0.001$) was detected. The social norms of using family recipes (that may not be food safe) and participants' intent to use the University of Maryland Extension educators and laboratory-tested recipes significantly (statistically) improved ($p<0.05$).

UME Baltimore County FCS Educator maintains the Twitter @FoodSmartUME with 108 followers and 1,290 tweets in 2016.

Key Items of Evaluation

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: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	20.0	3.5	13.0	0.0
Actual Paid	20.0	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**
413154	164572	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
413154	164572	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Continued training Extension educators across the country to be certified to teach "Smart Choices" health insurance literacy curriculum
- Developed, pre-tested, pilot-tested, and started implementation Smart Use Curriculum focusing on maximizing the use and understanding of health insurance.
- Began development of Smart Choice curriculum for millennials.
- Create and publish scholarly work in support of Smart Choice curriculum and associated health insurance literacy efforts.
- Planned, organized, and conducted Personal Finance Seminar for Professionals (professional development for personal finance specialists, educators, and practitioners from across the country).
- Worked with inmates to teach basic concepts of economics, business, and finance.
- Worked with individuals at risk for tenant eviction to teach basic financial management skills.
- Promoted green cleaning as a component of healthy homes
- Conducted healthy living programming at Senior Centers focusing on healthy eating and increased physical activity.
- Developed and implemented educational programs focusing on safety on the farm and at home.
- Provided nutrition, healthy eating habits, food safety, and wellness programming to a wide range of audiences.
- Adapted the Food-for-Profit program and began offering the workshop to food entrepreneurs in Maryland.
- Delivered food preservation education through the Grow It, Eat It, Preserve It program.
- Delivered diabetes and health information through the
- Partnered with the Maryland State Department of Education on "Champions for Change" to improve school health environments.
- Delivered the YMCA Diabetes Prevention Program (YDPP) to individual at high risk of developing diabetes.
- Began the development of a Latino father-focused program to enhance father engagement, build quality parent-child relationships, and promote healthy eating and physical activity.
- Offered multiple train-the-trainer workshops within the area of FCS.

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?

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

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	39431	1895	5214	0

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

Patent Applications Submitted

Year:	2016
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	1	0	1

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of educational workshops offered

Year	Actual
2016	1684

Output #2

Output Measure

- Number of adults and youth with increased financial literacy

Year	Actual
2016	1760

Output #3

Output Measure

- Number of adults and youth with increased health literacy

Year	Actual
2016	7552

Output #4

Output Measure

- Number of youth with increased safety awareness

Year	Actual
2016	134

Output #5

Output Measure

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

Year	Actual
2016	450

Output #6

Output Measure

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

Year	Actual
2016	8896

Output #7

Output Measure

- Number of applied research projects

Year	Actual
2016	3

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.
7	Diversity & Inclusion

Outcome #1

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle

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
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Although Maryland is often ranked as one of the wealthiest states in the United States, 9.8% of Marylanders and more specifically 14.4% of Caroline county residents live below the poverty line, thus the effort to address the lack of financial capability within vulnerable populations in the Eastern Shore region of Maryland through directed educational sessions located at homeless shelters.

What has been done
The sessions conducted by the University of Maryland at the homeless shelters engaged participants through social, emotional and cognitive activities to develop positive attitudes, applied knowledge and financial skills within a personalized plan for recovery. To date, 53 participants attended 6 weekly 1.5 hour sessions to acquire their credit report, examine a variety of budgeting tools, evaluate financial services, identify free financial resources, practice goal setting and work toward connecting personal behaviors with the realities of their credit history.

Results
While homeless populations are difficult to re-engage for follow-up studies, participants at the conclusion of a program series indicated a greater understanding of financial resources and higher ability to use newly acquired skills for financial decision making. Over 60% of the homeless participants completing sessions sought assistance with reading their credit report for understanding at the local extension office with 12% of those re-contacting the Extension office to report negotiating bill repayment terms for lower overall payment costs. Providing financial capability focused instruction in conjunction with access to credit reporting retrieval enables participants to develop stronger financial plans for recovery.

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
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Lifestyle choices, including diet and physical activity, play a major role in the development of chronic diseases, like diabetes. According to the American Diabetes Association, close to 24 million Americans have diabetes today (over 10% of the adult population) with the majority of those individuals having Type 2 diabetes. In the Western cluster, all 3 counties have higher rates for diabetes than the state of Maryland (Allegany 10.6%, Garrett 10.1% and Washington County 11.3% vs. State of Maryland 9.4%) (CDC, 2012).

What has been done
Educating consumers on behavioral changes (healthy eating and increasing physical activity) can result in improved control of diabetes. This can result in decreased health costs. Educators offer a 3-session workshop on Strategies for diabetes and weight loss. The 3-part series covers detailed menu planning guidelines, portion control, counting carbohydrates, understanding artificial sweeteners, navigating the grocery store aisles and reading food labels, and tips for eating out. This program was offered to participants who have diabetes to control their diabetes or those who are at risk to take measures to prevent or delay its development through weight loss and exercise.

Results
All participants in the Diabetes and Weight loss workshops reported that they had a good understanding of carbohydrate counting, what foods are low in carbohydrates, what are appropriate portion sizes. Ninety-one percent reported a good understanding of nutrition facts labels and artificial sweeteners and sugar alcohols. In addition, they reported increased knowledge and skills about nutrition (100%), greater confidence in meal planning (91%) and better motivation to eat better and exercise (82%).

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle

Outcome #4

1. Outcome Measures

Increase in people reporting the adoption of healthy home practices

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Good health is greatly influenced by the home environment. Reduction of commercial chemicals and products in the home leads to a decrease in accidental poisonings, accidents and long-term health effects.

What has been done
Many people mistakenly believe the alternative "green" products are always more expensive than other options. The goal of the Green Cleaning program is to educate people about the harm of commercial chemicals and cleaners and provide low-cost alternatives they can create with common household products.

Results
The program has been conducted in the Northern Cluster of Maryland (counties of Carroll, Baltimore, and Harford). Since the program began, 312 families in these counties have been reached. Pretests and post-tests show people have an increase in knowledge about the harm of commercial cleaning products and an increased likelihood of using green products. The program has also led to referrals and requests by other partners due to its positive reputation.

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 Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Health insurance literacy is the ability to chose 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
The Health Insurance Literacy Initiative developed Smart Use Health Insurance. The program will be divided into four or five modules, each targeting a different aspect of using health insurance. Two modules have been developed, Smart Actions for Using Your Health Insurance and Your Essential Benefits. Smart Actions has been tested and educators have been trained to teach it nationwide. Your Essential Benefits is being piloted on the Eastern Shore and will be widely available in 2017.

Results
The Smart Use Health Insurance program has and will reach hundreds of Marylanders in 2016 and 2017. Our data shows that this is increasing consumers knowledge and confidence to use their health insurance. Additionally, the Essential Health Benefits module is being tested with Eastern Shore residents during 2017 and Maryland residents will be able to use their new knowledge at the start of the plan year, enabling them to maximize their health plan.

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.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
607	Consumer Economics
723	Hazards to Human Health and Safety
724	Healthy Lifestyle
801	Individual and Family Resource Management

Outcome #7

1. Outcome Measures

Diversity & Inclusion

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Now, more than ever, discussions around diversity, equity, and social justice are needed in American dialogues. It is imperative for all Extension educators to reflect on their responsibility to provide relevant and need-based programs to all residents, especially underserved audiences.

What has been done
Trainings have been developed and implemented for Extension audiences on the topics of diversity, cultural competence and inclusive programming. In addition, 169 Extension Faculty, staff and volunteers attended a Diversity and Inclusion workshop in 2016. Workshops were included the UMES Retreat, County Meetings, Master Gardener Meetings, and at the state-wide Diversity and Inclusion Training.

Results
At the completion of 2016, over 15 UME educators were engaged in efforts related to diversity and inclusion, including the development and implementation of cultural competence training programs, books, fact-sheets and a college course. As the issue of diversity takes the national spotlight, University of Maryland Extension educators will be there to provide evidence-based, timely, and relevant resources to Maryland residents and Extension educators across the country.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

Family and Consumer Sciences in Maryland has made significant strides in attracting high-quality tenure-track and professional-track faculty members. Although the staff is small, the team has formed itself into a "Healthy Living" focus area that concentrates on financial wellness, physical wellness, and environmental wellness. In addition, the team has incorporated the ECOP National Framework for Health and Wellness and the social-ecological models into its programming approach. Through these strategic decisions and frameworks, it is believed that Maryland FCS can make significant progress in helping to ensure the health and well-being of all of Maryland's residents.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The Reading Makes Cents program introduces children in Baltimore City to the basic money management concepts ofearning, managing, spending, saving, borrowing, and lending. (2) Attract youth to thetopic of financial management using the history of money as a tool; (3) improve children's attitudes toward reading, and (4) provide opportunities for youth to practice important life and money skills. In 2016, of the 221 third through sixth graders participating in the program:

- 91% of students acquired new knowledge of basic principles of economics
- 95% of students increased their awareness about the importance of basic decision-making, such as making appropriate choices, deciding between needs and wants
- 90% of students agreed that they can make better decisions about spending money

The Inmates/Ex-Offenders Small Business Program in Baltimore City teaches financial management skills to inmates and motivates inmates to become entrepreneurs after incarceration. Ultimately, the expected outcomes are that inmates will become ex-offenders who become business owners and job creators and/or small business owners as opposed to job seekers.
2016 Outcomes: Baltimore City Adult Inmates (N=23)

- 98 % of inmates indicated that they acquired new knowledge in business such as using Microsoft Excel to derive total cost (fix and variable cost), revenue, total revenue, profit, and total profit for their small business.
- 95% of inmates indicated that they would start a small business after jail.

- 2% indicated that they would go back to school after incarceration to become community business teachers.
- 90% recommend this program to all inmates to help reduce recidivism.

2016 Outcomes: Carroll County Juveniles Inmates, Silver Oak Academy, Keymar Career Choice and Financial Management (N=32)

- 92% acquired new knowledge of basic principles of economics and Career choice
- 90% increased knowledge on basic decision-making - such as making appropriate career choices, deciding between needs, wants, and opportunity cost
- 91% increased knowledge about earning income, spending, and saving to invest

The Financial Literacy Team offered three workshops in 2016 using the Your Money, Your Goals toolkit by the CFPB. The workshops were offered in the western cluster, central Maryland,and the eastern shore. There were 40 total participants with 16 participating in the training in the western cluster. The survey results of the western cluster indicate 95% of the participants agreed or strongly agreed that they were satisfied and learned a lot from the workshop. On a scale of 1 to 5, there was a mean increase of 1.2 (3.45 pre, 4.65 post) in knowledge from the pre- and post-assessment.

The Financial Nuggets program is designed to introduce children to basic money management concepts, such as saving, earning,spending, managing, borrowing and lending, investing, and protecting. Middle-school students in Prince George's County (n=21) participated in six-series program and two field trips. The field trips were a trip to the Maryland State House to speak with the Comptroller and to the BB&T Bank, which provided $25 to the students to open a bank account. Participating youth demonstrated an increase in confidence as well as gained knowledge and skills in all content areas.Results in terms of student outcomes are as follows:

- 61.9% (n = 13) will definitely consider needs and wants before making purchasing decisions.
- 66.6% (n = 14) definitely better understand important financial terms.
- 57.14% (n = 12) definitely can apply financial literacy vocabulary.
- 100% (n = 21) definitely better understand how education and career choice affects income and other spending decisions.
- 90.5% (n = 19) can definitely distinguish between a dream and goal.
- 85.7% (n = 18) can definitely write a SMART goal.
- 42.8% (n = 9) definitely understand how to calculate credit card interest.
- 100% (n = 21) definitely understand the effects of borrowing.
- 66.6% (n = 14) definitely plan to invest money, in addition to saving.
- 47.6% (n = 10) definitely better understand the basics of investing.
- 66.6% (n = 14) definitely plan to protect and preserve their money.
- 52.4% (n = 11) definitely better understand the importance of insurance.

In addition, 47.6% opened a bank account.

The Grow It, Eat It, Preserve It program in Baltimore County had both a pre/post-survey at the time of the program and an optional six-month follow up survey for participants to enroll in at the time of the workshop. Post-workshop, 50 pre/post surveys were completed out of 56 initial adult respondents. The majority were female (90%),identified as White, Caucasian, Non-Hispanic (66%), between the ages of 45-64 (52%), and in a household making $75,000 or more (N=54%). Most (44.9%) participants did not preserve any produce in the past year, and for the majority (92%), this was their first food preservation workshop

in the past 12 months. There was a statistically significant difference in respondents' confidence to operate a water bath ($p<0.05$) and pressure canner ($p<0.001$). The social norms of using family recipes (that may not be food safe) and participants' intent to use the University of Maryland Extension educators and laboratory-tested recipes significantly (statistically) improved ($p<0.05$).

Key Items of Evaluation

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
134	Outdoor Recreation	0%	5%	0%	0%
402	Engineering Systems and Equipment	0%	30%	0%	0%
806	Youth Development	100%	65%	0%	0%
	Total	100%	100%	0%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	17.0	0.0	0.0	0.0
Actual Paid	31.0	1.0	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**
447583	178286	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
447583	178286	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Continued development and delivery of Agsploration program (named a signature program of UME)
- Continued development and delivery of Teen Corps (adopted as a national 4-H curriculum)
- Conducted 4-H community clubs focusing on activities that support youth learning science and technology, healthy living, and citizenship
- Conducted 4-H school enrichment programs
- Conducted 4-H Operation Military Kids programs to youth throughout the world
- Conducted 4-H Camping programs that promote safety, inclusion, skill-building, decision-making, and responsibility
- Provided youth leadership and development opportunities through state and county fairs
- Provided high-quality STEM enrichment through exploring, learning, practicing, and experiencing activities
- Engaged youth in 4-H Robotics Challenge programs
- Recruited and trained volunteers to become club leaders and/or project leaders.
- Offered Adventures in Science programs, the National Science Day, and other science-related workshops and programs
- Offered 4-H Health Science Adventures summer programs at local hospital and 4-H Health Science Club.
- Offered health and nutrition activities and programs that promote healthy living.
- Offered hands-on, experiential environmental activities and programs that teach about soils, water, composting, biodiversity, and food production.
- Developed and offered the 4-H Bay Stewards program.
- Offered 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?

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

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	4363	133537	73104	37488

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

Year:	2016
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	1	0	1

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
  Not reporting on this Output for this Annual Report

Output #3

Output Measure

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

Year	Actual
2016	45687

Output #4

Output Measure

- Number of youth engaged in building citizenship skills

Year	Actual
2016	9375

Output #5

Output Measure

- Number of youth involved in healthy lifestyles

Year	Actual
2016	28615

Output #6

Output Measure

- Number of adult 4-H leaders

Year	Actual
2016	4363

Output #7

Output Measure

- Number of youth enrolled through the Health Rocks program

Year	Actual
2016	2000

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

- Youth Participating in Agriculture in the Classroom

Year	Actual
2016	15182

Output #10

Output Measure

- Youth Participating in Family & Consumer Sciences

Year	Actual
2016	7994

Output #11

Output Measure

- Total 4-H Club Membership

Year	Actual
2016	9970

Output #12

Output Measure

- Total Youth Participating in 4-H Camping Programs

Year	Actual
2016	2832

Output #13

Output Measure

- Youth Participating in School Enrichment Programs

Year	Actual
2016	26216

Output #14

Output Measure

- Youth Participating in Individual Study/Mentoring/Family Learning Programs

Year	Actual
2016	119

Output #15

Output Measure

- Youth Participating in After-School Programs Using 4-H Curricula/Staff Training

Year	Actual
2016	2826

Output #16

Output Measure

- Total Youth Volunteers

Year	Actual
2016	4973

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
2016	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
To address health and nutrition in Baltimore City, UME Educators have youth engaged in healthy living and healthy behaviors curricula. The aim is to engage youth in a safe and engaging environment and to also increase their knowledge about health and nutrition.

Results
Engaging youth about health and nutrition is a first step to encouraging life long attitude about healthy behaviors and lifestyle towards themselves and their communities. A post survey conducted with Baltimore City youth ages 5-13 who participated in a three session class about health and nutrition revealed that 70% of them are excited about health and nutrition.

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
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Like many cities undergoing urban renewal initiatives, it is imperative that Baltimore City Extension, 4-H youth/adult leaders and community stakeholders assess community assets so that a clear strategy toward community revitalization can occur.

What has been done
Teen Corps began as a citywide collaborative between 4-H members and adult leaders, agencies, and community stakeholders who partner to strengthen communities and increase leadership opportunities for youth from 12 to 18 years old. A core element of the Teen Corps is a monthly meeting that brings 4-H youth/adult leaders representing several after school programs across the city together in one location. They receive facilitation training on various youth development topics, and then demonstrate those skills.

Results
Twenty-two of the youth and adults representing six 4-H clubs citywide completed Teen Corps training in leadership, workforce readiness/entrepreneurship, environmental science (STEM), and service-learning. They delivered training in these subject areas to 370 club members and 1,000 community members to implement sustainable initiatives. Teen Corps members assisted with 4-H marketing and outreach (awareness, club and volunteer membership expansion), and formed a committee to support the planning and implementation of the Annual Baltimore City 4-H Youth Expo.

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
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There is a continual and growing 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 4-H Animal Husbandry and Quality Assurance Program (AH&QA) is an online program that teaches 4-H youth how to use best practices that assure producing quality and safe animal products for consumers, as well as responsible animal handling, care and welfare in not only farm animal production, but also with companion and performance animals.

Results
In 2015-2016, 11,563 lessons were completed by 8,712 youth. In total, 23,193 lessons have been completed by 16,436 youth since the program was initiated in 2010. Program outcomes include improved knowledge and understanding 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 by Maryland 4-H Members enrolled in and exhibiting in animal projects.

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
2016	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 $21,003 a year. Because of the enormous cost the average American now owes $37,172 when they graduate. The Institute for College Access and Success reports that 56% of Marylanders will leave college with an average of $27,672 in debt. 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
Colleges have competitive agricultural teams, in particular livestock judging, that offer scholarships and a way for gifted livestock students to pay for their college education. 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 2016, five state livestock judging practices were held for over 250 attendees. One state livestock judging contest was held for 140 youth. Four youth participated on the Maryland state livestock judging team that competed at the national 4-H contest. Maryland ranked 5th nationally out of 32 teams and had 2 of the top 20 individuals. These two youth were named All-Americans. 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 10 years 19 students have accepted such scholarships totaling in excess of $120,864. 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

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Numerous careers are connected to agriculture and offer opportunities far beyond most youth's concept of farming.

What has been done
The UME AGsploration program is in its sixth year of development and implementation. The curriculum and associated learning activities incorporate hands-on experiential learning to help participants learn about science and agriculture. The program strives to increase the number of youth pursuing post-secondary degrees and careers in agriculture and other science-related fields.

Results
In 2016, 127 people from 31 states accessed the AGsploration curriculum online. In Maryland, lessons were taught this year to 3,666 program participants. The team also held two trainings that prepared 58 people to become curriculum teachers. The curriculum was also featured at the National 4-H Agri-science Summit where 52 participants were trained as teachers. Post-surveys of students indicated that participants gained knowledge related to the agriculture topics covered; 25% of participants indicated an interest in pursuing a degree or occupation in agriculture science or related fields.

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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
According to the U.S. Census Bureau, Maryland is the fifth most densely populated state. As the population grows and urbanizes, it places increased strain on the environment. There is a need to help residents understand ecological concepts and learn to reduce negative environmental impact.

What has been done
Chesapeake Bay themed environmental school enrichment programs in Talbot County focus on the Choptank River, a tributary of the Chesapeake Bay. During the past four years (and now extended for a fifth year until July 2017), 4-H educators have worked to provide environmental education to youth in the Mid-Shore counties. Topics vary, but water quality has been heavily emphasized. Teaching venues have included 4-H clubs, community events, in-school enrichment, after-school programs, summer programs, and fairs/shows.

Results
From 2012 through 2016, more than 375 students participated in 4-H Chesapeake Bay-themed environmental school enrichment programs as part of an annual Bay Days program. Surveys in 2016 of student participants indicated that 85% were more interested in science as a result of the program; 75% were more interested in pursuing a career in science.

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
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

The Maryland 4-H program conducted an 18-month reorganization plan and identified six priority needs. These six youth related priority needs drive the focus of our work. They include: Building Community & Civic Engagement, Developing Leadership Skills for Life, Nurturing Social Empowerment & Resilience, Improving College & Workforce Readiness, Fostering Exploration & Creativity in Arts & Sciences, and Promoting Healthy Lifestyles & Self Acceptance.
To identify goals and actions to achieve the Maryland 4-H Program mission, vision, and core program components, we have:

- **Three Focus Teams**: 4-H Club Enhancement, Development of the 4-H Practitioner, Short Term 4-H Experiences (Outreach)
- **Four Task Force**s: Awards & Recognition, Inclusivity & Diversity, Marketing, and Research & Evaluation
- **Five Subject Matter Committees**: Engineering & Technology, Animal Sciences, Citizenship & Leadership (Workforce/College Readiness and Entrepreneurship), Environmental Science & Camping, and Healthy Living
- Various revolving **affiliate committees** to support these efforts.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Twenty different camping programs conducted on-site evaluations of their campers for the UME camping research project. A total of 766 8-13 year-olds completed the camp environment questionnaire, while 859 youth ages 8-19 participated in the life skills survey throughout the state. For the camp environment survey, 55% were female and 42% were male. In addition, 80% were white, 7% were Black or African American, 2% Asian, 1% Alaska Native/American Indian and 6% identified as other. For the life skills assessment, 61% were female and 37% were male. In addition, 80% were white, 9% were Black or African American, 3% Asian, 1% Alaska Native/American Indian and 5% identified as other.
In review of the data from the camp environment survey, the following data was compiled from across the state:

- 92% agreed or strongly agreed that they felt safe at camp
- 94% agreed or strongly agreed that they felt good about their accomplishments

- 86% agreed or strongly agreed that they improved skills in some activities
- 90% agreed or strongly agreed that they felt accepted by other campers
- 85% agreed or strongly agreed that they felt free to express their opinions
- 86% agreed or strongly agreed that they felt that they learned useful things for the future

In review of the life skills survey, the following data was collected from across the state:

- 97% of respondents agreed or strongly agreed that they respected others different from themselves
- 98% agreed or strongly agreed that they respected others while at camp
- 96% agreed or strongly agreed that they accepted people thinking and acting differently
- 97% agreed or strongly agreed that they were responsible for their own behavior
- 97% agreed or strongly agreed that they tried to do what was expected of them
- 94% agreed or strongly agreed that they were proud of the projects that they completed
- 94% agreed or strongly agreed that they encouraged others to do their best
- 97% agreed or strongly agrees that they made new friends at camp
- 92% agreed or strongly agreed that they thought carefully about making decisions

Twenty-two of the youth and adults representing six 4-H clubs citywide completed Baltimore City Teen Corps training in leadership, workforce readiness/entrepreneurship, environmental science (STEM), and service-learning (private value). They delivered training in these subject areas to 370 club members and 1,000 community members to implement sustainable initiatives (public value). Teen Corps members assisted with 4-H marketing and outreach (awareness, club and volunteer membership expansion), and formed a committee to support the planning and implementation of the Annual Baltimore City 4-H Youth Expo.
Outcome Data:

- 95% can describe Teen Corps to someone who has not heard of it before.
- 100% can explain their role in Teen Corps and why it is important to them.
- 97% can state three goals they have for themselves as a member of Teen Corps.
- 98% can describe community service and service-learning, and explain how the two concepts are similar and different.
- 100% can explain the importance of service-learning and community building activities.
- 97% Youth can apply knowledge in ways that solve "real-life problems" through community service.
- 89%Youth have the confidence to speak in front of groups.
- 85%Youth can teach others about science.
- 80%Youth believe that science is useful for solving everyday problems.

In 2016, 127 individuals accessed the 4-H AGsploration curriculum in 31 states. In Maryland, 146 AGsploration lessons were taught to 6,138 program participants and two trainings were held to certify 63 new curriculum teachers. The curriculum was also highlighted at the the National Association of Extension 4-H Educators and the National 4-H Agri-science Summit where 71 participants were trained as teachers. The Agsploration program was named as one of the first three "signature"programs for UME.
On pre/post tests of students all indicated gaining more knowledge in the topics covered on agriculture and one in four participants indicated wanting to purse a degree or

occupation in agriculture science. 100% of trained teachers on a followup survey indicated the program increased their agricultural knowledge and that the AGsploration curriculum was an effective tool to incorporate science into the 4-H learning experience. 94% reported they were more ready to teach about agriculture because of the program. Trained teen teachers were also surveyed after 3 years of being involved with the program. 85% of them indicated that their participation in AGsploration developed their teaching ability, and confidence in teaching agriculture. 77% also indicated the program helped develop planning and organization skills. An additional 62% reported developing agriculture content knowledge and leadership skills. Of the group, 62% major in agriculture and 73% now have a job in the agriculture industry. Therefore the AGsploration program has increased the knowledge and appreciation of agriculture in Maryland and created a network of trained individuals to more effectively continue the educational cycle.

From 2012 through 2016, more than 375 students participated in 4-H Chesapeake Bay-themed environmental school enrichment programs as part of an annual Bay Days program. Surveys in 2016 of student participants indicated that 85% were more interested in science as a result of the program; 75% were more interested in pursuing a career in science.
A total of 173 students participated in extended-duration water quality educational experiences as part of a 4-H Eco-Stewardship program that included collaborative programs with University of Maryland Eastern Shore. Students learned to properly use water quality sampling equipment and measure physical water quality indicators including temperature, pH, dissolved oxygen, salinity, nitrate, phosphate, turbidity, and coliform bacteria. They also learned to identify aquatic macroinvertebrates as bioindicators of stream health and explored common best management practices.
A total of 65 teens learned to collect stream sediment samples using the Maryland Department of Natural Resources (DNR) Stream Waders program protocol. (DNR biologists collect sediment samples from Maryland streams and identify macroinvertebrate species as bioindicators of water quality.) Participants collected samples that were sent to DNR for analysis and thereby contributed to Stream Waders Program data collection. From 2013 through 2016, students from numerous public school classes and learned about sampling and bioanalysis and learned about the work of water quality scientists.
Short-term educational outreach activities have reached a total of more than 2,205 youth and adults. The overall goal of 4-H educational outreach is to help Maryland residents become more environmentally literate, better understand Chesapeake Bay watershed ecology, learn techniques for improving water quality, and become environmental stewards. Talbot 4-H educational programs are helping to accomplish this goal.

Based on two years of data, 87% of teens participating in the Career Education for Talbot County High School Students program and surveyed by 4-H said the program has helped them develop a better understanding of career options and educational opportunities they have after high school. In addition, 85% of participants surveyed said the program has made them more interested in a specific career.
Although the program focuses on longer-term goals such as post-secondary education, some immediate results also are evident. During the meetings with career representatives, teens have an opportunity to go through an official interview process with local businesses. Many of them are hired to work in local businesses during the remainder of their high school years. Being hired for local jobs provides an immediate positive financial outcome for Talbot teens. Therefore, Talbot 4-H is directly contributing to career education in STEM and other fields, introduction to community college programs, and making connections between teens and local employment opportunities. We hope to continue expansion of 4-

H's involvement in the program in future years.

The Adventures in Science 4-H program in Montgomery County achievements in 2016 were:

- The Flying Tigers club participated and demonstrated hands on activities on Robotics, SUGO Robots at the Rockville Science Day, Robot fest at National Electronics Museum, 4-H STEM fair program, reaching about 350 youth. Approximately, 15 youth members participated in the state and national contest and the FLL challenge events.
- The Gear Box 4-H Club participated and taught scientific activities at the Silver Spring Maker Fair, Robotic Vision Tutorial, First Tech Challenge tournaments, engineering training for high school and National Youth Science Day reaching approximately 340 youth and families.
- The Inventor Club participated in science shows and conducted hands on activities at the Montgomery County Fair, Silver Spring Makers Fair, and Rockville Science day with more than 500 viewers.

Since 2010 the Wicomico County 4-H Robotics program has grown and maintained new 4-H members and volunteers. Since 2010 Wicomico County 4-H has delivered over 250 hours of dedicated instruction directly related to robotics and engineering to over 2,300 participants both youth and adults. Wicomico County has experienced the following:

- 27% membership increase.
- 38% volunteer increase.
- 27% club growth increase.
- Reached 450 youth through outreach efforts during out of school time efforts.
- Local club awarded first place in the Robotic Competition and Awarded Overall Champions during the Regional First LEGO League (FLL) Robotics Qualifying Competition.

4-H youth participating in robotics clubs/programs have an increased interest (awareness, attitudes, understanding, and aspirations) in 4-H Science and improved related knowledge, skills, and abilities for use in their lives and future careers. Giving Maryland residents an environment for innovation in science related fields such as robotics creates awareness to new and emerging educational fields and will lead to future growth for local businesses and the economy.

In 2016, there were 854 youth enrolled in traditional 4-H programming in Carroll County with 445 trained UME volunteers to work within the program. Utilizing the volunteers to their fullest ability throughout the year over 70 programs took place including livestock projects, camps, day programs, judging and bowl practices, tractor certification, fashion revue, public speaking, demonstration day plus much more. Many of these activities include volunteers meeting weekly with 4-H members to educator and develop their skills within their project areas. In 2016, 26,700 hours were donated by UME volunteers to Carroll County 4-H, along with many of these hours to volunteers who volunteer on a state level with Maryland 4-H. Carroll County volunteers have brought an additional $711,288 to the county with an average of 5 hours per month given to the 4-H program. The success in the 4-H volunteer is proven by the years volunteers have been involved in the 4-H program and the impact they have on the members they are working with.

An intentional and targeted approach to providing high quality STEM educational experiences to youth in Allegany County is needed improve their college-readiness and support Maryland's priority need of growing a science-ready workforce. A series of

robotics lessons was developed to introduce elementary-aged youth to computer science and engineering fundamentals using highly engaging LEGO WeDo robotics kits.In 2016, 224 robotics lessons were taught to 660 youth in both in-school and out-of-school settings. Participants surveyed reported the following outcomes:

- 87% want to learn more about science (n=458)
- 59% would like to have a job related to science (n=458)
- 97% can change what a robot does by changing its program (n=376)
- 84% would like to learn more about programming and robots in the future (n=458)

Although the target audience was elementary-aged youth, their interests in STEM coupled with their ability to successfully manipulate a program to change a robot's function show promise for developing a future science ready workforce. Giving youth an early start in STEM subjects creates the foundational skills and competencies needed to succeed in challenging college coursework and competitive STEM occupations.

To date, 1,477 adults and youth have been through the AgVenture program. Paired sample t-tests show an statistically significant increase in agriculture knowledge. Feedback from teachers, students and parents show that enthusiasm for the program and that it creates a healthy interest in STEM. This has led to increased partnership within the community and the number of donations for community businesses, farmers, and ag-based organizations has grown. Further, the program has no fee so that all students can attend and benefit without having the barrier of payment. This means that for Marylanders, they become exposed to the extension service, get quality education for thier children and interest in agriculture and STEM grows.

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.