2016 West Virginia University and West Virginia State University Combined Research and Extension Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

This report is the combined 2016 Annual Report of Accomplishments for three entities: West Virginia University Agriculture and Forestry Experiment Station (WVU-AFES) which is part of the Davis College of Agriculture, Natural Resources and Design; West Virginia University Extension (WVUES); and, the West Virginia State University (WVSU) Gus R. Douglass Land Grant Institute (WVSU-GRDI) which includes both Research and Extension programs. This report is based on the joint plan of work for the period 2015 - 2019 and includes ten goal areas. Last year (reporting period 2015) was the first year we submitted a joint annual report of accomplishments. We will work in the future to increase coordination and reduce duplication of effort in each of the ten program areas.

The WVU-AFES supports approximately 44 FTE research faculty positions distributed across the 104 faculty positions. The Station also supports approximately 25 FTE technical positions, 35 clerical and farm/forest worker positions and 40 professional support positions (mostly graduate students). The Experiment Station operates seven farms and two forests which support faculty research. Four of the farms (Animal and Nutritional Sciences farms in Morgantown and Reedsville, Horticultural and Agronomy farms in Morgantown) and the University Forest are sufficiently close to the University campus to be used extensively to support academic programs in addition to research. Outlying farms include the Reymann Memorial Farm (beef, sheep, aquaculture, agronomic crops and bull testing station) and Kearneysville Tree Fruit Research Farm (primarily apples and peaches) in northeastern West Virginia; the Willow Bend Farm in the southeast (pasture raised and finished beef); and the Tygart Valley Forest (mostly oak regeneration and disease control research).

The West Virginia Agriculture and Forestry Experiment Station is part of the Davis College of Agriculture, Natural Resources and Design. While the West Virginia Cooperative Extension Service is a separate administrative unit and not part of the College, research and extension are integrated through joint appointments (nine of 104 faculty in the Davis College have partial extension appointments), through coordination of activities and planning at the deans, directors and associate-directors levels, through integrated research, extension and education projects and programs funded by Hatch, Smith-Lever and McIntire-Stennis formula funds and through competitive funding from NIFA and other sources.

The Davis College has three schools, the School of Agriculture and Food (Plant and Soil Sciences and Animal and Nutritional Sciences); the School of Design and Community Development (Design and Merchandizing, Landscape Architecture and Agricultural and Extension Education); and, the School of Natural Resources (Forestry and Natural Resources and the Agricultural and Resource Economics program. Four centers and one organizational unit exist within the College to help focus and direct our efforts on economic development, natural resources and the environment. They also contribute to our ability to leverage Hatch and McIntire-Stennis capacity funding by attracting external competitive grants and other external sources of funding. The four centers are the Natural Resource Analysis Center (NRAC), the Institute for Water Security and Science (IWSS), the National Geospatial Development Center (NGDC) and the Appalachian Hardwood Center (AHC). The organizational unit is the West Virginia Cooperative Fish and Wildlife Unit.

The regular WVUES workforce of 465 county agents, state specialists, and staff is augmented by an additional 1,200 seasonal employees who help deliver our large, statewide summer learning programs. More than 18,000 well-trained volunteers also help design, deliver, evaluate, and improve Extension programs each year. Employees of numerous longtime program partners, such as Regional Education Service Agencies (RESA) of the West Virginia Department of Education, West Virginia Department of Agriculture, county school professionals, West Virginia Department of Health and Human Resources, and WVU Health Sciences, help in this regard as well. Many identify with WVU Extension through our educational programs. Some of the most recognized programs are 4-H, Dining with Diabetes, Extension Master Gardeners, Firefighter Training, Community Educational Outreach Service (CEOS), Family Nutrition Program, Energy Express, Soil Testing, Workplace Safety, Pesticide Recertification Training, Character Education, Beef Quality Assurance, Farm Management, Forest Stewardship, and Community Leadership Development. The University's strategic plan specifically mentions the work and contribution of the Extension Service, "Expand outreach efforts to connect the campuses to citizens and communities throughout the state. Provide resources and information to equip WVUES county agents, and other personnel engaged in outreach and care, for a broader role as ambassadors for the institution."

WVUES continues to play a major role in reaching these goals and objectives by implementing relevant programs linked to the National Institute of Food and Agriculture's five priority areas childhood obesity, global food security and hunger, climate change, food safety, and sustainable energy. Programs also are implemented in youth development, workforce and community development, and family finance and relationships.

Agriculture and Natural Resources: Agents and specialists work with farmers, landowners, and communities to support local agriculture and encourage wise use of natural resources. We are committed to helping small family farmers find ways to increase their profits. As the trusted local source for answers to home and garden questions, Extension is committed to ensuring a safe food supply and working with rural landowners to develop alternative enterprises. Included in this division are the planned program areas of global food security and hunger; sustainable energy; climate change, environmental quality and stewardship; production/sustainable and forestry. In 2016, WVUES agriculture and natural resource programs tallied 216,361 direct contacts.

4-H Youth Development: Positive youth development is achieved by weaving essential elements into 4-H programs that promote independence, generosity, and mastery of new skills. The three primary educational areas of emphasis are healthy lifestyles; science, technology, engineering, and math (STEM); and citizenship. Our literacy programs strengthen children's reading skills and promote the benefits of adults and children reading together. In 2016, 4-H youth development programs at WVUES tallied 388,158 direct contacts.

Families and Health: Extension faculty and paraprofessionals help families thrive by providing research-based knowledge, skills, and resources for healthier lifestyle choices. Nutrition and health education programs teach individuals and families ways to improve their diets and to engage in regular physical activity. Family programs include resource management, relationship education, parenting, and early childhood development. Faculty members work with adults to build leadership and interpersonal skills. In 2016, family and health programs tallied 312,925 direct contacts.

Community Economic and Workforce Development: WVUES promotes collaborative community projects and builds the capacities of local businesses, governments, and unions by delivering programs that build local leadership capacity, expand and attract employment, improve retail opportunities, provide information and recommendations on downtown revitalization and tourism, and expand understanding of cultural and economic diversity. In 2016, WVUES community development programs tallied 73,937 direct contacts.

WVU Extension and its educational programs tallied 1,028,858 direct contacts in 2016, including both youths and adults. Please note that Extension participants attend multiple sessions, therefore, this number is not the number of individuals who have attended programs.
WVSU's Gus R. Douglass Land Grant Institute currently supports 38 FTE positions across research and extension. Research and extension efforts continue to expand and integrate programs. As the University builds infrastructure and capacity, and is able to secure additional funding sources, existing research and extension programs are further strengthened and new programming is being developed to better serve the needs of stakeholders.

Aligning WVSU research and extension programs within NIFA's priority areas has proven beneficial, by providing an opportunity to determine where programs complement each other; as well as, where there are opportunities to build greater collaboration and identify pathways for new integrated efforts. The Masters of Science in Biotechnology program, within the WVSU College of Natural Sciences and Mathematics, continues to benefit from the development and maturation of research programs. Split appointments of graduate research faculty within GRDI have permitted the increased participation of undergraduate and graduate students in agricultural and environmental research.

WVSU continues to undergo organizational restructuring due to changes in University administration, programming needs, and decreasing federal and state appropriations. Despite this organizational evolution, the mission of the Institute continues to be one of delivering educational and life-long learning opportunities by conducting research, teaching and outreach services to improve the well-being of West Virginia citizens (particularly those traditionally under-served). Federal support continues to be a key success factor for the Institute. As additional state appropriations and other resources continue to be attained, the University carries on efforts to strengthen and extend its research and extension programming capacity and programs.

Federal support continues to be a key success factor for the WVSU-GRDI. As additional state appropriations and other resources continue to be attained, the University carries on efforts to strengthen and extend its research and extension programming capacity and programs The following report provides details of the programs supported by Evans-Allen, Section 1444 Program and McIntire-Stennis formula funds appropriated to 1890 Institutions and matching funds provided by the State of West Virginia.

As in the past, research programs of the WVU Agricultural and Forestry Experiment Station are coordinated with and supported by research programs at WVSU and by educational and outreach programs of both West Virginia State and West Virginia University Extension. Supporting research at West Virginia State includes; genetic mapping for pest and disease resistance, as well as value-added traits in melon, watermelon, squash, pumpkin, tomatoes and peppers, and field trials of many vegetables and cut flowers; diet formulation in aquaculture; improving operation of poultry waste digesters and develop novel techniques for soil remediation on reclaimed mine lands.

West Virginia University and West Virginia State University entered into a voluntary agreement in 1997 to create the West Virginia Association of Land Grant Institutions; a collaboration of the state's two land grant institutions committed to providing education that would help the citizens of West Virginia improve their lives and communities. In 2005, triggered by an USDA CSREES mandate, the two Universities developed a Comprehensive Plan for the State which superseded the former agreement. This plan assures appropriate coordination between the two institutions to avoid duplication of efforts, as it relates to their research and extension programming, and thus an efficient investment of human and financial resources within the State.

The combined extension efforts of both Universities are addressing the most common problems facing families and communities in West Virginia which includes, a decreasing and aging population; a largely rural population with limited access to health and nutritional information and a consequent tendency

towards poorly balanced, calorie dense diets; and an extreme need for environmentally friendly and sustainable economic development which will provide jobs to replace the many which have been lost in coal and timber harvesting industries.

This combined five year Plan of Work has ten program areas:

- Global Food Security and Hunger: Production/Sustainable Agriculture
- Climate Change and Environmental Quality
- Sustainable Energy
- Childhood Obesity, Nutrition, and Health
- Food Safety
- Community, Economic and Workforce Development
- Production/Sustainable Forestry
- Fundamental Plant and Animal Systems
- Strengthening Families
- Youth Development

Progress for 2016 in each of these goal areas is summarized in the Planned Programs section.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	173.0	25.0	42.0	12.5
Actual	142.0	25.0	47.0	13.0

II. Merit Review Process

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

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

2. Brief Explanation

Internal merit review

Internal merit review at WVUES was done in the following way:

1. Each Extension faculty member developed an individual plan and each program area team developed a plan of work. These plans are approved by the unit directors (agriculture and natural resources, 4-H youth development, families and health, and community economic workforce development). Faculty based their plans on objectives designed to meet the goals of WVU's planned programs.

2. Each unit director reviews the data collected through the reporting system. The evaluation specialist writes a summary of the data collected, as well as outcome reports which are used to report to NIFA/USDA. This year, we began collecting output and some outcome data through Digital

Measures. Digital Measure is being adopted university-wide at WVU. We have examined the databases used by other Extension units and adapted the university system to meet Extension's unique needs. The result was a significant increase in the total number of contacts. We believe that this year's numbers better reflect our work.

3. All Extension specialists and county agents are appointed as faculty at West Virginia University. As such, they undergo the same faculty reviews as other university faculty and are promoted under the same protocol. In December of each year, every Extension faculty member submits a faculty file which contains productivity charts and accomplishment narratives related to teaching, service, and research. Depending on the years of service and whether the person is applying for promotion, the files are evaluated by their peers in their unit, their program unit director, an Extension-wide committee, and the WVU Provost (for promotion years only).

4. Administrative reviews are done periodically. All administrators in WVU Extension were reviewed by Extension staff and faculty in 2013 and have been counseled with regard to evaluations.

5. In 2015, the administration of the WVU Extension Service conducted four "Listening Session" with faculty and staff and these listening sessions are being conducted in 2017. At these listening sessions, Steve Bonanno and other administrators informed faculty and staff about upcoming events and issues related to Extension. Faculty and staff were allowed to ask questions and express their opinions to administrators.

External merit review

1. Evaluations done by individual programmatic teams often serve as merit reviews for WVU Extension. Findings from the evaluation are used to improve current programming and help Extension educators plan new programming.

2. Programs at WVU Extension, as well as individual Extension educators, continue to win awards for their excellent programming. WVU Extension programs are recognized by regional and national organized as providers of quality educational opportunities. WVU Extension professionals won the following awards in 2016:

From the National Association of Extension 4-H Agents, Northeast Division
- Meritorious Service Award - Brenda Pruett
- Distinguished Service Award - Alicia Cassels and Rhonda Coleman
- Achievement in Service Awards - Donald Reed and Sherry Swint
- Specialty Awards - Citizenship in Youth Development - the Youth Leadership Regional Meetings team
- Diversity and Inclusion: Expanding the 4-H Audience - the WVU ES Global Citizenship Curriculum team

From the National Extension Association of Family and Consumer Sciences
- Distinguished Service Award - Sue Flanagan
- Continued Excellence Award - Patricia Morrison
- Dean Don Felker Financial Management Ward (2nd Place Eastern Region Award) - the Smart Money Series team
- Family Health and Wellness Award (1st Place Eastern Region Award) -- the Health Motivator Initiative team
- Excellence in 4-H Volunteerism - the Regional Volunteer Camp Staff Training Team
- Excellence in Camping - Individual - Donald Reed for the McDowell County 4-H Teen Camp
- Excellence in Global Citizenship Programming - the 4-H Ireland Learning Adventure Team
- Excellence in Healthy Living Programming - the Stop Spit Tobacco Curriculum Team
- Search for Excellence in Teen Programming - the Youth in Action: Creation of a 4-H Heritage Quilt Trail
- Educational Package - Individual - Amanda Johnson

- o Periodical Publication - Ohio County Extension Newsletter
- o Education Piece - West Virginia State 4-H "Welcome to 4-H" Packet
- o Promotional Piece - Individual - Amanda Johnson -- 4-H National, State, and County Event Fact Sheets
- o Published Photo - Donald Reed - 4-H Clue Mystery Dinner Group Photo

Scientific Merit and Peer Review at WVY-AFES
A scientific merit and peer review process is used for all Hatch, McIntire Stennis and Animal and Health and Disease Act research projects. Projects are reviewed internally by individuals with expertise in the fields of science addressed in each proposal are selected by the Division Director, Experiment Station Director or designee and asked to judge technical merit, likelihood of achieving stated objectives, and potential impacts for each proposed project. A minimum of three peer scientists (i.e., individuals qualified by their status in the same discipline, or a closely related field of science), are asked to read and provide written comments on the proposed activities. The terms of reference for the reviewers focus on questions of the quality of the proposed science, technical feasibility of the research, the validity of the scientific approach, and likelihood for completing the stated objectives. Additional comments may be requested on a project's relevance to the station's priorities, the degree of integration with extension (as appropriate), responsiveness to stakeholder needs, and the accuracy of any claims for multi-disciplinary and multi-state collaboration. Reviewers are asked to present their findings in writing, and records of the reviewers' comments are preserved for the life of the project, or for a period of three years in the event that a project is not initiated. Competitively awarded grants requiring peer review or contract research requiring grantor approval are exempt from this process. Programs of research are reviewed annually by the Station visiting committee and every five years through a College level strategic planning process.

Internal and External Review at WVSU:
All projects funded by Evans-Allen (and associated state match) are submitted to an external panel for peer review. Reviewers for the proposals are selected nationally and include prominent scientists in the relevant field of study. Reviewers provide feedback on the projects and suggestions for improvement which must be incorporated prior to program submission to NIFA. 1890 Extension funds (and associated state match) are typically used to enhance, expand, or otherwise complement funds that have been successfully obtained through a competitive grant process and as such, the associated projects have been approved by and deemed relevant and appropriate by the funding agency. All external grant submission for both Research and Extension must complete an internal review process prior to submission. All employees of Research and Extension (professional staff, clerical staff, administrators, etc.) are subject to an annual performance evaluations.

III. Stakeholder Input

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

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Survey of selected individuals from the general public

Brief explanation.

At special events where the public gathers, such as the WVU Day at the Legislature and the West Virginia State Fair, WVU Extension has made an effort to gather post-evaluative information on stakeholders' satisfaction and how they are able to use what they have learned in their everyday lives. We also gather evaluative information at most educational events all year round. This information not only tells us if participants are satisfied, but also whether and how participants have benefited. The results of these evaluative efforts are generally positive, but critical comments are always used to inform program improvement. Faculty members are expected to report on program outcomes in their annual reports. In order to receive ratings of excellent, evaluations must measure changes in learning, action, and conditions.

Our WVU Extension website is viewed favorably. It is consistently updated with news and information about programs and issues of interest around the state. There is an opportunity for stakeholders to comment on Extension's programs available on the site. County offices have websites and some have Facebook pages where stakeholders can comment on activities and give suggestions. This year, our website is being totally revised and will better meet the needs of our constituencies.

Another indication of stakeholder participation is their willingness to give financially to Extension programming. WVUES has benefited from an increase in financial giving over the last year.

WVU-AFES
Much stakeholder input is collected in conjunction with West Virginia University Extension (administratively distinct from the College of Agriculture, Natural Resources and Design) since we share a majority of stakeholders. We discontinued special meetings which had as their sole purpose the gathering of stakeholder input and instead, have more recently relied upon input gathered at meetings with other primary purposes (annual or regular meetings of West Virginia Farm Bureau, West Virginia Forestry Association, West Virginia Grasslands Steering Committee, State Aquaculture Forum, Organic Research Project annual meeting, the West Virginia Farmer's Market Association, etc.) We find the new procedure more efficient and to represent a larger and more diverse segment of our stakeholders. Input also originates from various advisory groups associated with specific interest areas within College Divisions (e.g., Organic Research Project Steering Committee within the Division of Plant and Soil Sciences; Appalachian Hardwood Council; Advisory Board in the Division of Forestry and Natural Resources, etc.) as well as from advisory groups established at the College/Station level (Davis College Visiting Committee).

WVSU
Stakeholder input is collected on a continual basis for both Research and Extension. Stakeholders are engaged and feedback sought informally in community meetings, at public events, during WVSU Day at the Legislature, at the state fair, and in more formal advisory committee meetings which are convened quarterly. WVSU Extension professionals work very closely with local stakeholders to ensure impactful relevant program is being delivered to the communities of WV.

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.

Each of our counties have county advisory committees that meet regularly and advise county faculty on issues and needs of that county. In addition, unit directors and other administrators meet from time to time with these groups. During hiring of county agents, county advisory committees have direct input into the hiring process. Administrators also meet regularly with major stakeholder groups such as the WV Farm Bureau and Community Education Outreach Service (CEOS) constituencies.

One of the associate deans focuses on programming and research. Another, the associate dean for partnerships and initiatives, leads our efforts to increase collaborations with state agencies and organizations. She will help bridge the gap with other WVU colleges and departments. She is also playing a key role in WVU's Mountain State University initiative in Beckley. She will work with our agents and specialists to build and cultivate relationships on a local, county, state, and national level. In 2016, a new Director of Development was hired.

<u>WVU-AFES</u>
The focus of the Service/Outreach agenda for the College is to continue to enhance our communication and working relationship with our Extension partners, commodity and industry groups, state agencies and community organizations that represent our College disciplines within the State of West Virginia. The impact of these efforts by the College will continue to enhance our relationship with our academic partners and stakeholders and make our programs more relevant to needs of the State and be consistent with Goal 5 of the West Virginia University's 2020 Strategic Plan- "to enhance the well-being and the quality of life of the people of West Virginia. We truly believe that our success as a land grant College/Institution will be measured by how well we serve the citizens of West Virginia, then the nation and the world. Based on the initial strategies identified in 2010 to improve our Service and Outreach agenda, we have had good success in implementing these strategies and have realized some strong positive impacts for an improved image of the College within the University and our Service and Outreach agenda within the State and region.

<u>WVSU</u>
-Individuals are selected for stakeholder feedback who are:
- Community leaders
- Program partners
- Program recipients
- Collaborators
- Research and extension professionals at other Universities
- Local business/industry

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)
- Meeting specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public
- Survey of selected individuals from the general public

Brief explanation.

Meeting with traditional Stakeholder groups

Representatives of WVUES, most especially the Director, Steve Bonanno, meet with legislators and heads of stakeholder groups to learn how Extension can serve the state and meet the needs of stakeholders. We coordinate WVU Day at the Legislature each year.

Our new Development Director, works to not only raise funds, but also to understand what alumni and stakeholder groups want Extension to do to extend outreach throughout the State.

The WVU President, Gordon Gee travels the State and tours Extension county offices. He has met with stakeholders of Extension as well as other outreach initiatives of the university. His feedback has helped Extension strengthen its programs.

Survey of traditional Stakeholder groups

Most coordinators of Extension activities conduct surveys of participants in order to understand their needs with regard to Extension programming. Those surveys are studied by teams of agents and specialist in each program area to determine how to improve programming and/or create new programs. The Evaluation Specialist, Allison Nichols, works with those teams to create appropriate evaluation protocols.

WVU-AFES

Surveys are distributed at annual meetings for numerous organizations having interest in College program areas (related to agriculture, forestry, landscape architecture, interior design, human nutrition, etc.) to provide input. Division Directors, College faculty and advisory groups are queried regularly and routinely to identify industries, groups or subject matter areas needing representation in the College input stream and for specific individuals to fill these roles. The dean and selected directors meet annually with our Congressional delegation during the APLU meetings and as needed throughout the year. We communicate frequently with our State legislators both locally and in Charleston. We have always had a close relationship with the State Department of Agriculture but have increased our contact by providing permanent office space in our building for the Deputy Commissioner of Agriculture. We hold biannual meetings with our local NRCS office, the State Department of Natural Resources and the State Conservationist to review our research program and to develop joint research and outreach projects that are mutually beneficial.

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 Action Plans

- To Set Priorities

Brief explanation.

In the Budget Process

WVUES administrators carefully consider the needs of stakeholders when making additions or subtractions to the budget. In the past, a priority has been placed upon expanding and enhancing the role of Extension at the county level. This continues to be a priority. Most recently, there have been threats to funding at the county level. WVUES administrators have worked hard to convince county leaders of the importance of Extension. Recently about 80 Extension faculty attended a Public Value and Evaluation conference in order to learn how to document our public value.

The administrative team members interact with several constituent groups on the state level and participate in professional associations, boards, etc. County-based faculty interact on the local, and sometimes state levels, as well. County Extension Service Committee, mandated by WV State Code, and applies ONLY to WVU Extension, specifies the committee's function to provide program advice.

Identified Emerging Issues and Redirected Extension Programs
The following are emerging issues in West Virginia:

1. Energy, particularly changing sources of energy. Shale gas is making new millionaires and decreasing the cost of energy but also decreasing the price of coal. Loss of coal jobs and severance taxes deepens the poverty in already distressed counties. There are many issues related to drilling for shale gas and the environment. WVUES is providing educational programs to help landowners make decisions based on research.

2. Low workforce participation among eligible adults. Since our unemployment rate is reasonable compared to the nation as a whole that low workforce participation has different implications. One of those is a high rate of substance abuse.

3. High rates of obesity and chronic diseases that result from poor nutrition and lack of exercise.

WVU is addressing these issues in the following ways:

1. The growth and development of the Marcellus shale in West Virginia creates both opportunities and concerns. In 2016, the expertise and knowledge that the citizens of West Virginia need to make informed decisions about the oil and natural gas industry have been addressed through many educational programs.

2. Science, Technology, Engineering, and Math (STEM) programming has been developed and promoted within our 4-H and Youth Development program this year, which is one way we are addressing the employment rate. We hope to prepare well-trained workers in the STEM fields.

3. Our Community Education, and Workforce Development unit has increased its emphasis on tourism, an expanding industry in the state and has expanded the First Impressions program to include tourism. These new tourism businesses will open up jobs for our citizens.

4. We are placing an emphasis on our health living programs in both our family and health programs and 4-H programs. We will be adding an item to all evaluation forms to measure intentions to

changes behaviors related to healthy living.

5. Our climate change and natural resource specialists have been working to help citizens reclaim land and monitor the water and air after several natural and man-made disasters this year.

6. A community development team, headed by our tourism specialist, is assisting WV communities with beautification and historical restoration efforts designed to attract tourists to WV which will increase local economies.

In the Action Plans and To Set Priorities

Each of the four Extension units have developed strategic plans. Most have considered national indicators in their planning. University and Extension administrators have been studying ways to make the Extension service more of an integral part of the University. Extension outcome data has been added to the University's strategic planning website.

In hiring:

In 2016, WVUES hired three program unit directors. In response to state need and financial constraints, two unites (Community Workforce Economic Development and Families and Health) were combined. This new unit is led by Tony Michael. Six assistant directors (two in each unit) were appointed to assist the unit directors.

A new Director of Development was also hired in 2016. This position had been vacant for about a year, and the Dean of WVUES responded the fiscal needs of WVUES by making this position a priority.

WVU-AFES

The Davis College of Agriculture, Natural Resources and Design continues to value our work with the stakeholders and partnerships within our State and need their continued input to improve and make more relevant these relationships in the future and continue to enhance the wellbeing and quality of life of citizens in West Virginia in disciplines germane to our College. New facilities such as a new greenhouse completed in 2012 and a construction of a new 240,000 square foot Agriculture Sciences that we moved into in September of 2016 have enhanced the quality of our teaching and research activities and partnership potential with external partners. The new building has over 50 wet labs as well as a state of the art meat lab. These new facilities as well as scheduled renovations of existing facilities will certainly improve morale of faculty, staff and students, enhance our image and afford enhanced opportunities for our service, outreach and engagement agenda. We are currently beginning planning for new and renovated facilities for our Forestry and Natural Resources Division and our Design and Community Development Division. Input from our stakeholders is used to help inform long term strategic planning and budgeting. As we are faced with a State budget cut this and next year, as well as a cut in the operating budgets for our farms, we work with our stakeholders to help determine where spending can be reduced without impinging on mission-critical programs.

Brief Explanation of what you learned from your Stakeholders

1. We have learned that the Marcellus Shale natural gas industry develops in West Virginia, developers and citizens want more information and guidance about how to respond. They particularly want to know more about leasing and contracts.

2. We learned that we have a great opportunity to expand tourism in West Virginia. We have

learned that we need to work together with West Virginia State University Extension to reach out to all populations in West Virginia.

3. We have learned that other agencies look to us for research-based programs on healthy living. For example, the state insurance program, PEIA, has offered two of our signature programs - Dining With Diabetes and Stress Less with Mindfulness - to their clients and have reimbursed WVUES when they attend.

4. We have learned that 4-H is considered an important contribution to positive youth development in our state. The PROSPER program has been adopted by two counties as one of the substance abuse prevention programs offered to 6th and 7th graders in their schools.

WVU-AFES perspective:

1. Our constituents have urged us to conduct more applied research to help support their businesses and to help stimulate the State economy. This is part of our mission but is increasingly difficult to accomplish given decreasing State funding and the priorities of the federal research agencies which generally favor more basic research projects.

2. We have received positive feedback about two of our programs which are designed to produce graduates that are well trained for jobs that exist within the State. These are the Energy Land Management program and E Quad (Energy, Economics, Entrepreneurship and Environment).

3. The State budget and economy are feeling the effects of the decline in the coal industry and falling energy prices. Our College budget has absorbed three major cuts in the last three years with more to come in 2017. We have been advised by our constituents, including the Commissioner of Agriculture and the new Governor to conduct research to help stimulate the WV agricultural economy and foster the forest products industry by creating value-added agricultural products and products that utilize the hardwood resources of the State.

WVSU

Stakeholder feedback is used on a continual basis to improve the research and extension work at WVSU and is used for strategic planning regarding hiring, target communities, programmatic priorities, etc.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
4258111	1404447	3289224	1542946

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	4258111	1208280	3075157	1599767
Actual Matching	6561801	817853	6393007	869726
Actual All Other	10819912	2331691	4537479	1321146
Total Actual Expended	21639824	4357824	14005643	3790639

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	0	84722	3031462	470802

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
101	Appraisal of Soil Resources	10%	2%	10%	0%
102	Soil, Plant, Water, Nutrient Relationships	10%	3%	10%	0%
111	Conservation and Efficient Use of Water	0%	10%	0%	0%
201	Plant Genome, Genetics, and Genetic Mechanisms	0%	0%	0%	30%
202	Plant Genetic Resources	0%	0%	5%	30%
205	Plant Management Systems	10%	5%	10%	11%
211	Insects, Mites, and Other Arthropods Affecting Plants	0%	5%	10%	0%
212	Pathogens and Nematodes Affecting Plants	0%	5%	10%	0%
216	Integrated Pest Management Systems	10%	10%	5%	0%
301	Reproductive Performance of Animals	0%	0%	10%	0%
302	Nutrient Utilization in Animals	0%	0%	15%	29%
307	Animal Management Systems	15%	0%	10%	0%
308	Improved Animal Products (Before Harvest)	10%	0%	0%	0%
313	Internal Parasites in Animals	0%	0%	5%	0%
403	Waste Disposal, Recycling, and Reuse	0%	10%	0%	0%
405	Drainage and Irrigation Systems and Facilities	0%	3%	0%	0%
503	Quality Maintenance in Storing and Marketing Food Products	10%	10%	0%	0%
604	Marketing and Distribution Practices	10%	2%	0%	0%
607	Consumer Economics	10%	5%	0%	0%
806	Youth Development	5%	30%	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	17.0	2.0	10.0	6.5
Actual Paid	142.0	9.0	8.0	4.8
Actual Volunteer	1400.0	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**
750000	453107	889352	652213
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
398979	306699	1370643	354580
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
1148979	874383	708509	538618

V(D). Planned Program (Activity)

1. Brief description of the Activity

This program area involves applied research in plant and animal production systems. Projects are focused on increasing the productivity and sustainability of agriculture thereby contributing both to food security and alleviation of world hunger.

WVU-AFES

West Virginia agriculture is dominated by high intensity poultry production and low intensity pasture-fed ruminant production with a declining amount of acreage in tree-fruit production. Much of the land in West Virginia is characterized by steep slopes and high rates of erosion that are suitable to pasture but not to intensive row-crop production. Most intensive crop production, including some fruits and vegetables, is limited to those regions of the state that have relatively flat terrain and favorable soil and climate characteristics. To be competitive, West Virginia producers typically must either increase the value of what they produce or reduce transportation and production costs by relying on locally-marketed products by taking advantage of the State's proximity to major urban markets or by developing niche products. Some examples of successful enterprises include encouraging markets and consumer acceptance of pasture-raised and pasture-finished beef; cool water aquaculture; focusing on higher priced products such as those with ornamental or recreational use; increasing real or perceived product value in specialty or out-of-season markets such as lamb and organic products; and by diversifying product offerings. A number of projects at the Davis College involve long-term organic farming research involving plant systems, animal systems, recovery of proteins in fish processing, integrated plant and animal systems and non-chemical control of parasites in sheep.

Research program highlights for 2016 include:
· Predicting the impact of climate change on the biology and distribution of arthropods.
· Continued research on the mechanisms that regulate the development of protective immunity during gastrointestinal nematode infection of sheep.

- Improvement of post-harvest quality of ornamental crops by reducing stress.
- Innovative protein sources for a growing population: repurposing protein from underutilized sources.
- Proper sampling to determine nutritive, feed additive and mycotoxin content of poultry feed.

WVUES

The WVUES Global Food Security and Hunger planned program has the following goals: 1) increase food supply and quality by improving and promoting animal health, marketing, using pesticides, using risk mitigation, and controlling predation; 2) engage individuals in the promotion, support, and sustainability of horticulture, 3) expand marketing opportunities for value-added products and develop food systems that support local consumers and local business creation and expansion; 4) enhance the agricultural knowledge so that citizens make informed decisions related to the production of food, fiber and wildlife ecology; and 5) build volunteer capacity related to agriculture within communities. In 2016 there were 1087 educational activities reported and 213,200 direct contacts in this program area. Of those direct contacts, 44,071 were with youth. Activities in the WVUES Global Food Security and Hunger planned program include those that address animal health, livestock production, animal product marketing, and grassland management, feeder cattle marketing, livestock improvement, grassland management, homeowner and commercial horticulture, volunteer Master Gardeners, integrated pest management, weed control management, small farms, fertilizer use and selection, soil sampling, composting, livestock judging, and other agriculture skills for youth. In 2016, as in prior years, WVUES conducted the West Virginia Small Farms Conference and hosts the Small Farms Website.

WVSU-GRDI

WVSU Agricultural and Environmental Research Station research efforts are focused on developing vegetable varieties suitable to small farm environments, developing improved feed for rainbow trout an reducing aquaculture pollution, and developing value added and disease resistant cultivars of melons, watermelons and peppers.
Adult programs efforts have concentrated on educational workshops and trainings on topics such as hydroponic/aeroponic production, irrigation, small fruit production, adaptive gardening, cold storage/post-harvest technology and aquaponics. With a focus on re-education of our veteran, socially disadvantaged and displaced worker populations, WVSUES has focused on agricultural education to best meet these needs in our state.
Highlights for 2016 include:

- Veteran, socially disadvantaged and small farmers across the state were provided hands on workshop instruction and illustrated and increase in knowledge.
- New hydroponic and aquaponics workshops and demonstration sites have enabled growing to be knowledgeable about nutrient management
- Workshops, trainings, and mentoring have enabled new growers to enter local foods markets
- Genes were identified which regulate fruit weight in watermelon cultivars

2. Brief description of the target audience

The target audience for this program area includes beef, dairy, and aquaculture producers, large and small growers of horticultural products, processors, distributors, agricultural consultants, regulators, homeowners, shepherds, pesticide applicators, certified nutrient managers, fish feed manufacturers, federal agencies youth livestock exhibitors, volunteers, minority farmers, policy makers and other researchers, and Extension specialists and agents.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	169580	671791	44071	40454

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	56	29	85

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of general press articles

Year	Actual
2016	13

Output #2

Output Measure

- Number of educational materials create or updated

Year	Actual
2016	57

Output #3

Output Measure

- Number of workshops and other educational presentations for clients

Year	Actual
2016	1114

Output #4

Output Measure

- Number of professional/academic presentations

Year	Actual
2016	169

Output #5

Output Measure

- Number of graduate students earning degrees

Year	Actual
2016	11

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of participants (youth and adults) who improve or increase skills in farm management
2	Number of participants who increase or improve skills in animal production and health.
3	Number of participants who increase or improve skills in weed or pest management.
4	Number of participants who increase or improve skills in aquaculture.
5	Number of participants who increase or improve a skill in nutrient management.
6	Number of producers indicating adoption of recommended or best practices.
7	Number of people certified or licensed to practice in the field.
8	Number of new groups or organizations that are established or enhanced.
9	Number of producers who utilize best practices with alternative agricultural enterprises to diversify their income portfolio.
10	Development of a new diet formulation for rainbow trout.
11	Development of value-added, disease resistant cultivars.
12	Increase in the number of producers and other members of the food supply chain.
13	Growth in state sales of beef- % increase.
14	Growth in state broiler, egg and turkey sales- annual % increase.
15	Predicting the impact of climate change on the biology and distribution of arthropods
16	Development of protective immunity during gastrointestinal nematode parasite infection of sheep
17	The efficacy of certain herbicides for managing invasive weeds that displace desirable forages was shown to be effective

18	Development of new cultivars possessing nutraceutical traits

Outcome #1

1. Outcome Measures

Number of participants (youth and adults) who improve or increase skills in farm management

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1513

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
As the focus turns towards local foods and urban agriculture, it has become important to provide information on alternative crop production to new audiences. Youth in WV have shown interest in growing their own fruits and vegetables. Women farmers in WV are crucial to preserving small farms, improving the local food system, and enhancing rural development, however, female-operated farms tend to be small-scale, more financially at-risk, and more dependent on off-farm incomes.

What has been done
The WV WIA Risk Management Program helps women use risk mitigation tools, develops a network of women farmers, provides a regional team who help women lead profitable agribusinesses; and preserves small family-farms. 145 participants attended one of 9 short-courses. WVSU agents conducted 27 workshops for emerging farmers and youth including topics such as container gardening, mushroom production, small fruit production, post-harvest handling, and AgrAbility. 23 presentations were made at state and national conferences.

Results
In the WV WIA Risk Management Program, 100% of post-survey respondents have implemented at least 2 risk management strategies. 91% either intend to or have already started determining their cost-of-production. 92% indicated some positive benefit to their enterprises including, higher returns, lower costs, new markets, new products, new partners or alliances, or access to resources. Over $25,000 was secured through fund-raising and the support of partner agencies;

More than 130 participants have attended the WIA conference in 2016.451 participants in WVSU Extension workshops learned about new techniques and crops. Additionally, 62 individuals were trained on the Junior Master Gardener Program to work with youth on garden based learning initiatives.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
216	Integrated Pest Management Systems
307	Animal Management Systems
604	Marketing and Distribution Practices
806	Youth Development

Outcome #2

1. Outcome Measures

Number of participants who increase or improve skills in animal production and health.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Number of participants who increase or improve skills in weed or pest management.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	9753

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
WVUES and WVSU Extension educators seek to increase implementation of IPM practices through educational programs for commercial orchardists, small farmers, homeowners,

community gardeners, and members of the landscaping industry and to coordinate IPM practices in different commodities throughout the state, and to improve the documentation procedures related to the implementation of IPM practices overall.

What has been done

WVUES and WVSU Extension have a grant to improve IPM practices in WV. Programs include: Brush & Weed Control, Commercial Pesticide Applicator Recertification, Deer Damage, High Tunnel Leafy Greens Workshop, Insect Pollinators, Integrated Pest Management Panel Discussion and Clinic, Organic vs. Conventional Insecticides, Private Applicator Recertification, and Organic Farm Horticulture.

Results

A retrospective questionnaire was administered to IPM participants that asked them to indicate their skill level at the end of a workshop, and then recall what it had been before they came to the workshop. The skills which showed the greatest reported change were: 1) ability to develop a scouting/monitoring program for targeted pests, 2) ability to understand underlying problem by identifying weeds, 3) understanding of cultural practices in preventing and/or managing plant health, 4) understanding of issues related to balanced nutrition for the overall health of plants, 4) ability to identify mineral deficiency symptoms and ways to correct the problem. The participants were asked what they thought they would most likely do in the weeks following the workshop. The tasks that were cited most often were: 1) clean seeds before planting with Clorox bleach seed bath, 2) survey yard/garden for weeds early in the season, 3) use a hot water treatment of seeds. 5) identify some insects, 6) cut perennial weeds repeatedly/trim fields, 7) Evaluate soil to rectify problem soils and to discourage weeds.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems

Outcome #4

1. Outcome Measures

Number of participants who increase or improve skills in aquaculture.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Number of participants who increase or improve a skill in nutrient management.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	127

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Nutrient management is one of the most important facets of an agricultural operation. Nutrient conservation practices and production opportunities implemented through the use of hydroponic and aquaponic technology can result in a reduction of the nutrient loading issues of the past. Grassland production of hay and pasture is the largest crop acreage in WV. Management of this resource has improved over the years, however, grassland productivity is well below its potential due to sub-optimal nutrient management and grazing management.

What has been done
WVUES specialists have developed improved fertilizer recommendations for hay and pasture crops. They have calibrated a standardized falling plate meter for measuring light interception and provided guidance on how to use it when managing seedling in pasture and hay fields. They have also done research on simplifying plate meter calibration for measuring and budgeting forage. WVSU agents have conducted educational workshops and demonstrations to assist socially-disadvantaged farmers learn nutrient management strategies.

Results
New fertilizer recommendations enable producers to improve grassland cost per unit yield. The calibration of the plate meter vs. light interception enables producers to reduce plant completion with legume seedlings without the use of herbicides. Simplified plate meter calibrations reduces the labor requirement for clipping samples. This help technical service providers and through them to producers in the state. As a result of the hydroponic and aquaponic production workshops and demonstration sites, 6 different growers/organizations have begun using this technology. These groups range in production size from full high tunnels to individual units in backyard growing scenarios. Growers are learning to become more engaged with the nutrients

and the nutrient management that comes along with this method of production.

4. Associated Knowledge Areas

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

Outcome #6

1. Outcome Measures

Number of producers indicating adoption of recommended or best practices.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	30

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There has been a change in the demand for agricultural products toward local production. In horticulture, small farming operations need to adopt new techniques in post-harvest handling, cold storage and transport, and hydroponic/aeroponic production. Small-scale beef producers lack the critical mass to participate in commodity marketing strategies. Special graded feeder cattle sales are offered by auction markets, however, individual producers are often prevented from earning premiums for better management. Additionally, many calves offered in graded sales may exhibit health problems and may be non-saleable. West Virginia?s cow/calf producers must respond to consumer demands.

What has been done
Technical assistance has been provided to local small farming operations on best practices related to mushroom production, post-harvest handling, cold storage and transport, hydroponic/aeroponic production technology and small fruit production. Cooperative marketing pools were localized within WV counties. To increase the number of cattle offered and attract

buyers, these sales were held concurrently utilizing an online viewing tool. WVU Extension personnel provided technical assistance and advice, delivered educational programming and extended organizational support to marketing pools. To assist with delivery and provide a uniform format for data collection, a Microsoft Access database application was developed specifically for calf pools utilizing electronic (RFID) identification.

Results

Eight small farm enterprises have adopted recommended or best practices to enhance their production. One farm has increased its mushroom production capacity based on the resources and education provided by the Extension Service. A second farm operation was able to develop an educational and production orchard to increase the knowledge within the community of small fruit pruning and maintenance while also enhancing their own production for use in their bakery. Livestock producers in WV enrolled their calves and adopted the prescribed protocol. The average producer was able to return an additional $2,629 to their operation. From 2001 through 2016, the advantage of pool participation has ranged from $39 to $92/head, with an average of $65/head.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)
604	Marketing and Distribution Practices
607	Consumer Economics

Outcome #7

1. Outcome Measures

Number of people certified or licensed to practice in the field.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1500

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Pesticide safety education and training is necessary to protect public health and the environment from pesticide hazards that may occur due to improper handling and application of pesticides by applicators. There is a great need in West Virginia to provide educational support to commercial and private pesticide applicators seeking training in order to comply with federal and state pesticide certification and licensing requirements.

What has been done
The 2016 Pesticide Recertification Program Video was created and distributed to all county Extension offices to provide approved pesticide recertification training to pesticide applicators. Continuing education units for pesticide recertification were approved for participants attending and viewing the video.

Results
300 participants gained knowledge and skill from watching the pesticide recertification video. 1500 total pesticide applicators were certified in West Virginia in 2016.

4. Associated Knowledge Areas

KA Code	Knowledge Area
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems

Outcome #8

1. Outcome Measures

Number of new groups or organizations that are established or enhanced.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	9

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The current agricultural climate in West Virginia is changing to include younger growers utilizing alternative agricultural production methods to grow food to meet the demands of the local

markets. Extension programs have been designed to help teach these new growers alternative production methods that can be used by a small landowner, or even in urban settings, to grow food for the local markets. Additionally, there has been a lack of education on proper harvesting, handling, packaging and transportation help to assure that a product maintains its high quality once harvested.

What has been done

Educational workshops and demonstration areas have been put into place by the Extension Service to help emerging, small and socially-disadvantaged farmers. New groups and organizations have spun off into a production alternatives and very small-scale methods. These groups focus on production in urban settings and socially and economically distressed areas. Growers are learning how to produce in a variety of systems and also proper harvest, post-harvest and cold storage practices that increases the overall quality and food safety requirements to sell within the local markets.

Results

As a result of these programs, 9 different groups have increased their growing and marketing potential to the local markets. These groups are all at different places in their production plan with some at full production and others just getting started, however they have all started to grow food for entrance into the market through direct sales to restaurants/schools or through a farmer?s market or CSA model.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems
405	Drainage and Irrigation Systems and Facilities
604	Marketing and Distribution Practices

Outcome #9

1. Outcome Measures

Number of producers who utilize best practices with alternative agricultural enterprises to diversify their income portfolio.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
As new farming practices take hold in WV, farmers are starting to acknowledge the benefits of alternative cropping systems and the opportunities that come with niche market development. In the past, traditional agricultural practices were the norm and markets were fairly developed for crops produced. As a new face of agriculture has taken hold in WV, with an influx of farm to table concepts, growers have more opportunities to sell produce via local farmer?s market venues as well as restaurants for the first time.

What has been done
WVSU Extension Service has worked with small farmers to brainstorm ways to diversify their farming applications into developing niche markets, assess opportunities and make connections to market outlets. An educational program on cold storage was developed for 20 farms looking to expand their market opportunities. Mobile and stationary cold storage units were made available to program graduates. Supplies were provided for creation of cold storage on their farms. The mobile cold storage units make it possible for farmers to grow produce that otherwise would have been too perishable to transport to market.

Results
Six farms have indicated an increase in sales revenue after being given the ability to diversify their markets. One farm reported that due to the project they were able to grow and market crops that would otherwise perished during transport. Another farm CoOp reported that they were able to expand their market outreach capabilities due to the mobile cold storage units which allowed them to develop a contract with a local grocery chain. Additionally, two separate farms were able to expand their CSA opportunity and provide CSA members with higher quality produce which proved to have a longer shelf life for the consumer.

4. Associated Knowledge Areas

KA Code	Knowledge Area
503	Quality Maintenance in Storing and Marketing Food Products
607	Consumer Economics

Outcome #10

1. Outcome Measures

Development of a new diet formulation for rainbow trout.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Dietary formula with improved nutrient utilization will lead to farmed rainbow reaching market-size in less time with less nutrient input. This will have implications by reducing pollution from aquaculture discharge. High feed cost is problem and reducing the cost through optimal dietary composition will increase profitability to the farmers. If changes in dietary composition lead to improvement in nutrient utilization efficiencies, pollution from unused nutrients in effluent discharges from aquaculture production facility will be reduced.

What has been done
Growth, weight gain, condition factor, feed efficiency, feed conversion rates, specific growth rates, and proximate analyses of rainbow trout fed four experimental diets at two temperatures was analyzed. Harvested fish at the conclusion of the study were individually weighed, length measured, and hand processed. Liver, intestines, muscle, and visceral fat tissue samples were collected and stored at -80°C for enzyme analysis and gene expression studies. Hand processed fillets for each treatment were separately minced and ground into a homogenous pulp to be used for proximate analysis.

Results
Weight gain of rainbow trout was higher at 14°C relative to 18°C. The data on condition factor indicated a higher condition factor for rainbow trout grown at 18°C relative to 14°C. It is important to state that for both, weight gain and condition factor the data indicated no difference between the four diets within each temperature treatment. When feed efficiency (FE) was calculated and evaluated, it was observed that all four diets fed at 14°C had higher FE relative to those reared at 18°C, with the highest FE being for the 40/20PP diet (40% crude protein from plant sources only and 20% lipid) diet at 14°C (1.03 ± 0.041, Mean ± SD). Feed conversion rate (FCR) was higher for all four diets. Results for feed conversion rate (FCR) were as expected, inverse to that of FE. Specific growth rate (SGR) was higher for fish fed all four diets at 14°C relative to 18°C with the highest SGR being for the 40/20PP (40% crude protein from plant sources only and 20% lipid) diet at 14°C (0.527%±0.070, Mean ± SD).

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
307	Animal Management Systems

308 Improved Animal Products (Before Harvest)

Outcome #11

1. Outcome Measures

Development of value-added, disease resistant cultivars.

2. Associated Institution Types

- 1862 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Protected culture production of tomatoes has more than doubled in WV, while at the same time the number and size of vegetable farms has been static. Production in a greenhouse or high tunnel generates higher yields than field production when using varieties bred for this environmental conditions. Unfortunately most of the varieties bred in the US are for field production and no public tomato breeder is focused on protected culture tomato varieties. Specialty crop producers in WV are producing > 60 types of fruits, nuts, vegetables and herbs, but there is a need for up-to-date information related the cultivation of specialty crops. Moreover, there must be more growers producing specialty crops in all regions of the state.

What has been done
State-wide vegetable and small fruit variety trials were conducted by a WVUES team with asparagus, beans, carrots, blueberries, strawberries, popcorn, hazelnuts, kale, melons, pumpkins, peppers, spinach and lettuce. In their research, WVSU is focusing on selecting tomato lines with superior organoleptic and pest resistance traits. Trials will also be done to verify that the insect resistant trait, acylsugar production will not interfere with the existing biological control agents used in IPM before using marker assisted selection.

Results
As a result research by WVUES,700 producers were trained in skills related to cultivar selection, production, pest management, marking, and food safety. The WVSU research resulted in the five step method for the retrosynthesis of triesterified monosaccharide, 2-hydroxy-6-(hydroxymethyl) tetrahydro-2H-pyran-3,4,5-triyl triundecanoate created enough product for trialing. There was no

significant effects on mortality, developmental time, gender ratios, fertility, fecundity or longevity in triple and single exposure assays with lacewing larvae. Behavioral assays exhibited no repellence or irritability characteristics with the synthesized acylsugar or with acylsugars extracted from the wild species. A redesigned arena has been constructed and tested for future experiments.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
205	Plant Management Systems

Outcome #12

1. Outcome Measures

Increase in the number of producers and other members of the food supply chain.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Increasing the number of producers in the local food supply chain is the end goal of WVSU Extension. By hosting educational workshops and developing demonstration sites the goal is to increase the amount of food being produced with the idea that the added production goes directly into the local market. With the demand for fresh, local produce exceeding the supply- the market is wide open for even small producers.

What has been done
During this reporting year, growers have been encouraged to begin looking at the local market for sales of produce to increase fresh product into the market, as well as increase revenues for the growers. These growers have been assisted as needed to help find markets that fit into their business model. WVSU Extension has concentrated on developing educational workshops and trainings that cater to the emerging demands for specialty and niche crops.

Results
As a result of the WVSU Extension programs, at least 3 new growers entered the local foods market. These growers varied in the amount of produce available in the market, but each of the growers were very successful and are looking to increase their production of the specialty crop due to the large demand. This is very encouraging for these growers going forward, but also for new growers that get started in the coming years.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
205	Plant Management Systems
604	Marketing and Distribution Practices

Outcome #13

1. Outcome Measures

Growth in state sales of beef- % increase.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Beef cattle, and to a lesser extent, sheep production, are important contributors to the WV agricultural economy. Both utilize a high quality and abundant WV resource: pasture.

What has been done
A long term integrated project examining improved pasture management and the market for pasture raised beef has helped improve the efficiency of the livestock industry in WV and increased market access for producers of pasture raised beef.

Results
Beef sales increased slightly in 2015 (the latest figures from NASS). This slight improvement in

sales occurred in spite of lower prices for beef than usual in 2015.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
202	Plant Genetic Resources
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)
313	Internal Parasites in Animals
403	Waste Disposal, Recycling, and Reuse
503	Quality Maintenance in Storing and Marketing Food Products
604	Marketing and Distribution Practices

Outcome #14

1. Outcome Measures

Growth in state broiler, egg and turkey sales- annual % increase.

2. Associated Institution Types

- 1862 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)

The poultry industry in WV (broilers, eggs and turkeys) is the single largest agricultural industry in the State. There is considerable pressure on this industry due to increasing costs of production, regional competition and pressures to reduce phosphorus pollution in the Potomac Watershed.

What has been done

West Virginia University's Davis College and WVU Extension have one of the most productive feed manufacture and animal nutrition research and extension programs in the United States as evidenced by extensive industry collaborations and publications and growth in the industry. Current work is taking a two pronged effort to improve poultry nutrition to increase growth rate while formulating rations that reduce phosphorous runoff into waterways. With assistance from the poultry feed industry we are installing a $1.3 million feed mill. The mill will be utilized in our research program and be used for training students for jobs in the feed and poultry industries.

Results

In 2015, the most recent data, sales of broilers, eggs and turkeys declined nearly 10 percent due to lower prices for all livestock products. We are hoping that our enhanced research program will strengthen the industry in the State in the future.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
202	Plant Genetic Resources
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)
313	Internal Parasites in Animals
403	Waste Disposal, Recycling, and Reuse
405	Drainage and Irrigation Systems and Facilities
503	Quality Maintenance in Storing and Marketing Food Products
604	Marketing and Distribution Practices
607	Consumer Economics
806	Youth Development

Outcome #15

1. Outcome Measures

Predicting the impact of climate change on the biology and distribution of arthropods

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)
Temperature plays an important role in the growth and development of arthropods, and thus the current trend of climate change will alter their biology and species distribution.

What has been done
The researchers used Chaetodactylus krombeini, a parasitic mite associated with Osmia bees as a model organism to investigate how temperature affects the development and distribution of C. krombeini in the Eastern United States. The effects of temperature on the stage-specific development of C. krombeini were determined at seven constant temperatures (16.1, 20.2, 24.1, 27.5, 30.0, 32.4 and 37.8°C). Parameters for stage-specific development, such as threshold temperatures and thermal constant, were determined by using empirical models.

Results
Results of this study showed that C. krombeini eggs developed successfully to adult at all temperatures tested except 37.8°C. Under the future climate scenarios, the number of generations would increase by 1.5 to 2.0 times by the year of 2100 according to simulation which could have an extremely negative impact on the population of bees. Research results were disseminated to science and agricultural communities via publication and an outreach program with the WVU Insect Zoo and Museum which the PI is in charge of at West Virginia University.

4. Associated Knowledge Areas

KA Code	Knowledge Area
211	Insects, Mites, and Other Arthropods Affecting Plants
216	Integrated Pest Management Systems

Outcome #16

1. Outcome Measures

Development of protective immunity during gastrointestinal nematode parasite infection of sheep

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)
In January 2012, there was a 2% decline in sheep and lambs and a 5% decline in all goat inventory in the U.S. (NASS, 2012). Even though total inventory decreased some southern states have experienced large increases in sheep and goat numbers due to growing demand by ethnic populations and organic niche markets. However, the U.S. is still importing more lamb and goat meat than it is producing for domestic consumption. Both conventional and organic lamb and goat production in the southeastern U.S. is challenged because of the prevalence of gastrointestinal nematodes (GIN). Research to find new methods of GIN management is necessary. Priority areas include improved genetics, novel products or feedstuffs that enhance immunity, selective deworming programs and alternative forage systems. Breeds of sheep originating from the Caribbean islands have developed a natural resistance to GIN parasitism and this resistance is largely immune-mediated. Research is needed to determine if natural immunity can be enhanced in other commercial species of sheep.

What has been done
A body of knowledge exists that indicates an increase of inflammatory mediators prior to pathogen exposure may reduce severity and duration of infection in the host organism. In a joint project that involved West Virginia University and Virginia Tech we investigated this process by the modulating immunity of parasite-susceptible sheep prior to GIN infection, to determine whether immunomodulation is capable of enhancing parasite immunity in these sheep. An in vitro method was developed to assess immune activation in cells of resistant and susceptible sheep. From this assay we were able to determine that cells from St. Croix (Caribbean) sheep show an immunity response 6 hours after stimulation with parasitic antigen, whereas cells from Suffolk (susceptible) sheep required 72 hours an immune response was detected.

Results
Data generated from all these studies could lead to improved profitability for small ruminant

producers not only in West Virginia but nationwide, by providing additional tools for management of sheep infected with drug-resistant GINs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems
313	Internal Parasites in Animals

Outcome #17

1. Outcome Measures

The efficacy of certain herbicides for managing invasive weeds that displace desirable forages was shown to be effective

2. Associated Institution Types

- 1862 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Joint-head Arthraxon (small carpetgrass, joint-head grass), Arthraxon hispidus (Thunb.), Makino, is a non-native annual grass becoming increasingly prevalent in WV pastures. This invasive weed, capable of displacing desirable forages, is unpalatable to livestock and is difficult to manage. With weeds starting to germinate earlier, invasive grasses become more prevalent in the region, jointhead grass and stiltgrass will become increasingly prevalent in the region.

What has been done
In 2016 the herbicide Prowl H2O (active ingredient pendimethalin) received registration from the EPA for use in grass forages. We established a field experiment near Lost Creek, to evaluate its efficacy to manage jointhead grass and a field trial near Romney to evaluate the same herbicide for Japanese stiltgrass control. The goals were to evaluate Prowl H2O to control jointhead grass and Japanese stiltgrass and to evaluate the application timing for its control. A pesticide video was taped to disseminate the results.

Results
Positive results were generated from the field experiments which will be presented at the

upcoming Northeastern Weed Science Society's Annual Meeting in Philadelphia, January 2017.

4. Associated Knowledge Areas

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

Outcome #18

1. Outcome Measures

Development of new cultivars possessing nutraceutical traits

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The fruits, seeds or other parts of watermelon possess compounds with antioxidative, anti-inflammatory, hypoglycemic and anti-hyperglycemic actions are active as anticancer and antidiabetic agents. Developing new cultivars possessing nutraceutical traits combined with disease resistance has thus far proven difficult, and has been identified by producers as the major problems needing identification of linked markers for the important alleles and further marker assisted selection to pyramid into the cultivars.

What has been done
To meet market demands for functional foods, for novelty vegetables and for natural sources of phytochemicals, new varieties of fruits and vegetables are currently being bred in our program. Genomic driven selection of favorable alleles can improve taste, flavor with increased phytochemical levels and fruit weight in peppers. Presently, little is known about the genes controlling flavor, phytochemical contents in pepper germplasm that is relevant to breeding.

Results
Among normal population, vitamin C and reducing sugar levels are ranged between 2.54 to 50.44 and 41 to 700 mg g-1 DW of pericarp, respectively. Overall, 14 genotypes accumulated 50 to

500% of the RDA of vitamin C in each 2 g of fruit pericarp on dry weight basis. As compared to ripened fruits, matured (unripened) fruits contained higher vitamin C and lower reducing sugars. About 44% variation in the vitamin C content was ascribed to their reducing sugar levels. For the first time, this study provided a comprehensive data on vitamin C in the world collection that can serve as a key resource for functional food research in future. Some of the high phytochemical containing pepper accessions are ready to be shared with public and private seed companies.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
205	Plant Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

Weather continued to affect the outcomes of our program efforts due to the nature of horticulture and gardening. Workshops and training all were delayed or cancelled throughout the year due to weather. Changes in site locations and scheduling issues also came in to play. Program budget cuts and delays affected many projects. Hiring and training of new incoming personnel has been a large hurdle to overcome. As the workloads expand new personnel is essential.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

WVU-AFES

WVU Experiment Station research program evaluation takes place at two levels and on two different time cycles. All programs will be evaluated using these general criteria plus additional criteria tailored to each specific program as detailed in the Plan of Work under Outputs and State defined Outputs and Outcomes.

Annual evaluation will continue as before, looking at productivity in terms of immediate impact

- Professional presentations
- Referee journal articles and books
- General audience papers and news reports
- M.S. and PhD graduates
- Trends in terms of competitive funding

And in terms of longer-term impact:

- Citations in scientific journals
- Patents
- Successful technology transfer or start-ups based on research programs
- Awards based on continuing impact and research excellence

Every five years there will be a full portfolio review including:

- Long term productivity
- Relevance to our constituent groups and the State and Region
- The allocation of research inputs among the programs
- Consideration of eliminating some research programs that are not productive or have diminished relevance given NIFA and State priorities
- Consideration of adding additional program areas given NIFA and State priorities

This portfolio review will be conducted internally by a committee appointed by the Dean and externally by a committee composed by a subset of our College Visiting Committee.

In 2016 our research productivity, measured by refereed journal articles, continued to increase. We have invested in our plant and soil science and animal and nutritional science programs over the last 4 years in terms of new hires and increased investment in start-up financial support. The investment was targeted to three plant and animal research areas: molecular genetics, biochemistry and microbiology. That investment has paid off, resulting in increased publications each year, with the total number doubling over that four-year period using Google Scholar tallies. We are also seeing increased grant proposal submissions and recently, increased success at NIFA and NSF. We will move in 2017 to a uniform faculty productivity report using Digital Measures. This move will allow us to better track productivity in each of our goal areas.

WVSU

Of the 451 adults that participated in the multiple presentations across the state, an average of 88% gained new knowledge of the different urban and alternative agriculture topics that could benefit the increasing local food movement. As a result of the cold storage/post-harvest handling education, 20 farmers were trained and from that group over 80% are now utilizing cold storage on a regular basis. Additionally, over 50% this group of farmers has seen their customer base increase and nearly 20% have extended their delivery radius. New and beginning farmers are continuing to go through educational trainings offered by WVSU Extension Service and are beginning to enter the local foods market with small fruits, mushrooms and vegetables. Many of these farmers are military veterans that are looking to expand on current production levels on their family farms.

WVUES

We evaluated our Integrated Pest Management grant with the following outcomes:
During the first grant period, 63 individuals responded to an evaluation survey designed to find out if they perceived that they had gained knowledge and/or skills related to integrated pest management (IPM). Of West Virginia's 55 counties, 16 counties were represented at the workshops. About one-fourth of the participants (26.3%) were men and three-fourths were women (73/7%). About two-thirds said that they had college degrees. Sixteen of the participants identified themselves as farmers. Two training events

were surveyed: one was entitled "Advanced Certification Training in IPM" and the other was entitled, Indicator Weeds of Abnormal Conditions." A total of 63 participants responded to the survey.

A retrospective questionnaire was administered to participants that asked them to indicate their skill level at the end of a workshop, and then recall what it had been before they came to the workshop. A paired sample t-test of the data resulted in significant differences on all questions ($p<.02$). The skills which showed the greatest reported change from skills mastered before coming to the workshop to skill master as a result of the workshop (the differences between the means were greater than .8000) were:

- Ability to develop a scouting/monitoring program for targeted pests (1.06522)
- Ability to understand underlying problem by identifying weeds (1.0000)
- Understanding of cultural practices in preventing and/or managing plant health (.86716)
- Understanding of issues related to balanced nutrition for the overall health of plants (.86077)
- Ability to identify mineral deficiency symptoms and ways to correct the problem (.85219)
-

The participants were asked what they thought they would most likely do in the weeks following the workshop. The tasks that were cited most often were:

- Clean seeds before planting with Clorox bleach seed bath (7)
- Survey yard/garden for weeds early in the season (5)
- Use a hot water treatment of seeds (5)
- Identify some insects (4)
- Cut perennial weeds repeatedly/trim fields (2)
- Evaluate soil to rectify problem soils and to discourage weeds (2)fy problem soils and to discourage weeds (2)

Key Items of Evaluation

WVU-AFES

While our budget is increasingly limited by State and Federal funding, our main finding is that targeted investment in core programs, such as Plant and Soil Science and Animal and Nutritional Sciences, was a very effective strategy. We will plan on using this strategy of selective investment in the future.

WVSU

Evaluations focus on the increase of knowledge on the various topics that are being presented upon. Additional information being garnered includes presenter effectiveness, the likelihood of the participant implementing these topics and also comments on additional topics that should be made available going forward

WVUES

Each program in our Food Security and World Hunger program is encouraged to use client evaluations as well as peer evaluations when appropriate. Some have specialized evaluations as in the case of the Intregated Pest Management Program.

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Climate Change and Environmental Quality

☑ 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	15%	10%	15%	5%
102	Soil, Plant, Water, Nutrient Relationships	25%	15%	10%	25%
111	Conservation and Efficient Use of Water	0%	10%	0%	0%
112	Watershed Protection and Management	10%	0%	15%	0%
124	Urban Forestry	0%	10%	0%	0%
131	Alternative Uses of Land	5%	10%	0%	5%
132	Weather and Climate	0%	0%	10%	0%
133	Pollution Prevention and Mitigation	10%	5%	15%	15%
135	Aquatic and Terrestrial Wildlife	0%	0%	20%	0%
136	Conservation of Biological Diversity	10%	0%	0%	0%
211	Insects, Mites, and Other Arthropods Affecting Plants	0%	10%	5%	20%
212	Pathogens and Nematodes Affecting Plants	0%	10%	0%	20%
403	Waste Disposal, Recycling, and Reuse	15%	10%	0%	10%
605	Natural Resource and Environmental Economics	10%	10%	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	4.0	0.5	9.0	2.0
Actual Paid	3.0	0.5	10.0	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**
220000	25172	221446	332259
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
9796	17038	1031048	180636
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
229796	48577	1316644	274398

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research and extension programs to assist in the preservation of soil, water, forest and wildlife resources are a high priority given the importance of natural resources and the environment to the economy and wellbeing of the citizens of West Virginia. These programs have become even more critical given the extra stresses and uncertainty imposed by a changing climate. The focus of our research and extension programming is on studying, protecting and restoring environmental quality while developing economically effective and environmentally sustainable management practices for agriculture, forestry, mining and rural communities and anticipating and adapting to climate change.

WVU-AFES

Primary environmental research areas involve mine land restoration, soil science, ecosystem resilience to climate change and other environmental stressors, water quality, watershed management, wetlands, and aquatic and terrestrial wildlife ecology.

Contamination of soil and water with acid mine drainage from abandoned surface and underground coal mines and natural gas fields and restoration of the landscape from surface mining are important issues in West Virginia. Disturbed soils, such as those resulting from agriculture, erosion, deforestation, road building, urbanization, and surface mining require specialized treatments to make them suitable for subsequent use and management. Research is being conducted to characterize the nature and scope of these problems and to develop cost effective remediation programs. Work is being conducted to evaluate properties of soil materials placed on the surface and determine their suitability for a variety of land uses such as agriculture, forestry, building site potential, recreation, and energy production. Relevant research projects include restoring surface mines to productive forestland or grassland (including switchgrass as a possible feedstock for biofuels), use of different types of soil amendments such as biochar and poultry litter on damaged soils to restore productivity, and restoring lost aquatic ecosystem functions on reclaimed mine sites and watersheds. Progress continues in assessing the ecological functions of restored and created wetlands.

Research program highlights for 2016 include:

· Amphibian Reproductive Success and Diet Selection in Mitigated Wetlands of the Central Appalachians.
· Water economics: examining economic and social incentives to protect and conserve water resources.
· Mapping and managing central Appalachian temperate forest and Alaska Boreal forests under

climate change: population dynamics, carbon and biodiversity.
· Strategies for improving communication with audiences about complex and controversial science topics on public lands
· Natural resource integrity: water and energy systems

WVUES

In 2016, the Climate Change Environmental Quality and Stewardship planned program at WVUES worked towards developing an agriculture system that maintains high productivity in the face of climate changes. WVUES educators help producers plan for and make decisions to adapt to changing environments and sustain economic vitality and take advantage of emerging economic opportunities offered by climate change mitigation technologies. Objectives addressed in this program area include: 1) decrease risk and loss to farming operations through use of risk mitigation tools and control of predation; 2) increase compliance with and knowledge of the WV Best Management Practices for controlling soil erosion and sedimentation; and 3) increase the capacity of local communities and landowners in nutrient management and sustainability. Activities in this program area fall under several categories related to the protection of natural resources including: composting and utilization, nutrient management, grassland management, and wildlife management, Educational sessions included: well water clinic, flood damage and recovery, water conservation, Master Naturalist, deer damage management, bats, Master Naturalist, woods and wildlife, timber sports and state conservation camp. This year, there were 72 educational activities and 10,057 direct contacts reported in the climate change program area.

WVSU-GRDI

The Experiment Station researchers conducted research; reported results in scientific manuscripts, technical and popular presentations; and trained graduate students. The researchers generated applied research that is useful to the profession and to producers within the State and conducted outreach activities in conjunction with Extension staff to disseminate the results of that applied research in a way that is understandable and useful to State farmers and agribusinesses. Research efforts are focused on small farmers adopting new varieties and growing techniques to adapt to changing environmental conditions, developing soil ratings for mitigation of runoff, and improving the use of biochar and other byproducts as soil amendments.

Educational programs and demonstration sites farmers were established to meet the needs of small and urban farmers who looking for ways to mitigate these climate change issues while maintaining a productive and profitable agricultural operation. Through Extension based programs, these farmers, especially socially-disadvantaged farmers, were given opportunities to learn the latest developments in climate change mitigation.

Highlights for 2016 include:

· A new project to study the microbial processes in association with chemical and hydrological dynamics in the Kanawha River was initiated.
· Small and urban farmers were able to increase their knowledge of climate change mitigation strategies that could be used on their individual farms.

2. Brief description of the target audience

Target audiences include policy makers, planners, regulatory agencies and public interest and citizens groups, homeowners, land-owners, small-farm operators, volunteer organizations, various city, county and municipalities, state government, under-served and minority farmers/landowners, WVDA staff,

USDA staff and other agricultural and natural resource focused agencies, undergraduate and graduate students, the bioenergy industry; private state and federal conservation and environmental quality groups and regulatory agencies, horizontal directional drilling professionals, private forestland owners, forestry professionals, researchers, and the general public.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	2979	25240	9285	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	19	20

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of general press articles

Year	Actual
2016	3

Output #2

Output Measure

- Number of educational materials create or updated

Year	Actual
2016	1

Output #3

Output Measure

- Number of workshops and other educational presentations for clients

Year	Actual
2016	77

Output #4

Output Measure

- Number of professional/academic presentations

Year	Actual
2016	18

Output #5

Output Measure

- Number of graduate students earning degrees

Year	Actual
2016	12

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of participants who increase their knowledge of management practices under climate variability and change.
2	Number of participants that adopt recommended adaptation and climate mitigation strategies for production agriculture and natural resources management.
3	Number of groups or organizations that change their procedures and/or policies regarding climate control.
4	Number of state landowners adopting reclamation and watershed protection practices in consultation with WVU and WV State Extension and Experiment Station Faculty.
5	Development of value-added products through pyrolysis process of biomass-to-energy conversion.
6	Creation of new knowledge in horizontal directional drilling mud co-product use and impact.
7	Amphibian Reproductive Success and Diet Selection in Mitigated Wetlands of the Central Appalachians
8	Water economics: examining economic and social incentives to protect and conserve water resources
9	Number of participants who increase their knowledge of land use related to climate variability and change.
10	Number of participants who increased their knowledge and skill in using biological control agents.
11	Creation of new knowledge concerning the effects of human impacts on riverine and watershed microbial ecosystem services.

Outcome #1

1. Outcome Measures

Number of participants who increase their knowledge of management practices under climate variability and change.

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	313

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Rural and urban farmers in WV have been forced to deal with unprecedented climatic issues. As a result, these farmers are looking for ways to mitigate these issues while maintaining a productive and profitable agricultural operation. Local food helps communities overcome ?food desert? designation, aids farm sustainability, and prepares the public to be better stewards of the land, natural ecosystems and environment. Through Extension based programs, these farmers can learn the latest developments in climate change mitigation.

What has been done
Field cover crop trials were established in 3 locations in Southern WV in cooperation with WVDA and NRCS Plant Materials Center. A high tunnel cover crop trial was conducted with WVDA and WVUES. Three cover crops were trialed: buckwheat, forage type soybean, and sunn hemp. Vegetation was removed from the house immediately followed by a trellised personal cantaloupe trial using sugar cube melons. Through the Master Gardner Program, WVUES offers educational programs that prepare the public to be better stewards of the land, natural ecosystems and environment.

Results
Farmers were able to increase their knowledge of climate change mitigation strategies that could be used on their individual farms and develop a plan to implement these strategies and find funding through grants, cost-shares, or direct payment. Cover crop trials and high tunnel trials were conducted resulting in melons averaging 2.2 lbs each being distributed to local and regional schools. Four school districts showed interest in the melons at a price of $2 each. The Master

Gardner Program trained volunteers in 46 counties and added 228 new trainees. MG trainees completed 440 projects.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
124	Urban Forestry
131	Alternative Uses of Land
136	Conservation of Biological Diversity

Outcome #2

1. Outcome Measures

Number of participants that adopt recommended adaptation and climate mitigation strategies for production agriculture and natural resources management.

2. Associated Institution Types

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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	26

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
When well managed hay feeding returns plant nutrients to fields where the nutrients can be used to grow forage next year. When fed in permanent feeding areas, plant nutrients can build up and harvested in growing crops to prevent them from entering the surface water and becoming pollutants. In both cases winter feeding can damage grass sod that protects the soil from erosion. Establishing quick growing cover in the spring is essential to prevent soil erosion and movement of sediment and nutrients off the field and into surface waters.

What has been done
Field demonstrations were conducted in on 5 sites. Re-vegetated sites were evaluated for forage growth, ground cover, weeds versus planted crop, forage yield, and animal unit grazing days. A video was produced showing the benefits of re-vegetating winter feeding areas. The video was

used as part of the pesticide recertification training. In addition, a rainwater catchment system was installed on a high tunnel at a reclaimed surface mine in Paint Creek, WV. The catchment tank was buried and gutter systems were installed on a 30 x 48 high tunnel to eliminate the need to install a wooden hip board. This serves as a demonstration and education site.

Results
Individual case studies were written for each site to quantify the cost of re-vegetation and the value in terms of ground cover and forage production. 25 livestock producers said that they would improve their winter feeding management and their management of plant nutrients on the farm by adopting the practices presented in the case studies. One local farm has adopted the rainwater catchment concept and is installing the same system on two high tunnels with NRCS cost share. This system will be installed on other demonstration high tunnels managed by WVSU Extension Service for continued education and outreach.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
131	Alternative Uses of Land

Outcome #3

1. Outcome Measures

Number of groups or organizations that change their procedures and/or policies regarding climate control.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	140

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In 2010, West Virginia legislators approved a new rule for regulating pollution from concentrated animal feeding operations (CAFOs), and farmers had concerns and questions about what this new rule meant for them. Did their operation fall under these regulations? What would it mean if it

did? How could they make sure their animal feeding operation was environmentally friendly even if they didn't fall under the regulations?

What has been done

140 agricultural providers learned about the regulations facing CAFO livestock producers and best management practices to reduce pollution while improving efficiency and productivity. The workshops included farm visits with educational, non-regulatory mock inspections. The project team also produced brochures, PowerPoint presentations, fact sheets, and a comprehensive BMP and record keeping handbook.

Results

140 service providers became more knowledgeable about the new CAFO rules, the management strategies to meet conservation and regulatory standards. 140 service providers gained confidence in teaching farmers. Through follow-up visits, the team found that 69 service providers had incorporated information from the project into farmer outreach programs that reached 1,018 livestock producers who manage more than 43,000 acres. These service providers advised an additional 629 producers in the CAFO final rule, the importance of conservation planning, nutrient management planning, identifying best-fit BMPs and setting up record keeping systems. Thirty-six of the service providers formed multi-agency partnerships to conduct nine multi-county train-the-producer workshops and field tours for 389 producers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation

Outcome #4

1. Outcome Measures

Number of state landowners adopting reclamation and watershed protection practices in consultation with WVU and WV State Extension and Experiment Station Faculty.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Development of value-added products through pyrolysis process of biomass-to-energy conversion.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Thermal conversion of biomass (pyrolysis) to bio-oil and energy provides a sustainable and renewable energy resource. Use of pyrolysis co-product biochar as soil amendment could further improve fertility and productivity of marginal and disturbed lands in the Appalachian basin. In addition, biochar may increase soil carbon sequestration, rendering the pyrolysis biomass-to-energy pathway carbon negative. As such, the use of biochar as soil amendment could increase soil productivity while mitigating carbon emission.

What has been done
Biochar of different feedstock used in soil incubation study and soil CO2 emission during the study determined using base trap. Biochar and soil carbon and nitrogen pools were determined using different wet chemical extraction and relationships between biochar properties and soil respiration assessed. In addition, biochar of sugarcane bagasse feedstock produced under different peak-temperatures and with/out steam-activation were evaluated for their metal removal capacity from water using adsorption assays. The different biochars were also evaluated for their elemental composition and physical properties.

Results
Soil respiration and CO2 release from biochar-amended soils was feedstock and application rate dependent. Vegetative feedstock resulted in higher CO2 emission than woody feedstock biomass. Biochars available carbon and total nitrogen were best parameters to predict soil CO2 emission. Pyrolysis peak temperature and activation affected sugarcane bagasse biochar?s ability to remove heavy metals from water. Removal efficiency seemed to be dependent on biochar ash content, with biochar of high pyrolysis peak-temperature and/or activation having the highest ash and best metal removal performances.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
403	Waste Disposal, Recycling, and Reuse
605	Natural Resource and Environmental Economics

Outcome #6

1. Outcome Measures

Creation of new knowledge in horizontal directional drilling mud co-product use and impact.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Increase in oil & gas exploration and production at the Marcellus and Utica shale require corresponding increase in pipeline infrastructure to transport the product from production wells to processing facilities and end-users. Horizontal directional drilling (HDD) is used for installation of pipeline. HDD uses bentonite in the process and generates spent mud that require proper disposal. Use of the spent mud as soil amendment is a potential alternative to offsite removal for dewatering and landfilling. Yet, the environmental and agronomic implications of its land use are not clear. Main concerns include excess salts and clay, which can adversely affect soil productivity and hydrology.

What has been done
This research aimed at understanding the impact and development of management practices for the use of the spent HDD mud as soil amendment. Ten experimental sites composed of different soil types amended with different rates of spent mud established during late fall of 2014 and are monitored for soil physical, hydrological, and chemical properties, as well as moisture content, and plant growth. In addition, a short incubation study and pot experiments, using 17 different soil types, was conducted and plant growth and soil solution composition determined.

Results
Independent of mud application rate (up to 79 Mg mud ha-1[ca. 35 short tons per acre]), no adverse effect of spent mud application on soil chemistry or crop yield was found. Short incubation and pot studies, with mud application rate of up to 702 Mg mud ha-1, showed additive increase in soil salinity and sodicity with mud application rate. Yet, and amid the extremely high mud application rates used in the incubation study soil salinity and sodicity where below threshold considered limiting productivity of salt-sensitive plants or detrimental to soil aggregate stability. Moreover, increase application rate seemed to improve soil ability to retain ammonium, likely to be absorbed within smectite mineral interlayers. This may have positive implications for nitrogen

cycling, especially in sandy weathered soils.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
131	Alternative Uses of Land

Outcome #7

1. Outcome Measures

Amphibian Reproductive Success and Diet Selection in Mitigated Wetlands of the Central Appalachians

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 provide valuable habitat for wildlife, invertebrates, and plants. However, the destruction and alteration of wetlands across the U.S. has caused population declines of some fish, shellfish, furbearing mammals, waterfowl, and amphibians that rely exclusively on these areas for survival. The Clean Water Act of 1972 was the first major legislation that protected our nation's wetland resource base, but it was not until the "no net loss" policy of the late 1980s that the government actively sought to mitigate for these losses that have impacted wetland-dependent wildlife across the country. Under this policy, thousands of hectares of wetlands have been constructed to compensate for wetland destruction, but little monitoring has been conducted on the success of these newly created wetlands. The ability of a mitigated wetland to function similarly to a natural wetland is important for judging the success of a mitigation project, but function is rarely assessed. The objectives of this study were to assess the reproductive success, temporal calling patterns, and diet composition of amphibians inhabiting created wetlands relative to natural wetlands in order to facilitate determination of the adequacy of created wetlands as functional replacements of natural wetlands.

What has been done

The objectives of this study were to assess the reproductive success, temporal calling patterns, and diet composition of amphibians inhabiting created wetlands relative to natural wetlands in order to facilitate determination of the adequacy of created wetlands as functional replacements of natural wetlands. To evaluate reproductive success, we compared the abundance of amphibian metamorphs and survival and growth of larval amphibians in created wetlands relative to natural wetlands. Our results suggest that the function of providing adequate breeding habitat for generalist amphibians such as green frogs and spring peepers is being fulfilled by the created wetlands that were examined. We compared the occupancy and detection of calling anurans in created wetlands relative to natural wetlands to assess temporal calling patterns. We conclude that the function of providing adequate breeding habitat for adult anurans is being fulfilled by the created wetlands that were examined. To assess the diet composition of amphibians, we measured the diet composition of adult red-spotted newts and compared the selection of prey by newts between created and natural wetlands. Our results suggest that the function of providing an adequate prey base for a generalist wetland predator such as the red-spotted newt is being fulfilled for the created wetlands that were examined.

Results

This long-term study was designed to improve wetland creation and design. The outcome will be a savings of money by creating more effective wetlands and improving overall ecological health of wetlands. We have made a number of professional presentations and published papers as outlined above. I have led a walk on amphibians and wetlands to about 30 to 40 members of the general public each year for the past 10 years explaining wetland mitigation and the importance of wetlands and amphibians to the environment.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity

Outcome #8

1. Outcome Measures

Water economics: examining economic and social incentives to protect and conserve water resources

2. Associated Institution Types

- 1862 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)

Water is an essential element for life as we know it. However, for water to be essential, it must be of sufficient quality so that it supports human and ecological uses. According to the latest water quality assessment report, about one-third of West Virginia's rivers and streams do not meet their designated use and are considered impaired. Water resources and energy development are closely related. Expanded development of natural gas production in Marcellus shale creates additional pressures on the quality of water resources. In this research, we are examined how location of Marcellus shale drilling sites might affect watershed scale conditions given preexisting conditions (e.g., geology, previous mining, and residential development).

What has been done

This long-term research project used economic and social science analysis tools to evaluate non-regulatory solutions to nonpoint pollution problems and the economic impacts of water quality protection measures. We developed a GIS-based tool for modeling scenarios to protect water resources. We have developed a scenario modeling approach for nine 8-digit hydrologic unit code (HUC) watersheds that intersect the primary MTR-VF mining region within West Virginia and Kentucky. These include the Elk River, Gauley River, Upper Kanawha River, Coal River, Upper Guyandotte River, Lower Guyandotte River, and Twelve-Pole Creek watersheds within West Virginia and the Upper Cumberland watershed within Kentucky. The Tug Fork forms the border between West Virginia and Kentucky and drains land area in both states.

Results

The model may be used to predict water conditions in West Virginia and Kentucky under different land use and policy scenarios.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
605	Natural Resource and Environmental Economics

Outcome #9

1. Outcome Measures

Number of participants who increase their knowledge of land use related to climate variability and change.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1500

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Highway construction, coal mines, urban construction, and other disturbances require reclamation practices to re-instate a proper vegetation community. For example, landowners near New Martinsville were evacuated as a result of a Chlorine gas leak from several railcars at the Axiel Plant. Three hundred families left their homes until the vapor cloud dissipated. Vegetation in the area were killed, and buildings, cars, and other personal belongings were destroyed or damaged. Lawsuits are ongoing to compensate individuals for their losses.

What has been done
WVU and WVSU Extension faculty held informational sessions on reclamation and revegetation practices. They trained participants in using techniques such as replanting the grass, vegetable gardens, and trees that died as a result of the corrosive and deadly gas cloud.

Results
Participants gained knowledge on how to create productive and sustainable post-disturbance land use.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land

Outcome #10

1. Outcome Measures

Number of participants who increased their knowledge and skill in using biological control agents.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	270

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Recommendations that are based on local research trials evaluating production and production costs will provide the most information for a grower to make informed decisions for their farming operation. They need information about biological control in order to reduce populations of pests such as insects and weeds.

What has been done
The Extension Implementation Program (EIP) provided expertise in greenhouse and high tunnel IPM. Technical assistance was provided to the several small growers in the state interested in utilizing biocontrol agents in their operations. Weather stations were deployed with four high tunnel growers to evaluate the effectiveness of this tool. Trainings were held for agriculture service providers or as part of the WVU NE SARE PDP programming efforts. A website hosted at WVU (http://anr.ext.wvu.edu/sustainable-ag/sare) and social media sites [facebook page SARE in WV and twitter SARE in WV #SAREinWV] act as clearinghouses for information on sustainable agriculture topics.

Results
More than 20 service providers and over 250 farmers increased their knowledge about biological control agents through the WVSU NE SARE PDP program and were better able to manage their operations.

4. Associated Knowledge Areas

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

212 Pathogens and Nematodes Affecting Plants

Outcome #11

1. Outcome Measures

Creation of new knowledge concerning the effects of human impacts on riverine and watershed microbial ecosystem services.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Watersheds are critical for a variety of essential and often conflicting uses including the provision of drinking water and industrial manufacturing. Managing watersheds for long-term viability requires understanding how to manage the microbial processes that provide biodegradation and bioremediation services.

What has been done
A long-term project has been initiated through the NSF Appalachian Freshwater Initiative grant to study the microbial processes in association with the chemical and hydrological dynamics in the Kanawha River and its watershed. Chemical sampling of river water and sediment, and microbial diversity sampling, were started in the Kanawha River.

Results
Metagenomic sampling of the Kanawha River sediment microbiome was conducted in one location in South Charleston. Standard water quality chemical variables were sampled at five locations along the River. Analysis of these samples is underway.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

Weather issues caused demonstration sites to not germinate or push implementation behind forcing a delay in results. These issues were out of the control of the extension personnel, but were handled as quickly as possible.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

WVU-AFES

WVU Experiment Station research program evaluation takes place at two levels and on two different time cycles. All programs will be evaluated using these general criteria plus additional criteria tailored to each specific program as detailed in the Plan of Work under Outputs and State defined Outputs and Outcomes.

Annual evaluation will continue as before, looking at productivity in terms of immediate impact

- Professional presentations
- Referee journal articles and books
- General audience papers and news reports
- M.S. and PhD graduates
- Trends in terms of competitive funding

And in terms of longer-term impact:

- Citations in scientific journals
- Patents
- Successful technology transfer or start-ups based on research programs
- Awards based on continuing impact and research excellence

Every five years there will be a full portfolio review including:

- Long term productivity
- Relevance to our constituent groups and the State and Region
- The allocation of research inputs among the programs
- Consideration of eliminating some research programs that are not productive or have diminished relevance given NIFA and State priorities
- Consideration of adding additional program areas given NIFA and State priorities

This portfolio review will be conducted internally by a committee appointed by the Dean

and externally by a committee composed by a subset of our College Visiting Committee.

Evaluation

Research related to environmental quality: climate change, fisheries and wildlife, environmental economics and water science have always been strengths of our College. Those strengths fit will with the needs of our State clientele, with many of our rivers and streams polluted from acid mine drainage and deforestation. We have received strong public support for a long term project we conducted jointly with the State Department of Natural Resources. The history and results of that project were detailed in a PBS documentary titled "The Stewards of Shaver's Fork," that was released in 2016 and has since received very strong positive feedback. While this general area is a strength of the College, the resources supporting our programs have dwindled over the past several years as EPA and DOE funding has declined. We worry that this trend will continue given the current political climate regarding research related to climate change. In goal area 1 we documented the positive impacts from investment in our Plant and Soil Science and Animal and Nutritional Science divisions. We have made investments in our new Water Science and Security Center and are starting to see the benefits of that investment. We are cautious about investing further in the environmental quality area because of concerns about the funding picture for science in general and environmental quality and climate change in particular.

WVSU

During the workshops, evaluations were administered to determine how many participants increased in knowledge. Due to the nature of many of these workshops being hands-on and outdoors in nature, many evaluations were more verbal and informal rather than tangible. Of the tangible evaluations, approximately 75% of the participants showed an increase in knowledge of the topics at hand.

Key Items of Evaluation

WVU-AFES
We have a strong constituency in the State that supports our work in environmental quality and climate change. However, the unfavorable future funding climate makes it difficult for us to invest in this important area.

WVSU
During the workshops, evaluations were administered to determine how many participants increased in knowledge. Due to the nature of many of these workshops being hands-on and outdoors in nature, many evaluations were more verbal and informal rather than tangible. Of the tangible evaluations, approximately 75% of the participants showed an increase in knowledge of the topics at hand.

WVUES
The evaluation of many wildlife programs were included in the Integrated Pest Management Program. Other programs were evaluated using our client and peer-review forms.

V(A). Planned Program (Summary)

Program # 3

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
101	Appraisal of Soil Resources	0%	0%	0%	10%
102	Soil, Plant, Water, Nutrient Relationships	0%	0%	0%	10%
123	Management and Sustainability of Forest Resources	0%	0%	0%	10%
131	Alternative Uses of Land	25%	0%	10%	5%
133	Pollution Prevention and Mitigation	25%	0%	10%	0%
201	Plant Genome, Genetics, and Genetic Mechanisms	0%	0%	0%	20%
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%	0%	0%	10%
403	Waste Disposal, Recycling, and Reuse	50%	50%	20%	15%
511	New and Improved Non-Food Products and Processes	0%	50%	35%	20%
605	Natural Resource and Environmental Economics	0%	0%	15%	0%
610	Domestic Policy Analysis	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	1.0	0.0	3.0	4.5
Actual Paid	8.0	0.0	3.0	4.5
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
340000	0	127760	615295
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
329881	0	248317	334510
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
669881	0	233787	508130

V(D). Planned Program (Activity)

1. Brief description of the Activity

This activity involves research and extension programming on biofuel and bioenergy production. The program so far is focused on examining different biomass feed stocks for the production of biofuels (ethanol, biodiesel, syngas) and biomaterials, nondestructive methods for characterizing the physical and chemical properties of lingo-cellulosic biomass, and syngas production from co-firing coal and biomass. The feed stocks examined so far include algae, switchgrass and mixed grasses, and residual woody biomass from forestry operations.

WVU-AFES

Several related projects are researching production of biofuels and bioproducts from biomass. Woody biomass is being examined as the potential main feedstock for a wide array of bioenergy projects due to its widespread availability throughout the State and the fact that it can be used as either a combustion fuel or as a feedstock for the development of liquid fuels, while simultaneously creating environmental and economic benefits for the region. However, the development of these bioenergy projects will be incumbent on the ability to source feedstocks at sufficient quantities and competitive prices for economically feasible biofuel production.

Research program highlights for 2016 include:

· Thermochemically Modified Woody Biomass for Value-Added Material Application.
· Another project titled "Ecosystem Service Restoration: Achieving Resilience in Communities Impacted by Dynamic Land Use Change in West Virginia," is looking at mitigating the impacts of mountaintop removal mining on ecological services and communities in West Virginia.
· Another is developing a decision support system to aid in planning biomass-based energy development in the Northeast.

WVU-ES

The Sustainable Energy planned program at WVUES works toward energy independence to develop biomass use for biofuels by designing optimum forestry and crops for bioenergy production and improving water quality in the state. Educational topics include: reclamation of Marcellus well sites, switchgrass potential for minesoils, bioenergy crops on surface mines, flow effects on acidity, biomass for bioenergy, switchgrass biomass stewardship, biomass issues for forest management plans, an This year educational programs in this planned program that reached 1300 adults.

WVSU-GRDI

WVSU Agricultural and Environmental Research Station research efforts are focused on improving thermophilic digestion of poultry waste, developing anaerobic microbial energy conversion, and increasing awareness of soil remediation technology among mining operators and agencies. We have expanded into studying the functional role of additional oil biosynthesis genes in Arabidopsis and translate the proven examples from the model plant to a dedicated bioenergy crop for the production of bioenergy.

· A bioenergy crop was genetically engineered to accumulate less carbohydrate and more oil in its tissues.

· Increased carboxylate production was demonstrated in a thermophilic anaerobic digester.

2. Brief description of the target audience

The target audience for this program area includes the bio-fuels and materials industries, the electricity generating industry, foresters, digester manufacturers and users, poultry farmers, other agricultural waste producers, environmentally concerned citizens, undergraduate and graduate students, engineers and scientists who study bioreactors and anaerobic microbial processes, mine operators, mine reclamation contractors, land owners, farmers, related energy industry sector, environmental scientists and engineers, small and large scale commercial biotech and chemical companies and local coal power companies researchers, regulators, policy makers.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1306	35	2	8

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	8	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of general press articles

Year	Actual
2016	1

Output #2

Output Measure

- Number of educational materials create or updated

Year	Actual
2016	2

Output #3

Output Measure

- Number of workshops and other educational presentations for clients

Year	Actual
2016	33

Output #4

Output Measure

- Number of professional/academic presentations

Year	Actual
2016	12

Output #5

Output Measure

- Number of graduate students earning degrees

Year	Actual
2016	5

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of participants who increase awareness of beneficial use of waste and byproducts to improve soil productivity and ecological services.
2	Number of stakeholders participating in production/harvesting/storage systems that increase or improve their skills.
3	Number of youth who gain science process skills in biofuels.
4	Number of participants who adopt BMPs for production/harvesting/storage systems.
5	Number of new processes for converting lignocellulose to usable sources of energy.
6	Increase in the percentage of renewable sources of biomass co-fired with coal (% increase per year).
7	Number of improvements to the operational parameters that have been used to control thermophillic poultry waste digesters.
8	Creation of new knowledge concerning how microbial diversity gives rise to anaerobic microbial energy conversion and anaerobic digestion.
9	Improve the energy density of plants for sustainable production of bioenergy
10	New knowledge concerning the effectiveness of current mine site reclamation methods for restoring soil microbial processes
11	Thermochemically Modified Woody Biomass for Value-Added Material Application
12	Ecosystem Service Restoration: Achieving Resilience in Communities Impacted by Dynamic Land Use Change in West Virginia

Outcome #1

1. Outcome Measures

Number of participants who increase awareness of beneficial use of waste and byproducts to improve soil productivity and ecological services.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The challenge to landowners is to produce food while establishing an ecological balance which will prevent soil fertility or pest problems. Rather than a defensive approach which treats problems after they emerge, proactive agro-ecosystem approach is needed.

What has been done
WVUES educators provided training to landowners on how to apply wastewater sludge, wood wastes, fly ash and chicken litter to soils in order to increase the nutrient content of soils.

Results
Participants applied wastewater sludge to farmland soils throughout the state,
Participants applied wood wastes from sawmills to soils or reclaimed sites.
Participants applied to surface mines or other areas that apply fly ash from power plants.
Participants applied chicken litter spread to farm soils for nutrients.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
131	Alternative Uses of Land

Outcome #2

1. **Outcome Measures**

Number of stakeholders participating in production/harvesting/storage systems that increase or improve their skills.

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Number of youth who gain science process skills in biofuels.

Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

Number of participants who adopt BMPs for production/harvesting/storage systems.

Not Reporting on this Outcome Measure

Outcome #5

1. **Outcome Measures**

Number of new processes for converting lignocellulose to usable sources of energy.

Not Reporting on this Outcome Measure

Outcome #6

1. **Outcome Measures**

Increase in the percentage of renewable sources of biomass co-fired with coal (% increase per year).

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

Number of improvements to the operational parameters that have been used to control thermophillic poultry waste digesters.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Organic wastes wastes can be converted into bioenergy (methane) through anaerobic digestion. The use of anaerobic digestion has been growing in the US but still lags far behind. Anaerobic digestion is especially suited for animal farms and has been widely used for cattle production, but is still underutilized by the poultry industry which is important in West Virginia. The performance efficiency of anaerobic digesters is also known to vary for unknown reasons; diagnosis and engineering of the microbial system may improve reliability and performance. Anaerobic bioreactors may also be used for producing valuable platform chemicals for chemical syntheses by the chemical industry.

What has been done

Our research is aimed at advancing thermophilic anaerobic digestion technology by improving the stability and efficiency of the process. We have two projects that address the issue of improving operational controls in anaerobic digestion. First, we have been setting-up a new pilot-scale (2 cubic meter) thermophilic bioreactor that will be used for anaerobic digestion, bioenergy, and future biomass-to-bioproduct research. This project is funded by a USDA 1890 Research Capacity Building Grant. A second major project is an ongoing long-term experiment to study the properties of stability and adaptation in thermophilic digesters which have the reputation of being less stable.

Results

The set-up of the two cubic meter bioreactor has involved the placement of the vessel in a dedicated, semi-enclosed, high-roof laboratory building located at the WVSU AERS facility on campus. Feed storage and effluent storage tanks have also been placed in the building as well as the construction of a spill containment barrier which is required by WV DEP regulations.

Electrical cables have been placed underground and embedded in concrete to meet University safety requirements. The internal wiring in the building is underway but not yet complete. The installation will be finished in 2017. For our second project, we have measured digester stability in terms of degrees of variance through the metabolic network that gives rise to methane. This research was done using a set of replicate laboratory-scale digesters.

4. Associated Knowledge Areas

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

Outcome #8

1. Outcome Measures

Creation of new knowledge concerning how microbial diversity gives rise to anaerobic microbial energy conversion and anaerobic digestion.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Microbial diversity encompasses enormous varieties of metabolism, but harnessing these properties is challenging. Although mixed microbial consortia offer opportunities for converting organic wastes into products, our ability to engineer consortia requires research to understand the limitations and potential of mixed microbial communities. Anaerobic bioreactors may be a viable method for converting waste biomass into valuable platform chemicals, but this method needs to be optimized for mixed microbial cultures that have unique properties.

What has been done

We operated replicate anaerobic thermophilic reactors to test whether the carboxylate intermediates produced in a methanogenic reactor could be significantly increased and maintained at higher steady state levels. We continued a long-term experiment to evaluate the relationship between microbial population diversity and steady state reactor metabolic pathways. We evaluated the effect of substrate co-digestion mixtures on the performance of mesophilic digesters.

Results

The first project has shown that we can significantly increase carboxylate production in a thermophilic digester that was stabilized on poultry farm waste. We have increased the concentration of acetate (C2), propionate (C3), butyrate (C4), and valerate (C5) while maintaining stable reactor performance. We have also found that reactors set up as replicates can achieve different levels of increased carboxylate production which was unexpected. In a second experiment, we evaluated the recovery of a thermophilic digester that had been stressed by adding crude glycerol as a co-substrate. This reactor showed a very slow recovery indicating that the capacity of digesters to handle crude glycerol as a feedstock varies considerably. We also contributed to a project that investigated the value of microalgae biomass as a co-substrate in mesophilic digesters treating poultry farm wastes.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
403	Waste Disposal, Recycling, and Reuse

Outcome #9

1. Outcome Measures

Improve the energy density of plants for sustainable production of bioenergy

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Enhancement of energy density in plants can be achieved by synthesizing and accumulating oils in the biomass/seeds. After extraction of oils lingocellulosic feedstock remains behind can be used in microbial processes or value added products. Thus, we aim to study the functional role of oil biosynthesis genes in Arabidopsis and translate the proven examples from the model plant to the dedicated bioenergy crop.

What has been done
Low oilseed crop yield, competition for resources, and interference with world food demand limit the current supply for the production of biodiesel. One approach is to increase the availability of feedstock, for the production of biodiesel, is to increase oil content in vegetative tissues/biomass,

where oil does not normally accumulate. Few attempts have been made to increase oil in vegetative tissues. For example, we engineered the over-expression of the transcription factor WRINKELED1 (WRI1), which is required for oil accumulation, in Arabidopsis.

Results
We engineered the over-expression of the transcription factor WRINKELED1 (WRI1), which is required for oil accumulation, in Arabidopsis. At the same time we reduced the expression of enzyme, which is involved in starch biosynthesis, using an RNAi approach, in the leaf and roots of these plants. The resulting transgenic plants accumulated less carbohydrate (starch) and more oil in the vegetative tissues of Arabidopsis.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
511	New and Improved Non-Food Products and Processes

Outcome #10

1. Outcome Measures

New knowledge concerning the effectiveness of current mine site reclamation methods for restoring soil microbial processes

2. Associated Institution Types

- 1862 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	300

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
When topsoil is applied to mine sites, the process introduces microbes back onto the site to restore soil nutrient cycling and productivity.

What has been done
A professor at WVUES and another at WVSUES are working together on mining and reclamation related issues. They have a grant to do a reclamation and water quality monitoring project on a

mining site in southern WV. Efforts by WVUES and WVSUES to bring this new knowledge about applying top soil to mine sites were ongoing this year at every site that does reclamation in West Virginia.

Results
In West Virginia, reclamation sites adopting this method of adding topsoil to mine sites are being added each year.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
131	Alternative Uses of Land
403	Waste Disposal, Recycling, and Reuse
511	New and Improved Non-Food Products and Processes

Outcome #11

1. Outcome Measures

Thermochemically Modified Woody Biomass for Value-Added Material Application

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)
This is a basic science project to advance the understanding of the mechanical, electrical, physical, and chemical nature of thermochemically treated wood (i.e., biochar or bio-carbon). Specifically, the project aims to establish how the thermochemical treatment processing parameters influence the mechanical and electrical properties of the bio-carbon and how these factors influence the properties of composites made by combining polymers and bio-carbon. The rationale for this project is that a better fundamental understanding of how the thermal treatment process on wood influences the mechanical and electrical conductivity properties of the resulting bio-carbon particles will lead to the successful use of these materials in composites and sensor applications.

What has been done
To meet the project goals, biomass material (mainly woody type biomass) is being thermochemically treated. Upon treatment, the resulting bio-carbon are evaluated for physical, thermal, electrical, and chemical properties. The bio-carbon is then processed into a variety of micro and nano-sized particles and used to make sensor film and composite materials. The resulting composite materials will then be evaluated for properties required given their intended end-use applications.

Results
We analyzed the influence of final carbonization temperature on the properties of the resulting biochar material and the testing of sensor materials from thermally modified biomass (i.e.,carbonized wood), in particular yellow-poplar, red oak, and short rotation willow. Research was performed to look at using carbonized hardwoods to make sensors that could be used in a variety of applications such as temperature and pressure monitoring, and as general touch sensors. The use of carbonized hardwood has potential for being used for electrical sensing, energy storage, composite, and fuel cell applications. The research during this period investigated how various carbonization temperatures influence the carbon content, pore size, surface area and electrical conductivity of the produced bio-based carbon material. The project was able to take low-value hardwoods and convert them through thermal processing into high value conductive particles that were then used for sensor and composite applications. Eventually these technologies may be used to increase the economic value of hardwood products and by products.

4. Associated Knowledge Areas

KA Code	Knowledge Area
403	Waste Disposal, Recycling, and Reuse
511	New and Improved Non-Food Products and Processes

Outcome #12

1. Outcome Measures

Ecosystem Service Restoration: Achieving Resilience in Communities Impacted by Dynamic Land Use Change in West Virginia

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)

Land-use change associated with mountaintop mining in the Central Appalachian region associated has contributed to the loss of natural, biologically diverse landscapes, replacing them with degraded and polluted landscapes. Deforestation, soil compaction, topsoil loss, alteration of hydrologic flow regimes and coal processing waste practices associated with mining operations have significantly altered the ecology of region, pose serious threats to the human health and have endangered a culture that has existed for generations. Further land-use change and loss of ecosystem services within a region already vulnerable to environmental and health risks have the potential to be devastating. The primary objective of this project is to find solutions to large scale landscape ecology problems caused by land-use change through community scale initiatives that evaluate current ecosystem performance and develop a green infrastructure framework to restore ecological services.

What has been done

We assessed regional and community land-use patterns utilizing existing inventories as well as new classification efforts, relying on remote sensing sources such as satellite data, aerial photography and Lidar data. We integrated field studies that are useful for establishing resiliency profiles on community and regional scales; and completed local community to regional assessments of environmental resiliency. The development and evaluation of measures of resiliency was a major focus of this project enabling local and regional organizations to assess their resiliency and develop specific measures to improve their resiliency.

Results

Aspects of this study can provide a base on which to develop site specific design implementation measures for communities that will result in improved community resiliency by using alternative low cost construction measures such as bio-retention for storm water control and water recycling. Currently, such plans are being developed for southern McDowell County WV and plans are in the early stages of development for Raleigh and Fayette Counties WV. Many of the methods being utilized to document land use changes and the potential contributions of these changes to declining ecosystem resiliency, are well established, but had not been systematically applied to a range of focus areas in the central Appalachians. The linking of these methods to developing effective ways to involve communities in the design and implementation process for improving ecosystem resiliency through focused design charrettes and landscape visualization.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land
605	Natural Resource and Environmental Economics

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

Brief Explanation

None

V(I). Planned Program (Evaluation Studies)

Evaluation Results

WVU-AFES

WVU Experiment Station research program evaluation takes place at two levels and on two different time cycles. All programs will be evaluated using these general criteria plus additional criteria tailored to each specific program as detailed in the Plan of Work under Outputs and State defined Outputs and Outcomes.

Annual evaluation will continue as before, looking at productivity in terms of immediate impact

- Professional presentations
- Referee journal articles and books
- General audience papers and news reports
- M.S. and PhD graduates
- Trends in terms of competitive funding

And in terms of longer-term impact:

- Citations in scientific journals
- Patents
- Successful technology transfer or start-ups based on research programs
- Awards based on continuing impact and research excellence

Every five years there will be a full portfolio review including:

- Long term productivity
- Relevance to our constituent groups and the State and Region
- The allocation of research inputs among the programs
- Consideration of eliminating some research programs that are not productive or have diminished relevance given NIFA and State priorities
- Consideration of adding additional program areas given NIFA and State priorities

This portfolio review will be conducted internally by a committee appointed by the Dean

and externally by a committee composed by a subset of our College Visiting Committee.

Our evaluation of this goal area is the same as for goal area 2. Research related to environmental quality: climate change, renewable energy, fisheries and wildlife, environmental economics and water science have always been strengths of our College. Those strengths fit will with the needs of our State clientele, with many of our rivers and streams polluted from acid mine drainage and deforestation. We have received strong public support for a long term project we conducted jointly with the State Department of Natural Resources. The history and results of that project were detailed in a PBS documentary titled "The Stewards of Shaver's Fork," that was released in 2016 and has since received very strong positive feedback. While this general area is a strength of the College, the resources supporting our programs have dwindled over the past several years as EPA and DOE funding has declined. We worry that this trend will continue given the current political climate regarding research related to climate change. In goal area 1 we documented the positive impacts from investment in our Plant and Soil Science and Animal and Nutritional Science divisions. We have made investments in our new Water Science and Security Center and are starting to see the benefits of that investment. We are cautious about investing further in the environmental quality area because of concerns about the funding picture for science in general and environmental quality, renewable energy and climate change in particular.

Key Items of Evaluation

WVU-AFES
We have a strong constituency in the State that supports our work in environmental quality, biofuels and climate change. However, the unfavorable future funding climate makes it difficult for us to invest in this important area.

WVUES - None to report in this area.

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Childhood Obesity, Nutrition and Health

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
501	New and Improved Food Processing Technologies	0%	0%	15%	0%
502	New and Improved Food Products	0%	0%	15%	0%
701	Nutrient Composition of Food	0%	20%	0%	0%
702	Requirements and Function of Nutrients and Other Food Components	10%	0%	20%	0%
703	Nutrition Education and Behavior	30%	30%	30%	0%
724	Healthy Lifestyle	30%	20%	20%	0%
801	Individual and Family Resource Management	10%	0%	0%	0%
802	Human Development and Family Well-Being	10%	10%	0%	0%
806	Youth Development	10%	20%	0%	0%
	Total	100%	100%	100%	0%

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	4.0	4.0	0.0
Actual Paid	13.0	1.5	5.0	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**
375000	75517	312574	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
637094	51115	833661	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
1012094	145731	1137719	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

West Virginia citizens have the second highest level of obesity in the nation. West Virginia is also above the national averages for incidence of diabetes, high blood pressure, and cardiovascular disease, as well as for osteopenia and osteoporosis.

WVU-AFES

Station research in human nutrition and health is focused on determining the current and potential impacts of diet, nutritional education and dietary intervention on obesity and obesity related conditions (diabetes, elevated cholesterol and plasma lipids, heart attack, stroke and some cancers). The program also is testing the efficacy and safety of bioactive compounds in foods, including krill protein, and is developing omega-3 DHA enhanced diets and educational programs to support their adoption.
Research program highlights for 2016 include:

- Several related projects are assessing and addressing individual and environmental factors that influence eating behavior of young adults with the goal of reducing obeasity and obesity-related illnesses
- Another new study is looking at the effects of dietary conjugated linoleic acid on adipose tissue deposits and insulin resistance.
- A third study aims to change the health trajectory for older adults through effective diet and activity modification.

WVUES

In 2016, the childhood obesity planned program at West Virginia University Extension worked towards increasing the capacity of youth, adults, and families to make informed, science-based decisions which prevent chronic disease and maintain healthy weight status through physical activity and intake of nutrient-dense foods. There were 694 reported activities for 2016 in the Childhood Obesity and Healthy Lifestyle planned program. These activities can be grouped in the following categories:

Nutrition, Food Selection, and Preparation - The largest program in this category is the Family Nutrition Program for both low-come adults and youths. The program teaches food and nutrition by using the USDA's My Plate. Other activities in this category include nutrition classes, food preparation classes, and classes on food selection/shopping resources and techniques. Other programs in this category include: Eating a Rainbow, Rethink Your Drink, and Camp Cooking Class and cooking classes of all kinds. Specialists are working with childcare centers to promote good nutrition and physical activity for preschoolers.

Healthy Lifestyles Skills and Practice - The largest programs in this category include: Active for Life, Adult Exercise Program, ATV Safety, Stress Less with Mindfulness, Chair Yoga, Dental Health, Health Motivator, Health Rocks, West Virginia Healthy Children Project, and Up for the Challenge. Youth programs in this category are Girls on the Run, 4-H Health Officers, and 4-H Health Ambassadors.

Chronic Diseases and Associated Risk Factors - Dining with Diabetes, a cooking school for persons with diabetes and their caregivers is still being implemented in many counties, even though grant funding has ceased. The public health insurance group in the state, PEIA, has selected Dining with Diabetes as one of the programs that participants can chose to enhance their health outcomes. PEIA reimburses WVUES for each one of their participants who attend. Other initiatives address heart disease prevention such as Heart Health and Love Your Heart.

WVSU-GRDI

Programming in human nutrition and health is implemented and evaluated to educate participants on the steps necessary to improve diet and health practices that will improve overall health, including a reduction in childhood obesity and healthcare costs.
Highlights for 2016 include:
· A fitness program conducted in McDowell County showed a 90% increase in frequency and duration of physical activity among participants.

2. Brief description of the target audience

The target audience for this program area includes dieticians, nutritionists, health care professionals, policy makers, researchers, Extension educators, 4-H and other youth program developers, community leaders, low-income West Virginia adults and youth, West Virginians who have diabetes and their caregivers, and older adults and their caregivers.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	46681	6584124	273260	46993

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	15	4	19

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of general press articles

Year	Actual
2016	0

Output #2

Output Measure

- Number of educational materials create or updated

Year	Actual
2016	15

Output #3

Output Measure

- Number of workshops and other educational presentations for clients

Year	Actual
2016	17364

Output #4

Output Measure

- Number of professional/academic presentations

Year	Actual
2016	46

Output #5

Output Measure

- Number of graduate students earning degrees

Year	Actual
2016	6

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of youth who gained awareness and knowledge about eating more healthy foods.
2	Number of adults/families who gained awareness and knowledge about eating more healthy foods.
3	Number of youth who gained awareness and knowledge becoming more active.
4	Number of adults/families who gained awareness and knowledge about becoming more active
5	Number of participants that gained knowledge of how to access and produce healthy foods.
6	Number of youth who change a behavior or use a new skill related to nutrition and health such as choosing healthier foods and increasing physical exercise.
7	Number of adults/families who change a behavior or use a new skill related to nutrition and health such as choosing healthier foods and increasing physical.
8	Number of participants who train others to eat more healthy foods and/or become more active.
9	Number of delivery systems/access points that change their procedures and/or policies with regard to expanding or improving their offering healthy foods or healthy activities.
10	Number of participants who advance to higher knowledge and skill level in healthy lifestyle professional areas.
11	Assessing and addressing individual and environmental factors that influence eating behavior of young adults
12	Effect of Dietary Conjugated Linoleic Acid on Adipose Tissue Depots and Insulin Resistance

Outcome #1

1. Outcome Measures

Number of youth who gained awareness and knowledge about eating more healthy foods.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	59084

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Soda, energy and sports drinks are the 4th highest contributor of calories for people over the age of 2 and contribute over 37% of the sugar consumed. Reducing the consumption of sugar sweetened beverages could improve health and reduce obesity.

What has been done
A Rethink Your Drink campaign which includes both educational and media outreach, was established to address high rates of sugar sweetened beverage intake. Educational messages about drinking more water and less sugar sweetened beverages have been integrated into all Family Nutrition Program classes and is a key feature of community outreach. A RYD@Camp and RYD@School program has been developed to further promote the messages through week long educational and promotional activities. A media campaign using a combination of radio, TV, and digital marketing has served as additional promotion and reinforcement of messages. In 2016, over 6 million impressions were achieved with the media campaign.

Results
An evaluation of campers exposed to the Rethink Your Drink campaign showed that 4-H campers were significantly more likely to report drinking more water than those that were not exposed.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
724	Healthy Lifestyle

806 Youth Development

Outcome #2

1. Outcome Measures

Number of adults/families who gained awareness and knowledge about eating more healthy foods.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1831

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In West Virginia, adults need to learn skills to assist them in living healthy lifestyles. These skills lead to changes in behavior related to selecting and preparing healthy foods, shopping for the healthiest choices and best prices, choosing physical activities, and improving food safety behaviors.

What has been done
The Family Nutrition Program (SNAPed and EFNEP) in West Virginia enrolled 1639 adults and children in its family program which include training workshops for adults at community centers, public school, churches, elderly service centers, adult education and job training centers, health fairs, and the like. Of those 1240 adults graduated from the program. The WVSU EFNEP enrolled 130 adults who have families to support. They offered training workshops in three counties at locations that have a population that is need of life skills and assistance such as local recovery centers and mental health sites.

Results
78% (1428 of 1831) participants showed improvement in one or more food resource management practice (i.e. plan meals, compare prices, does not run out of food or uses grocery lists).
85% (1556 of 1831) participants showed improvement in one or more nutrition practice (i.e. plans meals, makes healthy food choices, prepares food without adding salt, reads nutrition labels or has children eat breakfast).
54% (988 of 1831) participants showed improvement in one or more food safety practice (i.e. thawing and storing foods correctly).
85% of adult participants reported a positive change in food group intake.
All reported levels of healthy eating index showed improvement at exit of adult program.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
724	Healthy Lifestyle
801	Individual and Family Resource Management

Outcome #3

1. Outcome Measures

Number of youth who gained awareness and knowledge becoming more active.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	7784

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The CDC (2010) cites the need for better youth health education to address problems related to childhood obesity in West Virginia. It is also a priority of the programs to educate the parents and caregivers of youth in order to assist them in making healthier decisions for our children. Furthermore, the physical education program in schools has decreased in frequency and entertainment that encourages little mobility, which opens the door to more youth leading increased sedentary lifestyles.

What has been done
The Youth EFNEP program at WVSUES implemented programs for middle school youth in the Cedar Grove and Charleston areas. Six lessons were implemented at 3 local middle schools and after school programs created for recent flood victims. Lessons on food safety, food preparation, physical fitness, and nutritious eating were offered using the Choose Health: Food, Fun and Fitness curriculum. As youth participated in the program, they were provided examples of healthy

meal options label reading, and fitness activities. WVUES has similar programs.

Results
Our results show that student's spare time sedentary activities, such as video games and watching television, increased to larger episodes of physical activity by 48%. Along with this, we also see a greater awareness of how important exercise and physical activity is for the body and healthy development. In the WVUES Family Nutrition Program, 37% of the youth increased their physical activity.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
806	Youth Development

Outcome #4

1. Outcome Measures

Number of adults/families who gained awareness and knowledge about becoming more active

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	570

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Those who work with or care for children need help in developing and implementing effective, practical healthy lifestyle strategies in early childhood that can be sustained throughout a lifetime. The environment and certain behavioral barriers hinder families from accessing and/or choosing a high quality diet and recommended levels of physical activity.

What has been done
In partnership with other universities and community and statewide organizations, WVUES is implementing the WV Healthy Children Project in three counties with staff and parents from 26 childcare settings. In partnership with Keys4HealthyKids, WVUES is implementing the Key 2 a Healthy Start program in 61 child care centers throughout WV. Key 2 a Healthy Start is a quality improvement initiative for child care programs. Both programs aim to improve the eating, physical

activity and screen time practices of children and their families by implementing strategies in child care settings. Staff and parents from 26 childcare settings received training.

Results
Providers and parents of children ages 3-5 gained research-based knowledge regarding healthy eating, physical activity and screen time practices for young children. Policy and environmental changes related to healthy eating, physical activity, outdoor play, gardening and screen time were implemented in participating childcare settings.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
802	Human Development and Family Well-Being

Outcome #5

1. Outcome Measures

Number of participants that gained knowledge of how to access and produce healthy foods.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	102

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Diabetes the 67h leading cause of death in the USA, and is the 6th cause of death in West Virginia adults. Hence, there is a critical need to reach those individuals with diabetes who are not accessing health care in a knowledgeable, optimal manner.

What has been done
Dining with Diabetes cooking classes were taught by WVU Extension Educators and Health Care Professionals in five counties in 2016. This program includes a curriculum-based lesson, demonstration of recipes, food tasting, exercise component, and discussion.

Results
Results of the evaluation of Dining with Diabetes program this year showed that there was significant self-reported improvement eating a variety of fruits and vegetables, considering portion

sizes when making meal choices, and reviewing the food label before eating. Also worth noting is the fact that on average, in the post-results, respondents ate a variety of fruits and vegetables about five out of seven days a week, considered portion about six out of seven days, and reviewed the food label before eating for about five out of seven days a week. Results also showed that there was statistically significant improvement in respondents? behavior of eating baked fish (prepared with little or no added fat), and/or not eating fried foods or drinking sugary beverages.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
724	Healthy Lifestyle

Outcome #6

1. Outcome Measures

Number of youth who change a behavior or use a new skill related to nutrition and health such as choosing healthier foods and increasing physical exercise.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	19996

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Although children and adolescents are generally more active than adults, many still do not meet the recommended guidelines for physical activity. According to the CDC, children and adolescents should have 60 minutes (1 hour) or more of physical activity daily including aerobic, muscle-strengthening, and bone-strengthening activities. Among West Virginia's children aged 2 years to less than 5 years, 14.4% were overweight (85th to < 95th percentile BMI-for-Age), and 13.7% were obese (≥ 95th percentile BMI-for-Age.

What has been done

The Family Nutrition Program (SNAPed and EFNEP) in West Virginia enrolled 19921 children in its family program which include training workshops for adults at community centers, public school, churches, elderly service centers, adult education and job training centers, health fairs, and the like.

Results
42% of the youths enrolled (3543)in the Family Nutrition Program throughout the state of WV improved their food safety practices.
36% of the youths enrolled (2746) in the Family Nutrition Program throughout the state of WV increased their daily physical activity.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle
802	Human Development and Family Well-Being

Outcome #7

1. Outcome Measures

Number of adults/families who change a behavior or use a new skill related to nutrition and health such as choosing healthier foods and increasing physical.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	877

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Heart disease is one of the leading causes of death of women in West Virginia. Programming is needed to raise awareness of the risk factors and prevention methods associated with heart disease in women. Resources and information on heart health, specifically for woman are needed.

What has been done
The Love Your Heart Partnership is a collaboration led by WVUES in partnership with nine organizations. LYHP educates, motivates, and supports women to: 1) assess their personal/family

heart disease risks; 2) identify and set personal/family goals to reduce risks; and 3) take action to pursue goals. The project includes culturally-tailored program strategies for rural women (ages 25-60) woman-to-woman dissemination of Heart Truth® messages, and a public media campaign. Direct education activities were conducted in six geographic areas. LYHP activities reached participants in 39 of West Virginia,s 55 counties which covered 70% of the state.

Results
469 of the women who were reached by this project participated in an evaluation.
98.5% of participants felt motivated by the LYH program to make important life changes, especially eating healthier foods.
99.3% rated presentations as easy to understand
97.2% said they gained new heart health information.
When comparing LYHP participant group responses, knowledge gain was evenly distributed across the age categories. This verifies the need for heart health education for women at every stage in life.

4. Associated Knowledge Areas

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

Outcome #8

1. Outcome Measures

Number of participants who train others to eat more healthy foods and/or become more active.

Not Reporting on this Outcome Measure

Outcome #9

1. Outcome Measures

Number of delivery systems/access points that change their procedures and/or policies with regard to expanding or improving their offering healthy foods or healthy activities.

2. Associated Institution Types

- 1862 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Limited resource youth suffer from food insecurity and are less likely to attend summer camping due to camp fees.

What has been done
WVUES collaborated with the WV Board of Education Office of Child Nutrition and the Summer Food Service Program to include the three WVUES state camps in the Summer Foods Service Program. Statewide, over 50% of the WVU ES camps participated in the Summer Food Service Program.

Results
This collaboration resulted in providing 90 limited resource youth with meals and resulted in over $4,500 in reduced camp fees for these youth.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
806	Youth Development

Outcome #10

1. Outcome Measures

Number of participants who advance to higher knowledge and skill level in healthy lifestyle professional areas.

Not Reporting on this Outcome Measure

Outcome #11

1. Outcome Measures

Assessing and addressing individual and environmental factors that influence eating behavior of young adults

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)
Based on data from the U.S. Centers for Disease Control and Prevention, the prevalence and severity of obesity in all age, gender and socioeconomic segments of the population continues to escalate, costing the US an estimated $75 billion annually. The rate of weight gain is higher in Blacks, Native Americans Indians, and Hispanics than in non-Hispanic whites although rural whites with low socio-economic status have a higher risk. There are many serious health implications of overweight (BMI 26-29) and obesity (BMI >29), making excess body weight one of the leading causes of preventable death in the U.S. and a serious concern for the nation's health care system and overall economy. Research has shown that lifestyle interventions are more effective at reducing obesity and improving health for young adults than for older adults.

What has been done
This long-term research project is using the community-based participatory research (CBPR) design. Research investigators work side-by-side as partners with young adults to understand, develop, create, and tailor interventions desired by young adults. By using these CBPR approaches, results of this work are more likely to be effective. Grant funding was secured for this participatory research and for the resulting tailored intervention projects, as well as smaller state/local specific projects. The ultimate outcome of this work will be tailored intervention strategies and environmental support approaches that meet the young adult groups' needs in their acquisition of healthful eating behavior to prevent excessive weight gain.

Results
The research impacts from this group have the potential for extensive health care cost savings. The research outcomes target pre-symptom behaviors and those items supporting pre-symptom behaviors. Consumption of adequate amounts of fruits and vegetables is positively correlated with prevention of cancer, obesity and cardiovascular disease. A stage-tailored intervention was found to be successful in increasing fruit and vegetable intakes and advancing stage of change parameters for young adults through two modes of intervention. The findings will enable nutrition educators to more successfully reach this age group with effective nutrition education messages. Economically disadvantaged young adults, a vulnerable group for food insecurity due to limited physical and economic access to food and inadequate availability to education and health care, were impacted with this research, as measured by the sustained improvement in fruit and vegetable intake among the intervention versus control group. Application of findings will contribute to reduced health disparities among limited resource subgroups.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
724	Healthy Lifestyle
802	Human Development and Family Well-Being

Outcome #12

1. Outcome Measures

Effect of Dietary Conjugated Linoleic Acid on Adipose Tissue Depots and Insulin Resistance

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)

Intramuscular fat (IMF) is a consistent marker of insulin resistance that can lead to type II diabetes in humans. However, in livestock species IMF is a positive aspect of meat quality. IMF is the last adipose depot to develop but little is known about the cellular mechanism(s) that triggers the development of IMF vs other depots. Our goal is to understand these cellular mechanisms so that strategies to alter the development of IMF can be developed. A strategy to prevent the development of IMF in humans would improve the insulin sensitivity of skeletal muscle, and therefore the whole body; while a strategy to induce IMF development in livestock would improve the quality and the profitability of the meat produced. Both of these goals require a greater understanding of the mechanism(s) by which IMF development is induced.

What has been done

The overall goal of this project is to determine the mechanism(s) by which dietary CLA reduces body fat in pigs and rodents and enhances the IMF in pigs and how this impacts insulin sensitivity, thus establishing a model for human insulin resistance and type II diabetes. Our goal at this stage of the project is to use metabolomics analysis to determine the mechanism(s) by

which dietary CLA reduces body fat in pigs and rodents and enhances the IMF in pigs and how this impacts insulin sensitivity, thus establishing a model for human insulin resistance and type II diabetes.

Results

Based on our preliminary data, our working hypothesis is that CLA is metabolized to longer chain polyunsaturated fatty acids that impact gene expression and metabolism of adipocytes in the different depots independently. We determined that fatty acid concentrations were altered as expected, thus confirming the accuracy of the mass spec data. Additionally, we identified new biomarkers that may be important in CLA's mode of action.

4. Associated Knowledge Areas

KA Code	Knowledge Area
502	New and Improved Food Products
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components

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

School and other site location schedules, weather conditions, and changes in economy all affected the program implementation. It is challenging to keep a consistent schedule due to class schedule changes and unforeseen issues at the recovery centers.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

WVU-AFES

WVU Experiment Station research program evaluation takes place at two levels and on two different time cycles. All programs will be evaluated using these general criteria plus additional criteria tailored to each specific program as detailed in the Plan of Work under Outputs and State defined Outputs and Outcomes.

Annual evaluation will continue as before, looking at productivity in terms of immediate impact

- Professional presentations
- Referee journal articles and books
- General audience papers and news reports
- M.S. and PhD graduates
- Trends in terms of competitive funding

And in terms of longer-term impact:

- Citations in scientific journals
- Patents
- Successful technology transfer or start-ups based on research programs
- Awards based on continuing impact and research excellence

Every five years there will be a full portfolio review including:

- Long term productivity
- Relevance to our constituent groups and the State and Region
- The allocation of research inputs among the programs
- Consideration of eliminating some research programs that are not productive or have diminished relevance given NIFA and State priorities
- Consideration of adding additional program areas given NIFA and State priorities

This portfolio review will be conducted internally by a committee appointed by the Dean and externally by a committee composed by a subset of our College Visiting Committee.

Given the prevalence in West Virginia of obesity, poor nutrition and related diseases such as diabetes, this goal area is of high importance to our State constituents. We invested in faculty positions in this area over the last four years, particularly in nutritional biochemistry, clinical work and public outreach. Our investments have paid off, we are having an increasingly visible role in the State with College, WVU extension and integrated activities. We have several existing multistate NIFA grants in this area and recently secured a new one that will start next year. Our evaluation of this program is very favorable, our main issue being one of trading off teaching needs for large enrollment undergraduate classes and our research and outreach needs.

WVSU

Youth EFNEP uses a pre and post survey mandated by the National EFNEP staff at USDA. Results from the post survey show that 92% adopted and practiced 1 or more food selection behavior(s) consistent with Federal Dietary Guideline recommendations, and 53% adopt and practice 2 or more of the same; 69% of youth adopted or improved 1 or more habit(s) or behaviors related to physical activity; 43% of youth adopted and practiced 1 or more behaviors necessary to handle food safely; and 43% of youth adopted or improved 1 or more knowledge or skills necessary to prepare simple, nutritious, affordable food. 97% of youth participants improved in one or more of the program's core areas including physical activity practices, food safety, food resource management, and diet quality practices.

WVUES

An example of one evaluation in this area is the Love Your Heart Program. Partners tracked participation in LYHP activities throughout the project, and these were divided into two types of activities - direct education and indirect. Direct education activities included face-to-face interaction with participants, and ranged from screenings to comprehensive heart

health programs. This chart shows the reach of the nine partners, as well as the WVUES. It was essential for our project to have visibility and reach women in our communities. However, the messages and educational experiences must make an impact on women's knowledge and spur them to act on this new knowledge. A standardized pre/post survey was provided to the partners in their training kit. Partners collected pre/post surveys to help document participant knowledge gain, program perceptions, and planned behavior change. A sample of program participants (n=469) completed the survey. Participants were 93.4% female and 6.6% male. The age breakdown was: 8.6% under 40 years, 22.4% ages 40-59, and 69.0% over 60. Overall program effectiveness ratings were 98% excellent or good. A two-tailed paired non-parametric t-test showed statistically significant (p=0.000) improvements in five key areas of heart health, at least in the short term. Important additional survey feedback included 98.5% of participants felt motivated by the LYH program to make important life changes, especially eating healthier foods. Moreover, 99.3% rated presentations as easy to understand and 97.2% said they gained new heart health information. When comparing LYHP participant group responses, knowledge gain was evenly distributed across the age categories. This verifies the need for heart health education for women at every stage in life.

Key Items of Evaluation

WVU-AFES

Our evaluation of this program is very favorable, our main issue being one of trading off teaching needs for large enrollment undergraduate classes and our research and outreach needs.

WVUES

Each major program in the Childhood Obesity, Nutrition, and Health area has its own specific evaluation protocol.

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
501	New and Improved Food Processing Technologies	10%	0%	25%	0%
502	New and Improved Food Products	10%	0%	50%	0%
504	Home and Commercial Food Service	50%	0%	0%	0%
703	Nutrition Education and Behavior	10%	25%	25%	0%
724	Healthy Lifestyle	10%	25%	0%	0%
802	Human Development and Family Well-Being	0%	25%	0%	0%
806	Youth Development	10%	25%	0%	0%
	Total	100%	100%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	21.0	1.0	0.5	0.0
Actual Paid	15.0	1.2	1.0	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**
525000	60414	123266	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
697383	40892	167098	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
1222383	116585	72337	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The Food Safety planned program in West Virginia worked toward reducing the incidence of food-borne illness by eliminating causes of microbial resistance to contaminants, educating consumers and food safety professionals, and developing safe food processing technologies.

WVU-AFES

An integrated project conducted jointly with WVUES examined control of Salmonella in poultry products by physical and chemical treatments.

WVUES

In 2016, educational programs at WVUES in food safety fell under three major areas: community food preparation, commercial food preparation, and beef quality assurance. In 2016, there were 157 educational activities.

Community Food Preparation: The major initiatives included food preservation and canning workshops/demonstrations, and Venison 101. Other programs include Fruits Drying Program,

Commercial Food Preparation: The major initiatives include ServSafe® Manager Food Safety Training, a food business workshop, a food defense workshop, Venison 101, HACCP training, and Mid Atlantic Secure Milk Supply Program.

Members of 4-H and other youth were instructed about the proper way to wash hands through such programs as Germ City and the Germ Stops Here.

WVSU-GRDI

Programming on safe food handling was implemented and evaluated throughout the EFNEP program using weekly lessons on temperature control, food storage and cross contamination.

· The Adult and Youth EFNEP surveys showed that participants are adopting behaviors necessary for food preparation and storage.

2. Brief description of the target audience

Target groups include WV citizens who can or preserve foods, commercial food processors, beef producers, WVUES agents, youth, and residents from low to moderate income level households.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	2263	143315	3975	820

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	1	1

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of general press articles

Year	Actual
2016	0

Output #2

Output Measure

- Number of educational materials create or updated

Year	Actual
2016	0

Output #3

Output Measure

- Number of workshops and other educational presentations for clients

Year	Actual
2016	203

Output #4

Output Measure

- Number of professional/academic presentations

Year	Actual
2016	21

Output #5

Output Measure

- Number of graduate students earning degrees

Year	Actual
2016	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of participants who improve their knowledge of safe food handling practices.
2	Number of participants who increase or improve their skill in proper time and temperature controls in food preparation.
3	Number of participants who improve or increase skills in safe food handling practices such as preparing, cooking, and storing foods safely.
4	Number of participants who report using new food handling practices.
5	Number of youth who disseminate information about food safety to their families.
6	Number of youth who participate in Extension nutrition programs that receive one balanced, nutritionally correct meal per day that is prepared and held at safe.
7	Number of growers, producers, and food workers completing food safety certification.
8	Number of improved prevention, detection, control and intervention technologies adopted.
9	Number of projects characterizing social, economic, and/or cultural practices attributed to foodborne illness.
10	Control of Salmonella in poultry products by physical and chemical treatments Issue

Outcome #1

1. Outcome Measures

Number of participants who improve their knowledge of safe food handling practices.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	861

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Since many West Virginia citizens hunt deer each year, there is a need to provide scientifically-based training on proper and safe- field dressing, processing, freezing, and drying methods of venison. It is also important to disseminate basic information on tested and approved procedures in canning of venison and other meats.

What has been done
Venison 101 Food Safety and Food Processing hands-on workshops were offered this year in collaboration with WVU Davis College of Agriculture, Natural Resources and Design (WVU DCANRD) and WV Department of Natural Resources (WV DNR). This program is in high demand. Videos on safe field dressing and venison processing, created by the WVU Food Safety Specialist in 2011, are in high demand and are available on YouTube. New resource videos were sent to educators for expert suggestions

Results
656 Participants learned how to properly field dress, clean, cut, and cook deer meat; they were also instructed in the basics of herd health and canning. There was increased knowledge on venison field dressing and processing through the newly developed videos.

4. Associated Knowledge Areas

KA Code	Knowledge Area
504	Home and Commercial Food Service
703	Nutrition Education and Behavior

Outcome #2

1. Outcome Measures

Number of participants who increase or improve their skill in proper time and temperature controls in food preparation.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1025

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Using tested procedures and recipes will help to prevent serious food-borne illnesses while preserving the quality of the food. Each year, WVU Extension county offices are inundated with requests for information about safe home canning recipes and methods.

What has been done
WVUES educators conducted 36 food preservation workshops. They learned to use the boiling water method for high acid foods and work with pressure canners for low acid foods. Dehydration and freezing is also covered. Programs included Canning 101, Canning Your Harvest, Food Preservation Workshop Greenhouse Project, at Fruits Drying Training and Demonstration. At WVSUES, participants were introduced to different types of kitchen appliances, utensils, and equipment and given proper and safe instruction on how to use such kitchen items and had lessons on food safety though accurate food temperature readings and as well as hand washing.

Results
Depending on the specific workshop, between 75 and 100% demonstrated increased ability to identify and utilize proper techniques for home preservation. As a result of the information that was given to WVSUES participants, 61% of the youth adopted and practiced 1 or more behavior(s) necessary to handle food safely. 66% of participants showed improvement in one or more food safety practices. 43% of the youth adopted and practiced 1 or more behavior(s) necessary to handle food safely. 54% of adult participants showed improvement in one or more food safety practices. These outcomes will enable the participants to be more confident in safe food preparation for themselves and their families.

4. Associated Knowledge Areas

KA Code	Knowledge Area
504	Home and Commercial Food Service

Outcome #3

1. Outcome Measures

Number of participants who improve or increase skills in safe food handling practices such as preparing, cooking, and storing foods safely.

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	205

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
504	Home and Commercial Food Service
703	Nutrition Education and Behavior

Outcome #4

1. Outcome Measures

Number of participants who report using new food handling practices.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Training is need with producers, processors, and home food preservers in order to reduce the incidence of food-borne illness by eliminating causes of microbial resistance to contaminants, educating consumers and food safety professionals, and developing safe food processing technologies.

What has been done
Food Safety training in WV is offered in combination with various workshops These programs train educators as well as producers, processors, and home food preservers. This year 36 agricultural professionals were trained to deliver food safety programs and to provide one-to-one consults on setting up and managing a food ventures. As a part of this work, between 2013 and 2016, 12 workshops were held in WV with WVU Extension Service field faculty who made presentations about food safety and food business development.

Results
An on-line survey of a representative sample of participants from the workshops (six to twelve months after attendance) demonstrated that 49% (N = 57) had started, maintained or expanded/ diversified their food business, using information provided by these workshops.
Food safety practices and planning is a key component of these workshops, and 45% of survey respondents indicated that they had HACCP planning, with an additional 19% attending a specialized HACCP training.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies

504 Home and Commercial Food Service

Outcome #5

1. Outcome Measures

Number of youth who disseminate information about food safety to their families.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	2409

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The CDC considers hand washing among the most important means of preventing the spread of infection. Keeping hands clean is one of the most important steps we can take to avoid getting sick and spreading germs to others.´ https://www.cdc.gov/handwashing/why-handwashing.html.

What has been done
WVUES has had a long history in implementing Germ City and The Germ Stops Here programs for youth. In these program, youth learn how to properly wash their hands by applying 'fake germs,' washing, and then examining their hands under an infrared light. This is a behavior that is easily transferrable to other members of the family by setting a good example.

Results
2609 youth gained skills related to properly washing their hands and indicated their intent to continue this practice at home. If two family members were influenced by the example they set and also wash their hands before eating, food-borne illness would be reduced in up to 7800 individuals.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
802	Human Development and Family Well-Being
806	Youth Development

Outcome #6

1. Outcome Measures

Number of youth who participate in Extension nutrition programs that receive one balanced, nutritionally correct meal per day that is prepared and held at safe.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	122714

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Behavioral, emotional, mental health, and academic problems are more prevalent among children and adolescents struggling with hunger. Children and adolescents experiencing hunger have lower math scores and poorer grades. Children experiencing hunger are more likely to be hyperactive, absent, and tardy, in addition to having behavioral and attention problems more often than other children (Research Brief: Breakfast and Learning, Food Research Action Center, Center for Disease Prevention)

What has been done
The 2016 Energy Express summer literacy program served breakfast and lunch meals to 122,714 youth in the program and other community youth.

Results
2,405 low-resource children who reached 50% attendance in the Energy Express program in 2016 and who were fed two meals each day, showed significant increases in letter-word identification, reading fluency, passage comprehension, and broad reading. Sixty-five percent of these children either maintained (60.5) or increased (4.8%), and the average child gained 1.9 months in broad reading achievement.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being
806	Youth Development

Outcome #7

1. Outcome Measures

Number of growers, producers, and food workers completing food safety certification.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	80

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Preventing food borne illness and death remains a major public health challenge. Medical bills and loss of productivity add to the cost. The incidence of food borne illnesses could be greatly reduced with the adoption of established food safety practices in the production, transportation, storage, preparation and service of food.

What has been done
The Extension Food Safety specialist and county agents offered the ServSafe program to commercial food handlers. Seven workshops were held with 104 participants in attendance.

Results
80 food handlers were certified in the ServSafe program in 2016.

4. Associated Knowledge Areas

KA Code	Knowledge Area
504	Home and Commercial Food Service

Outcome #8

1. Outcome Measures

Number of improved prevention, detection, control and intervention technologies adopted.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Contaminated poultry meat represents the greatest public health impact among foods and is responsible for an estimated $2.4 billion in annual disease burden. Salmonella spp. are the most common foodborne pathogens associated with poultry meat, causing an estimated 9.4 million illnesses, 55,961 hospitalizations, and 1,351 deaths annually in the USA. Starting in July 2011, USDA-FSIS established new performance standards requiring routine testing for Salmonella in all processing plants; the percentage of Salmonella-positive samples must be below 7.5%.

What has been done
This project determines the microbial safety risks and develop chemical and physical interventions to control Salmonella spp on raw poultry carcasses and in processed poultry products. We evaluated the efficacy of commercial antimicrobials to inactivate unstressed- and cold-stress-adapted Salmonella on broiler carcasses and wings processed at a small USDA-inspected facility in WV.

Results
Results indicated that applying post-chilling antimicrobial dipping treatments was an effective intervention to reduce Salmonella contamination on locally raised and processed broiler carcasses and wings. Second, we evaluated the microbiological quality, Salmonella, and Campylobacter prevalence in broiler ceca and ready-to-cook carcasses. The data suggest that raising broilers on clean shavings as opposed to built-up litter may decrease the presence of foodborne pathogens. Results of the research will contribute to the development of the new USDA-FSIS 5-year strategic plan for control of Salmonella spp. in poultry and meat products. It is necessary for poultry processors to employ new or additional physical or chemical interventions for effective control of Salmonella throughout chicken processing.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
502	New and Improved Food Products

Outcome #9

1. Outcome Measures

Number of projects characterizing social, economic, and/or cultural practices attributed to foodborne illness.

2. Associated Institution Types

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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
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
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
504	Home and Commercial Food Service

703 Nutrition Education and Behavior

Outcome #10

1. Outcome Measures

Control of Salmonella in poultry products by physical and chemical treatments Issue

2. Associated Institution Types

- 1862 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)
Contaminated poultry meat represents the greatest public health impact among foods and is responsible for an estimated $2.4 billion in annual disease burden. Salmonella spp. are the most common foodborne pathogens associated with poultry meat, causing an estimated 9.4 million illnesses, 55,961 hospitalizations, and 1,351 deaths annually in the United States. Starting in July 2011, USDA-FSIS established new performance standards in response to national baseline studies requiring routine testing for Salmonella in all processing plants, where the percentage of Salmonella-positive samples must be below 7.5% (USDA-FSIS, 2010). With the implementation of more rigorous pathogen reduction standards by the USDA-FSIS, it is necessary for poultry processors to employ new or additional physical or chemical interventions for effective control of Salmonella throughout chicken processing.

What has been done
This project aims to determine the microbial safety risks and develop chemical and physical interventions to control Salmonella on raw poultry carcasses and in processed poultry products. Results of the research will also contribute to the development of the new USDA-FSIS 5-year strategic plan for control of Salmonella spp. in poultry and meat products. The specific objectives of the project are to: 1) Characterize the microbial profile of poultry carcasses generated from Mobile Poultry Processing Unit (MPPU); 2) Evaluate the efficacy of none-thermal technology (electrostatic spraying and electronic beam) for reducing Salmonella spp. on chicken parts and eggs; 3) Evaluate quality attributes, consumer acceptability and the thermal inactivation activity of Salmonella in marinated chicken sausage patties without/with antimicrobials.

Results

So far, two projects have been completed. First, we evaluated the efficacy of commercial antimicrobials to inactivate unstressed- and cold-stress-adapted Salmonella on broiler carcasses and wings processed at a small USDA-inspected facility in WV. Results indicated that applying post-chilling antimicrobial dipping treatments was an effective intervention to reduce Salmonella contamination on locally raised and processed broiler carcasses and wings. Second, we evaluated the microbiological quality, Salmonella, and Campylobacter prevalence in broiler ceca and ready-to-cook carcasses. A cohort of broilers was reared for 38 days on either clean shavings or built-up litter. The data suggest that raising broilers on clean shavings as opposed to built-up litter may decrease the presence of foodborne pathogens.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
502	New and Improved Food Products

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

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

Adult EFNEP classes were challenging due to the nature and location of the sites. Introducing new and healthy alternatives to eating and cooking are very difficult. The participants may not have the adequate equipment in their kitchens to measure and cook with. They also have limited incomes that have a significant impact on the foods they purchase.

School and other site location schedules, weather conditions, changes in economy, appropriations changes all affected the program implementation. It was difficult to keep a consistent schedule due to changes in site location schedules, and funding cuts caused us to change some of the program deliverables.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

WVU-AFES

WVU Experiment Station research program evaluation takes place at two levels and on two different time cycles. All programs will be evaluated using these general criteria plus additional criteria tailored to each specific program as detailed in the Plan of Work under Outputs and State defined Outputs and Outcomes.

Annual evaluation will continue as before, looking at productivity in terms of immediate impact

- Professional presentations
- Referee journal articles and books
- General audience papers and news reports
- M.S. and PhD graduates
- Trends in terms of competitive funding

And in terms of longer-term impact:

- Citations in scientific journals
- Patents
- Successful technology transfer or start-ups based on research programs
- Awards based on continuing impact and research excellence

Every five years there will be a full portfolio review including:

- Long term productivity
- Relevance to our constituent groups and the State and Region
- The allocation of research inputs among the programs
- Consideration of eliminating some research programs that are not productive or have diminished relevance given NIFA and State priorities
- Consideration of adding additional program areas given NIFA and State priorities

This portfolio review will be conducted internally by a committee appointed by the Dean and externally by a committee composed by a subset of our College Visiting Committee.

Food Safety research has never been one of the primary research areas of our College. We have two faculty members who do some work in the food-borne illness area. Two years ago

we hired a faculty member jointly with WVU Extension who works on methods for controlling salmonella in food production and distribution. He has a Hatch project in place and is making significant progress in setting up his research and outreach programs. We feel this is a promising start and will consider adding more faculty to the food science area. It is too early to evaluate the success of this goal area.

Key Items of Evaluation

WVU-AFES

This program is new and it is too early to evaluate its success. We will report our evaluations in the future.

WVUES

Programs in this primary area tend to use our client and peer-review survey forms to evaluate each separate program.

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Community, Economic, Workforce 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
131	Alternative Uses of Land	0%	5%	10%	0%
134	Outdoor Recreation	10%	20%	15%	0%
602	Business Management, Finance, and Taxation	10%	5%	10%	0%
604	Marketing and Distribution Practices	0%	5%	15%	0%
605	Natural Resource and Environmental Economics	0%	0%	10%	0%
608	Community Resource Planning and Development	40%	40%	20%	0%
723	Hazards to Human Health and Safety	20%	0%	10%	0%
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	5%	10%	0%	0%
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures	0%	0%	5%	0%
805	Community Institutions, Health, and Social Services	10%	10%	0%	0%
903	Communication, Education, and Information Delivery	5%	5%	5%	0%
	Total	100%	100%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	21.0	7.0	2.5	0.0
Actual Paid	12.0	5.0	9.0	0.0
Actual Volunteer	3183.0	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**
500000	251725	587384	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
443651	170385	934118	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
943651	485768	275779	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

West Virginia is considered to be a lagging region in terms of economic development and growth, a characteristic shared by many states in the Appalachian Region. While the region has abundant natural resources, particularly coal, natural gas, forests, water and recreational opportunities, unemployment is typically higher than in the rest of the Nation. Accordingly, we have designated community, economic and workforce development and the quality of life in rural communities as one of our program areas.

WVU-AFES

A significant part of rural employment growth nationwide has occurred in non-traditional economic activities including those capitalizing on natural resources and climate. A number of possible economic opportunities are currently being investigated in West Virginia, including pasture finished beef, cool water aquaculture, local food production and marketing, wood utilization, organic production of vegetables and animal products, and ecotourism. In the last three years cutbacks in Agricultural Research Service (ARS) budgets and the closing of the ARS facility in Beaver, WV, have led to a reduction in the research resources devoted to the pasture finished beef projects. The elimination of congressionally directed spending has also led to reduced activity in the aquaculture and wood utilization areas. These cutbacks increase the relative importance of federal capacity funding and AFRI competitive funding to the success of our research and extension programs.

Research program highlights for 2016 include:

· A long-term study was completed that looked at the characteristics and performance of local food supply chains in the Appalachian Region and their impact on economic development.
· A landscape architecture study examined the cultural landscapes of the upland South from pre-settlement to contemporary times.
· Finally, a project looked at post-mining land use development in WV

WVUES

In 2016, the community and workforce development program area conducted 1329 activities. The activities in this program area are varied, but fall under the following four categories.

Workforce Development - WVUES conducts workshops and training opportunities for workers in a variety

of settings in West Virginia. Topics cover a broad range and include workshops and training opportunities related to workforce health and safety as well as training for a number of occupational requirements. WVUES contracts with OSHA to train workers. It should be noted that some workforce development is reported under other planned programs, where appropriate. Examples include ServSafe certification, logger training, and childcare provider training.

Leadership Development - WVU Extension relies on volunteers to carry out programs in the community. Groups who train volunteers, Community Education Outreach Service organization (CEOS), the Master Gardener program (reported under Food Security and World Hunger), 4-H and Youth Development (reported in that section) and Energy Express (also reported under 4-H and Youth Development). Topics for volunteers include budgeting and planning for small organizations, public speaking, board responsibilities including serving as an officer, and communications.

Community Development - WVU Extension implements a number of initiatives which focus on the development of local governments and community organizations. These initiatives include The First Impressions Program, Government Planning and Public Policy, Tourism, Farmer's Markets, Walkability Studies and Making Sense of Natural Gas Pipelines and Right of Way Agreements. These programs attract participants who are interested in initiating downtown revitalization programs to improve their community's capacity to attract and retain new businesses and make communities more desirable places to live and work. The Community Leadership Academy has been planned and implemented by WVUES each year. In 2016, 180 participants have attended. Recently, the community development faculty at West Virginia University Extension and West Virginia State University (1890) have come together to plan joint projects with mutually agreed upon outcomes.
Labor Relations - Under the direction of the Labor Studies Institute at WVUES, faculty provide training for members of unions and other workers who negotiate for better working conditions.

WVSU-GRDI

WVSUES Agents work directly in the communities to help develop, search out fiscal support and implement innovative programs to develop a greater sense of pride within the communities they serve. Through these efforts opportunities for continued economic growth and diversity are created and sustainable community models developed.

Highlights for 2016:
· The Mingo County Small Business Development Summit was developed to train community advocates on Trails Tourism
· A national television show visited southern WV to highlight the Pocahontas trail system.
· In the wake of the 1000-year flood that devastated this town in early 2016, the guidance provided by WVSU Extension has provided the City of Richwood to expertise needed to begin to look toward future redevelopment opportunities.

2. Brief description of the target audience

The primary audience for our community and economic development activities is community managers; city, county, and state planners and policy makers; consultants and local development committees or groups, producers, processors and distributors, State citizens and community groups and educators.

Workforce programs target firefighters, EMS, law enforcement, first responders, upper management in the fire services, airport personnel, the general population, people who seek to implement or assist in the implementation of individual or employer compliance with state, federal, and local safety and health

legislation, employers/owners of businesses.

Other audiences include local businesses, community-based organizations, fair and festivals boards, potential business start-ups, and regional economic development authorities.

Specialty populations include volunteers, immigrants, migrant workers, youth, disabled community members, older adults, the unemployed and the under-employed workforce members (with focus on low-to-mod income).

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	62595	2020547	14897	36872

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	17	23	30

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of general press articles

Year	Actual
2016	15

Output #2

Output Measure

- Number of educational materials create or updated

Year	Actual
2016	17

Output #3

Output Measure

- Number of workshops and other educational presentations for clients

Year	Actual
2016	1378

Output #4

Output Measure

- Number of professional/academic presentations

Year	Actual
2016	85

Output #5

Output Measure

- Number of graduate students earning degrees

Year	Actual
2016	13

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of participants in workforce development programs who increase their knowledge and skills.
2	Number of government and civic leaders who improve or increase skills.
3	Number of volunteers who increase or improve skills.
4	Number of adults who gain knowledge and skill related to working with you.
5	Number of workers who use a new skill.
6	Number of people certified or licensed to practice in the field.
7	Number of new groups or organizations that are established or enhanced by obtaining new sources of revenue, new licenses, etc.
8	Number of adults who successfully train youth in topics related to STEM, healthy living, and citizenship.
9	Number of government or civic groups that use a new skill or procedure.
10	Number of community specific plans developed and adopted in whole or in part to help enhance economic development and quality of life.
11	Number of business plans and successful start-ups in the State developed and implemented with assistance from the WVU and WV State University Extension and experimental stations.
12	Number of grants, financial awards or partnerships awarded or developed for use to support community, economic, workforce development initiatives.
13	The Role and Contribution of Local Food Supply Chains in the Economic Development of the Appalachian Region
14	Pre-Settlement to Contemporary Times- Cultural Landscapes of The Upland South: Research, Planning and Design Research, Planning and Design
15	Number of participants in labor education programs who increase their knowledge and skills.

Outcome #1

1. Outcome Measures

Number of participants in workforce development programs who increase their knowledge and skills.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1618

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In West Virginia there a need for professional training for hospitality workers. Time and expense are barriers to sending hospitality employees to classroom instruction.

What has been done
The WVUES Tourism team developed and implemented an online hospitality training called WV Welcome. In addition, a classroom training was conducted with 58 frontline hospitality employees in the WV. A train-the-trainer session of the classroom version was conducted with CRED and WVSU agents, and a CVB Director. We also delivered the classroom version of the training to employees at Pipestem Resort State Park. The PowerPoint presentation and trainers manual were updated. Videos, Q&A sessions, and role playing were added to the online training. Local information and information about the state's tourism resources was also added.

Results
1,597 frontline hospitality employees trained in the online WV Welcome training. 100% of these trainees successfully completed an online knowledge/skill-based assessment.

WVUES and WVSUES educators learned to implement the tourism face-to-face curriculum with their clients.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation

608 Community Resource Planning and Development

903 Communication, Education, and Information Delivery

Outcome #2

1. Outcome Measures

Number of government and civic leaders who improve or increase skills.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	121

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In WV, primary economic drivers have been based on extraction industries. The lack of economic diversity has led to generational dependence on these industries. In addition, an aging population of leaders has created a vacuum that new civic and elected leaders can fill. With trained leadership, communities will have the tools to adapt. In WV,tourism development is one solution to declining communities. Visitors are drawn to the State's authentic attractions including outdoor recreation, art, music, and heritage.

What has been done
WVSUES has assisted local leaders in implementing 'Trails Tourism' at the Mingo County Small Business Development Summit. They assisted the Hatfield McCoy Trails, Mingo County Redevelopment Authority and the city of Matewan and helped the Nicholas County Airport Authority to operate more cost effective air services for Summersville and Nicholas counties. The WVUES Rural Tourism Design team conducted strategic planning with citizens in Tucker County to identify local assets and prioritize tourism development work.

Results
Local leaders in Mingo and Matewan counties worked on implementing trail growth, planning municipal success, forming a business plan, marketing, and finding investment opportunities and resources. Through the technical assistance of WVSUES the airport received a $15,000 FAA reimbursement grant to be utilized in support of airport operations & maintenance. As a result of the work of the WVUES Rural Tourism Design team, Tucker County generated additional capacity, prioritized a grant program for product development, developed a community signage

plan, and pursued additional grant funding focused on industry sectors that produce the most return back to the community.

4. Associated Knowledge Areas

KA Code	Knowledge Area
134	Outdoor Recreation
602	Business Management, Finance, and Taxation
604	Marketing and Distribution Practices
608	Community Resource Planning and Development
903	Communication, Education, and Information Delivery

Outcome #3

1. Outcome Measures

Number of volunteers who increase or improve skills.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	3170

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
As West Virginia's population continues to age, civic organizations lose membership. Without active and engaged citizens, rural governments find difficulty in successfully maintaining vibrant communities. While many younger citizens may have some interest in volunteering in their community, without skills or direction it can be difficult to engage younger generations in successful projects.

What has been done
The WVUES Master Gardeners Association (WVEMGA) trained volunteers in 46 counties. They gained skill in horticultural and environmental and became engaged in community gardening and beautification projects at schools, parks, public institutions, and community organizations. WVSUES developed, distributed and held supporting workshops for the Destination:

Beautification program, and produced a 90-page comprehensive educational resource to assist communities in revitalization.

Results

In 2016, the statewide Master Gardner membership has increased by 200 new members bringing the total number of active Extension Master Gardener volunteers to about 1,400. In 2016, 228 new EMG Trainees completed the training and will complete their volunteer requirements to become certified Extension Master Gardeners in 2017. Volunteers have logged 26,796 volunteer hours on 440 projects. At the national volunteer work rate of $23.07/hour, WVUES Master Gardeners contributed $618,184 to their local and state economy. Using a toolkit developed by WVSUES. 885 individuals gained knowledge on the beautification. As a result concerned community members in Oak Hill, WV developed a group called Destination Oak Hill to focus on community and economic development in the area.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
903	Communication, Education, and Information Delivery

Outcome #4

1. Outcome Measures

Number of adults who gain knowledge and skill related to working with you.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	4969

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Teens, 16 to 19, who are not in school and not part of the workforce (sometimes referred to as "disconnected" youth) are at high risk as they transition to adulthood. These youths may have difficulty gaining the skills needed to become self-sufficient. Youth who drop out are at a disadvantage, but those who have graduated and are not working, may also be more susceptible to lower levels of economic success. Many adults also do not have the skills to engage in their

communities. It is critical to develop leadership skills in these individuals.

What has been done

The WVUES Post-Secondary Success Team provides training for youths and adults in WV. 71 Extension faculty, volunteers, educators, and youth service providers attended workshops on how to implement the post-secondary curriculum. The "How to Start a Rural Lodging Business" training program, coordinated by WVSUES in cooperation with the Small Business Administration and Southern WV Community and Technical College offers free webinars and resources to help trainers assist youth who want to know about starting businesses.

Results

71 Extension faculty, volunteers, educators, and other youth service providers gained knowledge and skills related to teaching middle and high school youth skills for post-secondary success. 2449 adults were trained to assist youth in gaining business skills.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
903	Communication, Education, and Information Delivery

Outcome #5

1. Outcome Measures

Number of workers who use a new skill.

2. Associated Institution Types

- 1862 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	737

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

High-risk industry and at risk workers are defined by OSHA and they develop grant opportunities that address the recognition and prevention of safety and health hazards for workers and employers engaged in high risk industries. The OSHA Susan Harwood Capacity Building grants support and assist organizations to establish or expand the capacity of the organization at all

levels to address occupational safety and health problems and provide training and education as well as related assistance.

What has been done

The WVU Safety and Health Education Extension division develops, conducts, and evaluates training for OSHA and offers assistance programs. The anticipated outcome of this program is to increase the safety and health knowledge, awareness, and safe work practices of workers and small business employers involved in high-risk work industries. WVUSHE reached 637 workers through 47 training sessions which resulted in 2262.5 training contact hours. WVUSHE reached 100 workers through safety and health consultation.

Results

WVUSHE used pre- and post-tests to measure knowledge gained during the class and skills, knowledge, and attitudes retained by the trainees as a result of receiving the training. Knowledge gain was determined to be significant at +24.7% from pre to post test. 75 respondents responded to a level 3 follow up survey; 61% expected to make changes to improve workplace safety; 60% used information to identify health and safety hazards at their workplace and 96% responded to be more aware of health and safety hazards as a result of the training.

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety
903	Communication, Education, and Information Delivery

Outcome #6

1. Outcome Measures

Number of people certified or licensed to practice in the field.

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)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
134	Outdoor Recreation
602	Business Management, Finance, and Taxation
604	Marketing and Distribution Practices
605	Natural Resource and Environmental Economics
608	Community Resource Planning and Development
723	Hazards to Human Health and Safety
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures
805	Community Institutions, Health, and Social Services
903	Communication, Education, and Information Delivery

Outcome #7

1. Outcome Measures

Number of new groups or organizations that are established or enhanced by obtaining new sources of revenue, new licenses, etc.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A major factor that impedes the creation and growth of new groups in rural communities is lack of resources. While an organization may have a strong vision and desire to accomplish it, lack of resources can prevent progress. Without resources and expertise, organizations are limited in their ability to carry out their missions. For example, visitors to the John Henry Historical Park in Talcott, Summers County, WV were not being provided any interpretation of American folk hero John Henry's legend. Tourism is important to Summers County in that it provides 250 jobs. In other counties, community groups lack the expertise to procure funding.

What has been done

Lacking the estimated $400,000 to build an interpretative center/museum in the park, the WVUES agent helped erect a series of educational kiosks around the John Henry Historical Park. A committee developed the content that provide interpretation of the legend, how the Great Bend Tunnel was built, and other related historical information. In the wake of the 1000 year flood that devastated this town in early 2016, WVSUES provided professional assistance to the city of Richwood with grant procurement and management. The groups in Richwood that were helped include the Richwood Nuisance Property Committee (NPC), Building Commission (RCBC), and Municipal Planning Commission (MPC).

Results

The educational kiosks in the John Henry Historical Park increase visitor's knowledge the legend of John Henry and contribute to a positive visitor experience. With target markets such a railroaders, African-Americans, and regional visitors, local planners believe that the John Henry Historical Park will become a significant economic generator for Summer County's 13,239 residents once it is opened and marketed in 2017. In Richwood, dilapidated and abandoned properties are being renovated. Municipal planning is taking place. Residents & leaders envision Richwood as a destination tourist venue.

4. Associated Knowledge Areas

KA Code	Knowledge Area
134	Outdoor Recreation
602	Business Management, Finance, and Taxation
604	Marketing and Distribution Practices
608	Community Resource Planning and Development
903	Communication, Education, and Information Delivery

Outcome #8

1. Outcome Measures

Number of adults who successfully train youth in topics related to STEM, healthy living, and citizenship.

2. Associated Institution Types

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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
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
134	Outdoor Recreation
602	Business Management, Finance, and Taxation
604	Marketing and Distribution Practices
605	Natural Resource and Environmental Economics
608	Community Resource Planning and Development
723	Hazards to Human Health and Safety
803	Sociological and Technological Change Affecting Individuals, Families, and

	Communities
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures
805	Community Institutions, Health, and Social Services
903	Communication, Education, and Information Delivery

Outcome #9

1. Outcome Measures

Number of government or civic groups that use a new skill or procedure.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Cooperative regional tourism planning and promotion efforts have been identified by the WVUES Community Development team as venues for promoting economic development in the WV. Community organizations need help complete tourism projects and establishing sustainability. Many times the potential of an organization to succeed is based on the ability to procure resources necessary to achieve its goals.

What has been done
WVUES Community Development team did strategic planning with the Eastern Panhandle Tourism Summit and with other regional tourism promotion entities such as the Mountain Music Trail and a craft beer project. The team held interviews with Convention Visitors Bureau leaders and WV craft breweries. In addition to published research, the project stimulated discussions about how destination management leaders engage with local breweries. WVSUES worked closely with local municipalities and civic groups on grant writing and management of tourism projects.

Results
In Jefferson County, the CVB won the Governor's award for the Best Vacation Guide in WV. In Morgan County, the Chamber initiated a series of mixers and established a master "community calendar." The Mountain Music Trail used a festival as a fundraiser, implemented Mountain Music

Day at the State Fair, completed a $10k advertising campaign, and was a finalist in the British Guild of Travel Writers Wider World tourism initiative category. The CVB and WV Black Bears hosted Homerun and Hops Craft Beer Festival. Through WVSUES efforts, funding was secured for the Nicholas County Historic Landmark Commission for preservation & restoration of the historic Beaver Mill with potential development as a county interpretive park to promote heritage tourism. The Downtown Beckley Business Assoc. hosted a Shop Small Saturday event.

4. Associated Knowledge Areas

KA Code	Knowledge Area
134	Outdoor Recreation
608	Community Resource Planning and Development
903	Communication, Education, and Information Delivery

Outcome #10

1. Outcome Measures

Number of community specific plans developed and adopted in whole or in part to help enhance economic development and quality of life.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In many communities, governments and civic leaders lack the skills to produce professional documents. Whether it is demographic information, marketing plans, event planning, vision statements or strategic plan, these documents are critical to community success. For example, Hardy County needed to update its comprehensive plan. Parsons was looking for strategic direction. Keyser wanted to attract medical professionals to the area. Westover had problems with its zoning ordinance.

What has been done
In Hardy County, a WVUES specialist reviewed the comprehensive plan. In Parsons a specialist assisted with the strategic plan. A WVUES team helped Keyser residents relocate a welcome sign and create a mural. In Westover, a specialist helped draft proposed changes to city

ordinances. Economic planning was done with Tucker and Pocahontas counties. The WVSU agent helped bring in Dirt Trax Television, which showcased the Hatfield McCoy Trails system. In Fayette County the agent worked with Mount Hope on developing the Dunloup Creek Conservation and Recreation Area.

Results

Hardy County implemented its comprehensive plan. Parsons began rehabilitation work began on the Shavers Fork. A Keyser group is working on community improvements. Westover passed parking regulations for off- and on-street parking and a rezoning process. Both Tucker and Pocahontas counties passed legislation allowing establishments to sell alcoholic beverages on Sunday after 10 a.m. Dirt Trax Television filmed a television show on the Pocahontas trail system, local businesses, restaurants, and lodgings which aired on the Outdoor Channel. The Dunloup Creek Conservation and Recreation Area will now provide recreation opportunities in the City of Mount Hope. The abandoned rail line also extends onto the Summit Bechtel Reserve, which allows for safe walking and biking to and from the Boy Scouts of America's property.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
604	Marketing and Distribution Practices
608	Community Resource Planning and Development
903	Communication, Education, and Information Delivery

Outcome #11

1. Outcome Measures

Number of business plans and successful start-ups in the State developed and implemented with assistance from the WVU and WV State University Extension and experimental stations.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

WVUES specialists wanted to know about the dynamic relationship between craft breweries and localities and how that relationship has augmented or hindered not only the development of the

craft beer industry but also local tourism economies within West Virginia. They also wanted to understand how and why breweries create and leverage tourism identities for localities and how destination management leaders at the state and local levels cooperate with breweries to attract travelers seeking an authentic tourist experience.

What has been done
"Life on the 'Beer Frontier" is a book chapter written by WVUES specialists that analyzes the growth and outreach strategies of state-based craft breweries. Specialists conducted over a dozen interviews with craft brewers and tourism specialists about their work and extent of their collaborative interactions and analyzed the economic impacts of the industry on local and state economies. A new craft beer festival was held in Morgantown, WV.

Results
Brewers, tourism specialists, and communities have begun to work together on collaborative opportunities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
604	Marketing and Distribution Practices
608	Community Resource Planning and Development
903	Communication, Education, and Information Delivery

Outcome #12

1. Outcome Measures

Number of grants, financial awards or partnerships awarded or developed for use to support community, economic, workforce development initiatives.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	9

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
With strained budgets from struggling local economies, many rural governments and organizations lack grant-writing skills that are necessary to fund public projects. In challenging

economic times, partnerships also become critical to developing resources and providing sustainability for projects and organizations. Planning and assistance with group tours in the county/region is a valuable way to increase knowledge of the culture, history, and economic assets of the area and creates economic opportunity for businesses looking to increase revenue.

What has been done

WVSU Extension agents actively pursued grants on behalf of communities. WVSUES assisted in the submission of 21 grant proposals and 8 were successful, providing an additional $2,122,882 in funding. Also, through partnerships, WVSUES leveraged 100,000 in cost recovery for local agents? salaries and other resources. The WVUES agent in Monroe County partnered with a national tour company to bring economic growth to her county. On the tour, she led a discussion of agriculture in WV and promoted locally produced food. Tour participants made stops at Morgan Orchard, Rehobeth Church, Town of Union, and the Old Mill.

Results

In Nicolas County, a $60,000 POWER assessment grant will fund a trail system to connect the National Parks in Fayette County to the National Forest trails in Nicholas County. The partnership with the Hatfield and McCoy Trail system resulted in a Power Grant of $2,033,882 to expand tourism in southern WV. Numerous partnerships were cultivated because of the Hatfield and McCoy Trail System, including partnerships with: Mercer County CVB, Mercer County Commission, Town of Bramwell and Buffalo Trail Properties. This partnership in Monroe County with the national tour company resulted in added revenue to producers whose products are used to serve a meal focused on local fare. An excess of $760 was spent within the county. In addition, a positive image of the Mountain State conveyed to tourists from around the country.

4. Associated Knowledge Areas

KA Code	Knowledge Area
134	Outdoor Recreation
602	Business Management, Finance, and Taxation
604	Marketing and Distribution Practices
608	Community Resource Planning and Development
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
903	Communication, Education, and Information Delivery

Outcome #13

1. Outcome Measures

The Role and Contribution of Local Food Supply Chains in the Economic Development of the Appalachian Region

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)
The last decade has witnessed unprecedented growth in local food supply chains (LFSC). The United States has seen considerable growth in farmer's markets, community supported agriculture, and the use of roadside markets. Fueling the growth in these contemporary supply chains are consumer demand for high quality, fresh food products, reduction in food miles, and the use of environmentally friendly production practices. The development of LFSC is increasingly being viewed as an "alternative" to the "traditional" agribusiness supply chains.

What has been done
The main purpose of this long-term project, completed in 2016, is to analyze the characteristics and performance of LFSC in the Appalachian region. The study examines the vertical and horizontal coordination, technology innovation, and competitive strategies utilized by LFSC to respond to changing consumer preferences and gain sustained competitive advantage and market share. The specific objectives are to: (i) Evaluate the different forms of vertical and horizontal coordination mechanisms influencing the development of LFSC in the Appalachian region (e.g., spot markets strategic alliances, joint ventures, contracts, franchises, third-party certifications, organic, traceability, trust and reciprocity, etc.). (ii) Determine the different competitive strategies (e.g., cost reducing, industry leadership, niche markets, buy local, culture, eco-labels, health and safety, etc.) used in LFSC in Appalachian region. (iii) Determine the various kinds of ICT-enabled supply chain innovations (e.g., e-commerce, mobile commerce, etc.) used to enhance the efficient performance of LFSC in the Appalachian region. (iv) Analyze the key factors affecting producer and retailer participation in LFSC in Appalachian region. (v) Draw appropriate policy alternatives based on research findings.

Results
The results of the potential-for-expansion study show that WV has the land base to produce enough specialty crops to meet local seasonal demand. In particular, markets for specific vegetables were shown to have potential for significant economic impacts and job creation. These results have sparked interest among farmers and Extension personnel that can encourage entry or expansion into local food supply chains in Appalachia.

During 2015, seven projects were funded from the NIFA grant "Enhancing Food Security by Cultivating Resilient Food Systems and Communities: Place-based Foodshed Analysis from Research to Community Practice" to community organizations across the state who are finding innovative ways to enable low income individuals to participate in local food supply chains. Two of the projects have mobile produce markets that travel to rural areas and/or to senior housing, bringing locally grown food to those who may otherwise not have access to it. Two projects helped farmers develop and/or expand food aggregation and distribution systems. Another project

facilitated a community garden to move its facility, and the sixth project started a farmers? market in a food desert in the coal fields region of West Virginia. The final project funded four farmers' markets to pilot a "gleaning" project at their market that would connect the market to a local emergency food system provider. The goal is for farmers and consumers to donate food for local food pantry clients, reducing waste and improving access for low-income consumers to healthy, local food.

4. Associated Knowledge Areas

KA Code	Knowledge Area
604	Marketing and Distribution Practices
608	Community Resource Planning and Development

Outcome #14

1. Outcome Measures

Pre-Settlement to Contemporary Times- Cultural Landscapes of The Upland South: Research, Planning and Design Research, Planning and Design

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)
The critical need that this research addresses is the lack of knowledge of Appalachian cultural landscapes and the lack of access to research, design and planning assistance for communities that wish to revision their future and create public assets from cultural landscapes. This is a critical need especially in areas of economic and environmentally compromised areas.

What has been done
Cultural landscape research within the Appalachian region was accomplished through execution of the following project: 2016 "Tucker County Cultural Tourism Planning." The project was funded through a grant from the Claude Worthington Benedum Foundation. Planning and design was also completed in Alum Creek, Hardy County with the Eastern WV Technical and Community College, Parsons, Coketon, Davis, Thomas, and Canaan Valley WV through a class project. The projects all sought to envision and implement designed spaces that would enhance the quality of

life for citizens and communities and spur economic development.

Results
The research and analysis of cultural landscapes allows for informed future planning, design and development. The Upland South/Appalachian region's history is one of dynamic change and constantly evolving new forms. These forms are reflections of cultural values, technologies, local economies and natural environmental context. Planning and design within the context of historical forms with adoption and adaptation of the evolving technologies provides for the advancement of human development and culture; enhanced quality of life for citizens and communities; and regional economic development.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land
608	Community Resource Planning and Development
903	Communication, Education, and Information Delivery

Outcome #15

1. Outcome Measures

Number of participants in labor education programs who increase their knowledge and skills.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	215

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Labor union leaders and members are often uninformed about labor history and therefore are unable to benefit from the mistakes and successes of the past in efforts to enhance the quality of work in American industries. Labor union leaders and members are also in need of leadership development.

What has been done

The WVUES Labor Institute implemented multiple classes focusing on specific dynamics particular to organizations and historical trends, people, and forces from 1877 to the present. Specialists also provided leadership training for labor union leaders, the WV AFL-CIO and the WV Service Personnel Association on strategic planning and development focusing on methodical planning and mobilizing approaches for organizational building, maximum efficiency, and resource utilization.

Results

175 union leaders and members enhanced their knowledge about the following: 1) labor history among labor union and working-class audiences; 2) interconnections between public and private-sector audiences, industries, and occupations about socioeconomic, political, and workplace trends; and 3) relevance of historical analysis to contemporary contexts and encountering and examining information generally.

40 participants in the strategic planning and development classes enhanced awareness of the importance and value of strategic planning, outreach, and community engagement for organizations' memberships and the constituencies they work with.

4. Associated Knowledge Areas

KA Code	Knowledge Area
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services
903	Communication, Education, and Information Delivery

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

Flood, oil spill

V(I). Planned Program (Evaluation Studies)

Evaluation Results

WVU-AFES

WVU Experiment Station research program evaluation takes place at two levels and on two different time cycles. All programs will be evaluated using these general criteria plus

additional criteria tailored to each specific program as detailed in the Plan of Work under Outputs and State defined Outputs and Outcomes.

Annual evaluation will continue as before, looking at productivity in terms of immediate impact

- Professional presentations
- Referee journal articles and books
- General audience papers and news reports
- M.S. and PhD graduates
- Trends in terms of competitive funding

And in terms of longer-term impact:

- Citations in scientific journals
- Patents
- Successful technology transfer or start-ups based on research programs
- Awards based on continuing impact and research excellence

Every five years there will be a full portfolio review including:

- Long term productivity
- Relevance to our constituent groups and the State and Region
- The allocation of research inputs among the programs
- Consideration of eliminating some research programs that are not productive or have diminished relevance given NIFA and State priorities
- Consideration of adding additional program areas given NIFA and State priorities

This portfolio review will be conducted internally by a committee appointed by the Dean and externally by a committee composed by a subset of our College Visiting Committee.

The State budget and economy are feeling the effects of the decline in the coal industry and falling energy prices. Our College budget has absorbed three major cuts in the last three years with more to come in 2017. We have been advised by our constituents, including the Commissioner of Agriculture and the new Governor to conduct research to help stimulate the WV agricultural economy and foster the forest products industry by creating value-added agricultural products and products that utilize the hardwood resources of the State.

WVUES

Each year WVUES holds the Community Leadership Conference. In 2016, the conference collected evaluation data after the conference. Here are two highlights from the evaluation.
44% had taken on a new leadership role since you came to the conference last year?
Some of those leadership roles included, moderator at workshops, senior level position, chamber of commerce, coach, work with teen leader club, officer at a state association.

In order to understand how to design the conference next year to meet participant needs, participants were asked about the most significant challenges that are faced by small businesses in your community?

- Space - quality space (dilapidated buildings).
- Funding niche marketing.
- Trained workforce, economy.
- As a baby boomer retiree, opportunity is created! In Charleston we are seeing popular

small businesses close when owners retire - can't find buyers. So we've lost and still losing successful businesses - next generation needs entrepreneurial training and knowledge of financing.

- Parking, bad areas, challenges with the homeless.
- Declining population with declining customers.
- Skilled workforce, drugs, money, skills of running a business, taxes.
- Too few trained employees.

Key Items of Evaluation

WVU-AFES

We have several research projects looking at developing novel products such as industrial hemp, bio-materials and bioenergy products from underutilized hardwood species and from waste generated by the forestry industry. We also continue our work on improved pasture management for beef cattle and improved feed products for the poultry industry, the two biggest agricultural industries in the State.

WVUES

The First Impressions team at WVUES is working with other states to develop an evaluation survey form to collect common data from each of the First Impression Programs. Even though, each has its own style, there are things that the group can learn and use to make programs better.

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Production/Sustainable Forestry

☑ 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
123	Management and Sustainability of Forest Resources	50%	0%	60%	0%
124	Urban Forestry	0%	80%	5%	0%
125	Agroforestry	20%	15%	0%	0%
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%	0%	10%	0%
511	New and Improved Non-Food Products and Processes	0%	0%	25%	0%
604	Marketing and Distribution Practices	15%	0%	0%	0%
605	Natural Resource and Environmental Economics	15%	5%	0%	0%
	Total	100%	100%	100%	0%

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	0.0	7.0	0.0
Actual Paid	2.0	0.5	3.0	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**
150000	25172	16996	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
35821	17038	287089	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
185821	48577	187124	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The forest products industry is an important part of the WV State economy. While the State has abundant forest resources, sustainable management of those resources is essential to preserve the productivity and health of our forest ecosystems for future generations. Such sustainable management involves understanding of the markets for forest products, utilization of current low value hardwoods, development of new biomaterials and biofuels, control of fire and pests, and development of forest management practices that increase productivity while preserving the environment.

WVU-AFES

This program includes research to develop improved procedures for hardwood timber management and harvest, to increase the efficiency of wood utilization while developing new uses for hardwoods, and, increasingly, to devise new processes to efficiently utilize wood and timber resources in the production of renewable bio-energy and bio-products. Timber management research includes the development of models to predict yields, systems to protect forest resources from insect pests, acid precipitation, fire, disease, and invasive species; harvest management protocols for optimum regeneration and re-growth; methods to use harvest and processing wastes to efficiently produce bio-energy; feedstock and bio-product logistics; and, programs that respond to research needs and concerns of corporate and private owners and provide economic comparisons among alternative management and harvest methods.

Research program highlights for 2016 include:

· Research on the economic impacts of increasing the intensity of management of immature Eastern forests.
· Another looked at the socioeconomic impacts of biofuels on rural communities.
· A long-term research project was completed that looked at development of novel hybrid cellulose nanocomposite film with potent biocide properties utilizing low quality Appalachian hardwoods.
· A fourth project examined Marcellus shale drilling in WV and its impacts on the forest products industry and forest landowners' behavior.

WVUES

In 2016, the Production/Sustainable Forestry planned program at WVUES sought to improve knowledge about the importance of the forest as a natural resource and increase participants' skill in protecting it. These skills are needed to improve woodlot conditions, expand forest and non-timber product production, and to improve the business and management competencies of forest/wood industry businesses. Topics

include: Forestry in WV, Tree ID, Firewood Processor, Timber!, Woody Ornamentals and Tree Care, Forestry and Forum.. This year, there were 26 educational activities.

WVSU-GRDI

West Virginia State University Extension Service conducts educational workshops focusing on urban and community forestry. These hands-on workshops allow participants to become comfortable pruning their own trees at home, as well as municipal employees being comfortable with basic maintenance skills. Topics such as cultivated mushroom production, pecan production, and others are being analyzed to determine the productivity possibilities, as well as the economic possibilities that could arise.

Highlights for 2016 include:

· Memorial Tree Project have been utilized from a community development perspective, as well as an urban forestry standpoint to bring aesthetics and community together.
· Workshops and training participants indicated an increase in their knowledge of cultivated mushroom production, pecan production, etc.

2. Brief description of the target audience

The target audience for this program includes professional foresters, the forest-product industry, small and large woodlot owners, extension specialists, consultants, regulators and policy makers.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1381	10703	644	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	13	13

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of general press articles

Year	Actual
2016	4

Output #2

Output Measure

- Number of educational materials create or updated

Year	Actual
2016	1

Output #3

Output Measure

- Number of workshops and other educational presentations for clients

Year	Actual
2016	35

Output #4

Output Measure

- Number of professional/academic presentations

Year	Actual
2016	18

Output #5

Output Measure

- Number of graduate students earning degrees

Year	Actual
2016	12

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of program and workshop participants who gain knowledge or skills that will improve their forest operation management skills.
2	Number of new state wood products and materials developed
3	Number of WV forestry program participants using forestry by-products.
4	Number of program and workshop participants who gain knowledge or skills in urban forestry practices.
5	Intensive Management of Immature Eastern Forests
6	Socioeconomic Impacts of Biofuels on Rural Communities
7	Development of novel hybrid cellulose nanocomposite film with potent biocide properties utilizing low quality Appalachian hardwoods
8	Number of program and workshop participants who gain knowledge or skills on forest related businesses.

Outcome #1

1. Outcome Measures

Number of program and workshop participants who gain knowledge or skills that will improve their forest operation management skills.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1216

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Since WV has vast tracts of public and private forest lands, WVU Extension has an important role in training and consulting with private woodland owners to manage their property based on accepted principles of sustainable forestry. The ultimate goal is to preserve forest resources in West Virginia.

What has been done
WVUES specialists offered a series of workshop for landowners on forest operations management. They included Firewood Processors, a series called, TIMBER!, and workshops on wildlife response to timber management. Topics covered included the proper operation of firewood processors, the basics of logging, selling timber, timber rights, harvesting, economics of logging, and the benefits and impacts of timber management to wildlife.

Results
Participants gained knowledge of: the proper operation of firewood processors, the basics of logging, selling timber, timber rights, harvesting, economics of logging, and the benefits and impacts of timber management to wildlife.
Participants gained skills in implementing road layout. They were able to use theory about forest roads in order to minimize environmental impacts from forest operations.
As a result of their training, participants were able to operate firewood processors for a number of cycles.
As a result of their training, landowners now contact a forester before timbering their property.

4. Associated Knowledge Areas

KA Code	Knowledge Area

123	Management and Sustainability of Forest Resources
125	Agroforestry
604	Marketing and Distribution Practices

Outcome #2

1. Outcome Measures

Number of new state wood products and materials developed

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Number of WV forestry program participants using forestry by-products.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	99

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
West Virginia has the 3rd highest percentage of forested land in the United States, creating an opportunity for forest landowners to utilize this area for things like mushroom production and other enterprises utilizing forest by-products.

What has been done
During the year, educational hands-on workshops were conducted focusing on cultivated mushroom production with forest landowners from various parts of West Virginia.

Results
Workshop evaluations were conducted to determine the number of participants increasing their knowledge of the topics being presented upon. For this reporting year, 100% of workshop participants indicated an increase in knowledge and a desire to begin implementing mushrooms in their farm/woodlot enterprise.

4. Associated Knowledge Areas

KA Code	Knowledge Area
125	Agroforestry
511	New and Improved Non-Food Products and Processes
604	Marketing and Distribution Practices

Outcome #4

1. Outcome Measures

Number of program and workshop participants who gain knowledge or skills in urban forestry practices.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	25

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
As urban and suburban areas increase in West Virginia, it is important for homeowners and municipal staff to better understand proper care and maintenance of these urban trees, as well as the benefits they can provide both aesthetically and economically to the urban setting.

What has been done
During this reporting year, a total of 15 educational workshops were delivered focusing on urban forestry and fruit/nut tree production in West Virginia. In addition to these workshops, there were 4 different urban orchards planted throughout the state, with plans to implement others during the next year.

Results
Evaluations were completed for most workshops (some outdoor workshops are difficult to have paper evaluations based upon weather constraints). These evaluations are designed to evaluate the number of participants increasing their knowledge of the topic being presented. During this reporting period, 89% of participants indicated an increase in knowledge as a result of the workshop.

4. Associated Knowledge Areas

KA Code	Knowledge Area
124	Urban Forestry

Outcome #5

1. Outcome Measures

Intensive Management of Immature Eastern Forests

2. Associated Institution Types

- 1862 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)
Historically, management of eastern hardwood forests focused on the extraction of forest resources. Even now, stands are partially harvested without consideration of future growth or value potential of the residual trees. When sound management does occur, timber stand improvement activities begin once stands attain commercial size. This ignores the potential to influence stand productivity and value during the first few decades. By focusing management efforts earlier in the rotation, future commercial operations can be much more valuable. However, the tools and knowledge base required for the intensification of hardwood management are lacking.

What has been done
This project is split into two parts, one that addresses natural stand management and another that deals with planted forests. The intent of the first is to explore an efficient means to enhance the productivity and value of eastern hardwood stands. Improving the growth and representation of species with high monetary and ecologic value will improve economic and amenity returns to landowners. We are trying several different management approaches, including a strip thinning study in young stands to look at multi-functional management of young hardwoods; developing survival probabilities for regenerating hardwoods to help predict long-term forest composition; Using the strip clearcut method to regenerate mixed upland oak; and, restoring red spruce stands in the southern Appalachians.

Results

So far five graduate students have used the study sites for their Master' project. Two undergraduate classes (WVU and Glenville State College) were taken to the strip thinning and strip clearcut study, and the progeny test. Several research sites have been used for training and workshops. The strip thinning and strip clearcut studies were shown as part of two professional workshops (20 participants each). Participants of a maple syrup workshop (40 participants) and an arborculture conference (35 participants) were shown a maple syrup/sugarbush demonstration area.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources

Outcome #6

1. Outcome Measures

Socioeconomic Impacts of Biofuels on Rural Communities

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

Development of novel hybrid cellulose nanocomposite film with potent biocide properties utilizing low quality Appalachian hardwoods

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)

Currently in the Appalachian region there is a vast amount of low-value, low quality hardwood that can be potentially used as feedstock for novel bio-products. Only West Virginia generates 2.41 million dry tones of underutilized wood per year that might be a great source for nanocellulose production. Today the technology to separate and obtain wood polymers at nanoscale exists and it has been demonstrated with success; however, specific applications for these novel raw

materials are still a challenge.

What has been done

Based on our preliminary results, one interesting application is the utilization of micro and nanostructures of cellulose as templates and stabilizers for biocide nanoparticles with emphasis of application as antimicrobial nanocomposites in the packaging and/or medical industry.
The manufacture of films, particularly in the flexible packaging enterprise represents the second largest sector in the packaging industry, which is approximately $135 billion in the worldwide (USA Flexible Packaging Association). Any improvement on these films will generate benefits not only to the industry but also to the population. Antimicrobial films for instance, that are capable of controlling the growth of microorganisms in food continue to be developed due to increasing demand for extended shelf life and food safety.

Results

We demonstrated the effective antimicrobial performance of the hybrid cellulose-copper nanoparticles when it is incorporated in polyvinyl alcohol films. The results of this project have potential application in films for packaging or in composites for wound care products. Our continued work will focus on development of economic processes for producing the nanoparticles.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources
511	New and Improved Non-Food Products and Processes

Outcome #8

1. Outcome Measures

Number of program and workshop participants who gain knowledge or skills on forest related businesses.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

As the coal industry continues to wane, West Virginians need new opportunities for jobs. The forestry industry was identified as one job sector that could be expanded.

What has been done

In Nicholas County, a forestry forum was developed to gather information from key stakeholders on how to help expand or retain forest related businesses. A training program was also implemented for contractors to teach time how to obtain licenses to become loggers. A forest industry tour was also conducted for national, state, and local leaders to see the opportunities that the wood industry had in Nicholas County.

Results

100 forest industry business owners and other stakeholders gained knowledge about how they could expand forestry-related jobs and retain workers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
125	Agroforestry
605	Natural Resource and Environmental Economics

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

V(I). Planned Program (Evaluation Studies)

Evaluation Results

WVU-AFES

WVU Experiment Station research program evaluation takes place at two levels and on two different time cycles. All programs will be evaluated using these general criteria plus additional criteria tailored to each specific program as detailed in the Plan of Work under Outputs and State defined Outputs and Outcomes.

Annual evaluation will continue as before, looking at productivity in terms of immediate impact

- Professional presentations
- Referee journal articles and books
- General audience papers and news reports

- M.S. and PhD graduates
- Trends in terms of competitive funding

And in terms of longer-term impact:

- Citations in scientific journals
- Patents
- Successful technology transfer or start-ups based on research programs
- Awards based on continuing impact and research excellence

Every five years there will be a full portfolio review including:

- Long term productivity
- Relevance to our constituent groups and the State and Region
- The allocation of research inputs among the programs
- Consideration of eliminating some research programs that are not productive or have diminished relevance given NIFA and State priorities
- Consideration of adding additional program areas given NIFA and State priorities

This portfolio review will be conducted internally by a committee appointed by the Dean and externally by a committee composed by a subset of our College Visiting Committee.

The State budget and economy are feeling the effects of the decline in the coal industry and falling energy prices. Our College budget has absorbed three major cuts in the last three years with more to come in 2017. We have been advised by our constituents, including the Commissioner of Agriculture and the new Governor to conduct research to help stimulate the WV agricultural economy and foster the forest products industry by creating value-added agricultural products and products that utilize the hardwood resources of the State.

WVSU

A total of 144 evaluations were received from program participants with 129 participants indicating an increase in knowledge on the topics being discussed. This shows 90% of participants increasing their knowledge of the subjects. Follow-up evaluations will be administered over the course of the next year to determine how many participants have implemented things they learned in these workshops.

Key Items of Evaluation

WVSU

Evaluations focus on the increase of knowledge on the various topics that are being presented upon. Additional information being garnered includes presenter effectiveness, the likelihood of the participant implementing these topics and also comments on additional topics that should be made available going forward.

WVU-AFES

We have several research projects looking at developing novel products such as industrial hemp, bio-materials and bioenergy products from underutilized hardwood species and from waste generated by the forestry industry. We also continue our work on improved pasture management for beef cattle and improved feed products for the poultry industry, the two biggest agricultural industries in the State.

V(A). Planned Program (Summary)

Program # 8

1. Name of the Planned Program

Fundamental Plant and Animal Systems

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
201	Plant Genome, Genetics, and Genetic Mechanisms	0%	0%	10%	0%
206	Basic Plant Biology	0%	0%	10%	0%
301	Reproductive Performance of Animals	10%	0%	20%	0%
302	Nutrient Utilization in Animals	90%	0%	20%	0%
304	Animal Genome	0%	0%	20%	0%
305	Animal Physiological Processes	0%	0%	20%	0%
	Total	100%	0%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	6.5	0.0
Actual Paid	2.0	0.0	8.0	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**
130000	0	796379	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
31353	0	1521033	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
161353	0	605580	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research involving fundamental plant and animal systems is designed to increase our basic scientific understanding of reproductive, nutritional and general physiological systems and processes.

WVU-AFES

Experiment station basic research involves animal and plant systems and use of animal models for biomedical research. On the animal side, problems addressed include embryonic mortality in sheep and cattle, infertility in dairy cows, performance limiting amino acids in animal rations, and health and disease resistance in poultry. For plants, the program emphasis includes determining the molecular interactions during nitrogen fixation symbiosis between legumes and rhizobial bacteria, characterization of arbuscular mycorrhizal fungi, determining functions of ubiquitin and other polypeptide tags, understanding basic mechanisms of flower senescence and cold shock adaptation, combating the impacts of phytophthora and Chestnut blight and defining and eliminating negative effects on grazing animals of ergot alkaloids produced by fungi that are symbiotic with pasture grasses. On the human health side, research involves using dairy cows as models to explore the linkages among nutrition, lipids, insulin resistance, metabolic disorder and diabetes.
Highlights for 2016 include:
· A long-term research project continued that is developing methods to alter alkaloid profiles of forage and turf grasses by genetic manipulation of endophytic fungi to maximize bio-protective properties of forage and turf grasses while minimizing toxicity to livestock.
· A long-term NSF funded project continued on phylogenetic, ecological, and biogeographical characterization of arbuscular mycorrhizal fungi and their symbioses with plants in diverse habits.
· A long-term NIFA funded project continued examining the biochemical mechanisms mediating insulin resistance in over-conditioned dairy cows transitioning from gestation to lactation.

2. Brief description of the target audience

The target audience for this area is composed animal and plant scientists, biochemists, professional practitioners, dieticians, regulators and agribusiness firms.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

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

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

Patent Applications Submitted

Year:	2016
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	0	11	11

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of general press articles

Year	Actual
2016	0

Output #2

Output Measure

- Number of professional/academic presentations

Year	Actual
2016	12

Output #3

Output Measure

- Number of graduate students earning degrees

Year	Actual
2016	15

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of new cultivars ergot alkaloid deficient grasses at or near wild-type vigor developed.
2	Number of strategies using hypovirus as a biological control agent for Chestnut blight developed and employed.
3	Number of ovarian-specific genes affecting reproductive success identified.
4	Phylogenetic, ecological, and biogeographical characterization of arbuscular mycorrhizal fungi and their symbioses with plants in diverse habit.
5	Mechanisms mediating insulin resistance in over-conditioned dairy cows transitioning from gestation to lactation

Outcome #1

1. Outcome Measures

Number of new cultivars ergot alkaloid deficient grasses at or near wild-type vigor developed.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Many agriculturally important forage and turf grasses, including tall fescue and perennial ryegrass, are infected with symbiotic fungi from the genus Neotyphodium. These fungi grow internally in the plants, which show no external symptoms. The fungi benefit the plant by providing tolerance to biological or environmental stress. In many cases, these fungi produce bioactive chemicals including ergot alkaloids and lolines. Certain ergot alkaloids provide protection against insects; however, many ergot alkaloids also are harmful to grazing animals, resulting in poor weight gain, poor health, and reduced reproduction.

What has been done
Our long-term research project has identified many of the genes required to produce ergot alkaloids and lolines. The goals of this current project are to eliminate, replace, or add specific genes to symbiotic fungi to alter the spectrum of ergot alkaloids and lolines produced in a controlled manner. The modified fungi will be reintroduced into their grass hosts (grown in containment), and the chemical profiles will be analyzed. Plants containing the modified fungi will be studied to determine the effects of specific chemicals on insect pests and parasitic nematodes (soil-dwelling round worms). This approach may produce fungi that provide enhanced bioprotective properties to their grass hosts. The alterations in ergot alkaloids also may reduce toxicity to grazing animals, but such tests are beyond the scope and time-scale of the current project.

Results
We used a novel approach to eliminate one of the two ergot alkaloid synthesis (eas) gene clusters of E. coenophiala by chromosome end knockoff. This new approach resulted in eliminating all genes between the targeted recombination site and the original telomere and established a new telomere at the recombination site. Significantly, all transgenic DNA involved in

the recombination event are eliminated during the process to yield a fungus free of transgenes. It is important that the strain lacks transgenes, which should lessen public concerns and regulatory requirements. These modified strains will be tested for their impacts on insect and nematode pests in the next phase of the research.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
206	Basic Plant Biology

Outcome #2

1. Outcome Measures

Number of strategies using hypovirus as a biological control agent for Chestnut blight developed and employed.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Number of ovarian-specific genes affecting reproductive success identified.

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Phylogenetic, ecological, and biogeographical characterization of arbuscular mycorrhizal fungi and their symbioses with plants in diverse habit.

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)

This is a long-term basic research project whose goals are to discover, characterize, understand, and utilize the diversity in form and function attributable to arbuscular mycorrhizal fungi (AMF) in the phylum Glomeromycota, their host plants, and the interactions between these symbiotic partners.

What has been done

Our current research focus is to discover, characterize, understand, and utilize the diversity in form and function attributable to arbuscular mycorrhizal fungi (AMF) in the phylum Glomeromycota, their host plants, and the interactions between these symbiotic partners. Over two decades, we have made the fungi cultured and characterized in our studies available to the public by distributing worldwide more than 5,000 cultures to over 600 scientists, educators, students, growers, and entrepreneurs. We provided training via visitations or workshops to more than 350 researchers and students, and responded to countless emails. Third, this work and the infrastructure we have at our disposal will promote transparency and public access to information and germplasm via videos, DVDs of high-resolution image libraries, and a website that includes searchable databases. Last, active collaborations with researchers at other universities will provide opportunities to utilize next-generation sequencing methods (454 pyrosequencing at present) for sampling a broader range of gene sequence diversity and extending the scale of analysis from genes to genomes.

Results

This project is closely tied to an international culture collection of arbuscular mycorrhizal fungi (INVAM) supported about 50% by the National Science Foundation. Results of this and other projects are reported along with collection activities and results on a website administered by West Virginia University (http://invam.wvu.edu). The website has an on-line searchable database updated daily for requesting culture material, educational information, and forms for visitations/tours. In 2016, the average number of visitors was 2,685 per month. Number of hits by those visitors averaged 22,892 per month.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms

Outcome #5

1. Outcome Measures

Mechanisms mediating insulin resistance in over-conditioned dairy cows transitioning from gestation to lactation

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)
The transition from gestation to lactation represents a critical period in the life cycle of the dairy cow. During this timeframe, dairy cows will experience a physiological state of negative energy balance characterized by excessive fatty acid concentrations in circulation (caused by adipose tissue mobilization) and hepatic ketogenesis. In turn, dairy cows can develop metabolic diseases such as fatty liver and ketosis during early lactation. The occurrence of metabolic diseases is greater in overweight cows, a result attributed to greater fatty acid levels in blood and reduced insulin sensitivity. Identifying the cause of insulin resistance in overweight dairy cows and developing new strategies to control insulin action to lower circulating fatty acid levels may be a means to improve animal health, reduce costs, and improve dairy farm profitability.

What has been done
In a joint effort between West Virginia University and Johns Hopkins University, we employed mass spectrometry-based metabolomics to profile metabolites in adipose and plasma pre- and postpartum in lean and over-conditioned cows and assessed whether stimulation of FAox can prevent insulin resistance in bovine adipocytes. Understanding the mechanisms that mediate insulin resistance in over-conditioned cows will enable us to devise strategies to prevent PMD. Furthermore, our metabolomics approach will identify prepartum plasma metabolite markers that serve as diagnostic tools to detect cows susceptible to PMD.

Results
This project is fundamentally basic research and proceeds in small steps. So far our results suggest that ceramide accrual represents a metabolic adaptation to nutrient restriction and impaired insulin action in dairy cows. To complete the project, we will: 1. Measure whole serum, lipoprotein fractions (VLDL, LDL, and HDL), adipose, and liver tissue ceramide and sphingomyelin concentrations. 2. Quantify liver lipid accumulation. 3. Evaluate changes in gene expression with a focus on ceramide and fatty acid metabolism, and inflammatory signaling. 5. Explore new methods to quantify different metabolite classes (e.g. phosphatidylcholines and phosphatidylethanolamines) to better assess lipoprotein metabolism. 6. Assess changes in systemic inflammation. 7. Statistically analyze our large data sets to draw associations between the bovine lipidome, adiposity, and insulin resistance in periparturient dairy cows. 8. Finally, submit our in vivo work for peer-review publication.

The central target audience of this project are producers that manage dairy cows. Although the research will benefit dairy producers nationally, a more immediate impact has been made

regionally within Somerset County, PA. Academic, government, and industry professionals also serve as a target audience. At West Virginia University (WVU), the target audience has included undergraduate and graduate students seeking a career in the agricultural sciences, and faculty interested in employing a mass spectrometry-based metabolomics approach for their own research goals. At WVU (for 2016), training exercises included blood marker colorimetric and mass spectrometry analysis, tissue lipid extraction, immunoblotting, and continued data organization, statistical analysis, and presentation. Additionally, mass spectrometry based methodologies that were developed with this project were utilized by other biomedical research programs at WVU.

4. Associated Knowledge Areas

KA Code	Knowledge Area
305	Animal Physiological Processes

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Appropriations changes
- Competing Public priorities

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

WVU-AFES

WVU Experiment Station research program evaluation takes place at two levels and on two different time cycles. All programs will be evaluated using these general criteria plus additional criteria tailored to each specific program as detailed in the Plan of Work under Outputs and State defined Outputs and Outcomes.

Annual evaluation will continue as before, looking at productivity in terms of immediate impact

- Professional presentations
- Referee journal articles and books
- General audience papers and news reports
- M.S. and PhD graduates
- Trends in terms of competitive funding

And in terms of longer-term impact:

- Citations in scientific journals
- Patents
- Successful technology transfer or start-ups based on research programs
- Awards based on continuing impact and research excellence

Every five years there will be a full portfolio review including:

- Long term productivity
- Relevance to our constituent groups and the State and Region
- The allocation of research inputs among the programs
- Consideration of eliminating some research programs that are not productive or have diminished relevance given NIFA and State priorities
- Consideration of adding additional program areas given NIFA and State priorities

This portfolio review will be conducted internally by a committee appointed by the Dean and externally by a committee composed by a subset of our College Visiting Committee.

Our evaluation for our Fundamental Plant and Animal Systems goal area is the same as for Goal Area 1, because most of our investment and hiring in our Plant and Animal Sciences divisions has been in the basic science areas. We have focused on the basic sciences in these areas because of the need for basic scientific research related to agriculture and the greater availability of external funding in the basic sciences.

From goal 1:

In 2016 our research productivity, measured by refereed journal articles, continued to increase. We have invested in our plant and soil science and animal and nutritional science programs over the last 4 years in terms of new hires and increased investment in start-up financial support. The investment was targeted to three areas: molecular genetics, biochemistry and microbiology. That investment has paid off, resulting in increased publications each year, with the total number doubling over that four-year period using Google Scholar tallies. We are also seeing increased grant proposal submissions and recently, increased success at NIFA and NSF. We will move in 2017 to a uniform faculty productivity report using Digital Measures. This move will allow us to better track productivity in each of our goal areas.

Key Items of Evaluation

WVU-AFES

While our investments in the basic plant and animal sciences have been highly successful we worry about keeping the best of our new faculty hires. We will be losing one of our top animal metabolomics researchers later this year to another institution.

V(A). Planned Program (Summary)

Program # 9

1. Name of the Planned Program

Strengthening Families

☑ 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
724	Healthy Lifestyle	20%	20%	0%	0%
801	Individual and Family Resource Management	20%	20%	0%	0%
802	Human Development and Family Well-Being	60%	20%	0%	0%
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	0%	20%	0%	0%
806	Youth Development	0%	20%	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	24.0	2.0	0.0	0.0
Actual Paid	20.0	2.8	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**
475000	140966	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1016193	95416	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
1491193	272031	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

In 2016, the Strengthening Families planned program at WVUES worked towards improving the financial wellbeing of WV families, encouraging good mental health practices, and building strong primary adult and child/parent relationships in WV families. The goals of the program include: 1) increasing knowledge and skills related to financial decision-making, emotional health, and family relationships; 2) ensuring the success of those in train-the-trainer programs; 3) increasing collaborations between WVUES and community organizations in order to strengthen families; 4) increasing the number of participants who are certified to provide childcare and offer relationship, parenting or financial education.

WVUES

The major initiatives within the family finance area AARP Fraud Watch, Build a Budget, Cruisin' thru the golden years, Dollars and Cents Budgeting Simulation, Financial Literacy, Identity Theft, and Make Your Money Matter-Use a Budget. The major initiatives within the parenting area were: Parenting Piece by Piece, iFather event,STEP, and Fatherhood . The major initiatives within the adult relationship area were: The Five Love Languages, Relationship Smarts, and Marriage Preparation Training. The major initiative in the childcare area is the ACDS Childcare Provider Training, Mandatory Reporting, Stewards of Children Darkness to Light. WVUES Extension faculty serve as liaisons and provide educational resources to the CEOS groups in West Virginia. Many faculty write and publish lesson plans for CEOS club meetings. There are approximately 4,000 members in West Virginia. This year there were 326 educational activities in the strengthening families' area in 2016.

WVSU-GRDI

Focus on improving overall health led to the implementation of programs that targeted underserved youth and families. Health and nutrition education classes are offered to a nontraditional audience on a weekly basis to help improve their physical health. A journal that guides recipients on proper communication with healthcare providers is provided in a workshop setting to adults, youth and military families.

Highlights for 2016 include:

· The Healthy Grandfamilies Program was implemented providing workshops and ongoing social services to support grandparents raising their grandchildren..
· Partnerships with local hospitals and recovery centers were strengthened to provide health and nutrition education to underserved audiences such as pregnant women, individuals transitioning from prison and/or recovering from drug abuse.

2. Brief description of the target audience

The target recipients of family services will be individuals and families representing a wide range of diversity, throughout the state of West Virginia. Audiences include West Virginia parents, childcare providers in WV, older adults in WV, kin caregivers in WV, school teachers, WV citizens in significant personal relationships, volunteers, partners, Extension agents, legislators, and social service personnel.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	7686	138169	6905	938

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	2	1	3

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of general press articles

Year **Actual**

2016	2

Output #2

Output Measure

- Number of educational materials create or updated

Year	Actual
2016	3

Output #3

Output Measure

- Number of workshops and other educational presentations for clients

Year	Actual
2016	345

Output #4

Output Measure

- Number of professional/academic presentations

Year	Actual
2016	12

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of participants who increased their skills in family relationships including harmful behavior avoidance, beneficial parenting techniques, and communication.
2	Number of participants who improve or increase their skills in family financial management including, informed shopping, budgeting and establishing savings accounts.
3	Number of participants who increase or improve their skills in parenting.
4	Number of participants who change a behavior or use a new skill related to family management.
5	Number of individual participants and communities that participate in social networking activities through Extension programs.
6	Number of participants who train others.
7	Amount of money raised by participants to support the program.
8	Number of people certified or license to practice in the field.
9	Number of new groups or organizations related to family life or finance that are established or enhanced.
10	Number of economic improvements related to families.
11	Number of social improvements related to families.

Outcome #1

1. Outcome Measures

Number of participants who increased their skills in family relationships including harmful behavior avoidance, beneficial parenting techniques, and communication.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1031

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The research behind relationship education programs indicates that a majority of partners entering committed couple relationships report high initial relationship satisfaction and hope that the relationship will be life-long. However, on average, relationship satisfaction declines over the first 10 years of marriage. The divorce rate for first marriages is about 40% to 45% in the United States. Most experts agree that a happy marriage affords numerous benefits for individuals.

What has been done

The PICK program or (How Not to Fall for/Marry/Date a Jerk) is a series of related programs for a variety of categories of individuals (teens, dating, committed, married) that is widely requested by citizens in WV counties. It covers crucial areas of exploration needed before entering into a committed relationship. Understanding the importance of choosing a partner wisely helps individuals have safe and healthy relationships. These courses are taught to middle school students, high school students, college students and adults. 508 people participated

Results
Participants completed workbook assignments and set goals for having healthier relationships.
After each class, participants were able to name 2 things they learned and 2 things they would do differently.
At least 80% reported they feel more confident about their ability to use the Relationship Attachment Model to strengthen their relationships

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
806	Youth Development

Outcome #2

1. Outcome Measures

Number of participants who improve or increase their skills in family financial management including, informed shopping, budgeting and establishing savings accounts.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	4801

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Families can manage income more effectively through planning. Managing income helps families understand how much money they will need for monthly expenditures and savings. Helping families knowing what to do when they are faced with an abrupt drop in income due to a layoff, salary reduction, illness or divorce is an important part of Extension work.

What has been done
To address this problem, the Strengthening Families Team members developed, delivered, and evaluated financial education classes and educational materials for West Virginia citizens including families, CEOS members, Farm Bureau members, and youth in 4-H activities. Some of the programs include: Building a Budget (elementary school program), Cruisin? AARP Fraud Watch, Through the Golden Years, Dollars and Cents, Budgeting Simulation, Financial Literacy, Make Your Money Matters, Living Frugally, Money Habitudes, and What Color is Your Money. One hundred family finance sessions were held.

Results
Participants increased knowledge about ways to protect themselves from fraud and remain safe in their homes.
Students developed a budget.
Students made money choices and then applied these choices to real-world scenarios.
Students indicated they would use information to make financial decisions after the program
Participants said that they will plan for financial stability, financial security and acquire assets by

using a budget.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
806	Youth Development

Outcome #3

1. Outcome Measures

Number of participants who increase or improve their skills in parenting.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	2107

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
According state conducted research, West Virginia children living in homes without committed father figures face a number of risks that affect physical, economic and emotional well-being. This study found that consistent father-child engagement, even in nonresidential circumstances, was associated with better socioemotional functioning, academic learning and behavior management. The state of West Virginia leads the nation in childhood obesity, depression and opioid addiction. A strong fatherhood program could address some of these issues.

What has been done
WVUES created a fatherhood celebration in collaboration with numerous organizations and companies, including a CPASS professor at WVU. The activities were designed to engage the fathers and their children physical activities. 1064 people attended.

Results
The number of fathers and their children who participated in the program has increased substantially over the past three years: 22 in year 1,300 in year 2, and 1064 in year 3. The

program is being replicated in other areas of the state.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
806	Youth Development

Outcome #4

1. Outcome Measures

Number of participants who change a behavior or use a new skill related to family management.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	607

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In general, children growing up in homes where there is a stable and healthy couple relationship show better academic performance, health behaviors, and reduced school misbehavior. Healthy stable couple relationships have also been linked to better physical and mental health for adults based on indicators such as improved health behaviors, longevity, lower rates of alcohol consumption, less depression, and fewer lost work days.

What has been done
Since 2005, WVU Extension Service has been engaged in delivering research-based, skill-focused education in relationships. One of the programs is the 5 Love Languages program. Extension faculty developed built on an existing program. The program has been implemented in 17 counties, with more than 2500 participants overall. There were 155 participants this year. A research study of the program resulted several positive impacts to participants.

Results
Participants gained understanding of their love language and the language of their partner.

Participants gain confidence in using the love language of their partner.
Participants who participated in the 5 LL program were more likely to say that they look at their partner's side of a disagreement, imagine how things look from their partner's perspective, try to look at things in their relationship from two sides, put themselves in their partner's.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being

Outcome #5

1. Outcome Measures

Number of individual participants and communities that participate in social networking activities through Extension programs.

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Number of participants who train others.

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

Amount of money raised by participants to support the program.

Not Reporting on this Outcome Measure

Outcome #8

1. Outcome Measures

Number of people certified or license to practice in the field.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	41

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In today's child care settings the training of childcare providers take varied forms, all of which include some form of on-the-job training. Often workers are placed under the direction of an experienced teacher but far too often child care providers are placed in centers without adequate training. The Apprenticeship for Child Development Specialist (ACDS) program has set out to remedy this problem.

What has been done
ACDA is sponsored by the U.S. Department of Labor and implemented in West Virginia through River Valley Child Development Center in Huntington. Two Extension county agents qualified to become instructors. They taught topics such as print awareness, metacommunication, bi-lingual learning, diversity, brain development, motor development, health, safety, nutrition and ethics.

Results
In the spring of 2016, 41 students completed the requirements for the course to graduate and were certified as childcare workers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being
806	Youth Development

Outcome #9

1. Outcome Measures

Number of new groups or organizations related to family life or finance that are established or enhanced.

Not Reporting on this Outcome Measure

Outcome #10

1. Outcome Measures

Number of economic improvements related to families.

Not Reporting on this Outcome Measure

Outcome #11

1. Outcome Measures

Number of social improvements related to families.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Grandfamilies represent a population with family and social interactions and responsibilities that are more complex than usual. Since 1991, the number of grandfamilies nationally has increased by 64%. WV ranks fourth among all states in the percentage of grandparents responsible for their grandchildren. These families are predominantly low income, have limited access to healthcare, have high rates of obesity, and lack strong social support systems. These families are vulnerable to health outcomes, social isolation, and depression.

What has been done
At WVSU, Grandfamilies program provides information and resources to grandparents raising grandchildren in nine discussion sessions with three months of follow-up services for family support as well as a television broadcast, and community open house forums. Three educators at WVUES have joined with Mission WV to provide resources to grandfamilies including an electronic listserv.

Results
Caregivers were empowered to better advocate for their patients/loved ones. Grandparents

reported feeling better equipped and more knowledgeable on how to serve as caregivers and how/where to seek assistance for specific needs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

WVUES
We have had a reduction in personnel in this area. The Family Life specialist retired two years ago and has not been replaced. Teams of agents are still working in this area but have not had leadership from a specialist.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

WVUES
A team in the Strengthening Families area is working on an evaluation project that should be completed in 2017. The evaluation objectives include:

- To evaluate the effectiveness of the Stress Less with Mindfulness program
- To understand how participants use the Stress Less with Mindfulness program in their daily lives
- To understand what motivates participants to use the Stress Less with Mindfulness program
- To understand the barriers that keep participants from using the Stress Less with Mindfulness program
-

WVSUES:

After attending the Healthy Grandfamilies sessions, pre and post tests indicated a positive change in key participant outcomes including knowledge of self-care, communicating with doctors, strategies to improve family relationships; a positive change was indicated in comfort level with ability to prepare healthy meals and willingness to try new parenting

approaches; there was also a 50% increase in knowledge of how to manage stress.

Key Items of Evaluation

The Five Love Language Program was evaluated in the last two years and an article is being considered for publication in the Journal of Human Sciences and Extension.

V(A). Planned Program (Summary)

Program # 10

1. Name of the Planned Program

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
802	Human Development and Family Well-Being	20%	30%	0%	0%
806	Youth Development	80%	70%	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	59.0	6.5	0.0	0.0
Actual Paid	52.0	3.5	0.0	0.0
Actual Volunteer	8288.0	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**
793111	176207	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
2961650	119270	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
3754761	340039	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

In West Virginia, 4-H Youth Development professionals and programs at both West Virginia University Extension and West Virginia State University Extension provide educational, fun, and safe opportunities for young people to make friends, learn, and grow. Positive youth development is achieved by weaving essential elements into 4-H programs that promote independence, generosity, and mastery of new skills. The three primary educational areas of emphasis are healthy lifestyles; science, technology, engineering, and math (STEM); and citizenship. Our literacy programs strengthen children's reading skills and promote the benefits of adults and children reading together. Programs focused on STEM, citizenship and expressive arts are created and implemented to cultivate youth and increase their interest in STEM fields, improve self-efficacy, and equip them with knowledge to become responsible youth and adults. There were 2356 activities reported in youth development this year.

WVUES

The youth development program at WVUES addresses five programmatic areas: 1) citizenship and global education; 2) literacy education, 3) science, technology, engineering and math (STEM), 4) healthy lifestyles, and 5) adult leadership for youth. The goals of the program are: 1) develop youths into responsible leaders of their state, country, and world, 2) improve reading skills in youth and engage adults in teaching children to read, 3) create in youth an appreciation for STEM and equip them for a technologically advanced society, 4) increase the capacity of youth to maintain a healthy lifestyle.
Activities include clubs, county camps, statewide camps, conferences, and national and international experiences.

Citizenship and Global Education - Within the Citizenship and Global Education program, youth gain skills in leadership, 4-H workforce development, cultural and international communication, and civics. Some educational activities include: iRespect, Global Awareness, Build-A-Budget, Dress for Success, Charting, 4-H Officer Training, Youth Voice Teen Leadership, Teen Counselor Training, and Career Connections.

Literacy Education - Within the Literacy Education program area the largest program is Energy Express, a summer program that promotes school success of children living in low-income communities by providing summer learning experiences and an ethic of service among college students and community members. This category also includes the Reading Partner initiative.

Science, Technology, Engineering and Math - Within the STEM program area, educational activities included topics related to the environment, energy, forestry, agriculture, animals/agriculture, technology and engineering, the biological sciences, and the physical sciences. A feature program in this area is the STEM Ambassador program which trains college students with STEM majors in pedagogy skills related to their field, and then places them in a 4-H state camp during the summer where they teach STEM related subjects and mentor campers who are interested in STEM careers.

Healthy Lifestyles - Many youth activities related to healthy living are reported in the Nutrition and Childhood Obesity section. The ones reported in this section are mainly those related to safety including ATV safety, shooting sports, risk prevention programs such as Health Rocks and PROSPER, and sport safety.

Adult Leadership Development for Youth Activities - WVU Extension faculty members train adults to work with youth in West Virginia. These programs train club leaders, camp counselors and staff. Some educational activities include camp counsellor training, Energy Express mentor and site coordinator training, and volunteer leader training.

WVSU-GRDI

Youth program content is focused on science, agriculture, expressive arts, mentoring and

citizenship. Summer camps are designed to increase youth's interest in pursuing degrees and careers in STEM fields. Junior Master Gardener programs improve knowledge on and increase interest in on agriculture.

Highlights for 2016 include:

· The Health Sciences & Technology Academy (HSTA) Summer Forensics Institute improved youth's interest in pursuing STEM and healthcare careers as well as a desire to pursue a college degree.
· The 4H PLANTERS program is providing hand-on AG-STEM programing to preschool youth.
· The 4H Mentoring program hosted an expressive arts summer camp collaboration with a local community center supporting underserved youth

2. Brief description of the target audience

Children ranging from preschool to 8 years of age. Youths 9 to 21 years of age, primarily in 4-H programs. More than 85,000 youth are 4-H members and more than 6,000 adult volunteers work directly and indirectly with them. Volunteer and adult workers will be the focus of professional development and program sustainability.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	156552	1153856	243193	59784

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	41	3	44

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of general press articles

Year	Actual
2016	0

Output #2

Output Measure

- Number of educational materials create or updated

Year	Actual
2016	45

Output #3

Output Measure

- Number of workshops and other educational presentations for clients

Year	Actual
2016	2456

Output #4

Output Measure

- Number of professional/academic presentations

Year	Actual
2016	129

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of youth participants who improve or increase skills in STEM subjects including agriculture and gardening skills.
2	Number of youth who report positive interests in science and/or an interest in pursuing a health, science, or technology-related career.
3	Number of youth participants who improve or increase leadership, communication, or citizenship skills.
4	Number of youth who increase their appreciation for cultural diversity and respect for other cultures.
5	Number of youth who improve or increase healthy living skills including consuming healthy foods and engaging in physical activity.
6	Number of youth who increase or improve their literacy skills.
7	Number of youth who increase knowledge and skills about risky behavior avoidance.
8	Number of youth who participate in service learning activities, community activities or issues.
9	Number of youth who express an interested in engaging in service learning activities, community activities and issues later in life.
10	Number of youth who engage in safety practices.
11	Number of youth participants who use a new skill that they learned in a 4-H activity.
12	Number of youth attending expressive arts programs who demonstrate mastery of their creative art.
13	Number of youth who improve their grade point average or other assessment score related to academic achievement.

Outcome #1

1. Outcome Measures

Number of youth participants who improve or increase skills in STEM subjects including agriculture and gardening skills.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	502

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Waning interest in science, technology, engineering, and mathematics (STEM) disciplines is especially problematic in a state like West Virginia where only 17% of the predominantly rural population have a Bachelor's degrees or higher, the lowest rate of any state. Given the lack of parents and local employers with STEM degrees, West Virginia students have fewer role models in these fields, leading to limited knowledge of STEM career opportunities and the steps needed to pursue them. In addition, West Virginia students are ranked at the bottom of nearly every national metric for science and math preparedness (The Science and Engineering Readiness Index (SERI), National Assessment of Educational Progress (NAEP)).

What has been done
WVUES STEM Camp: Twenty-three middle school aged youth from across the state came to campus to work with faculty and students in a variety of labs and research projects. The camp offered 5 full days of STEM programming with more than 30 total hours of hands-on STEM activities.

Results
To gauge the effectiveness of the 2016 WVU Extension STEM Camp curriculum, students were given a ten question assessment at the beginning (pre) and end (post) of the one-week camp. Questions were drawn from the major learning objectives prepared for each day of the camp. Overall, the group showed a percent gain in knowledge of 66.22% at the end of the camp. Further, males improved by an average of 57.42% and females improved by an average of 83.93%. To determine the lasting impact of the camp on youth attitudes, parents were sent an online survey two and half months following the conclusion of camp. The parent's responses to the evaluation were overwhelmingly positive.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being
806	Youth Development

Outcome #2

1. Outcome Measures

Number of youth who report positive interests in science and/or an interest in pursuing a health, science, or technology-related career.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	148

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Oil and gas industry seeks to hire individuals that have had training in basic safety skills to work on an oil or gas well site. A required safety course costs approximately $250 per individual with no guarantee that the individual will be hired. Few recent high school graduates were seeking this training because of the cost and travel distance required.

What has been done
CEWD Specialists obtained grant funding to reach out to high school seniors and provide in oil and gas safety skill training at no cost to them. Preston County WVUES educators contacted the Preston County Schools and arranged an informational meeting with vocational instructors. Shortly after that, school officials arranged a schedule for students to receive the training. The training was valued at $250 ($12,000 total).

Results
50 Preston High School seniors gained oil and gas safety skills will give them a significant edge in the local and growing oil and gas industry job market. With a declining local coal industry, this training provides a new opportunity for motivated students.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being
806	Youth Development

Outcome #3

1. Outcome Measures

Number of youth participants who improve or increase leadership, communication, or citizenship skills.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	4000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
According to the National Research Council and the Institute of Medicine, youth need opportunities and support from their communities to develop these important personal and social assets in order for youth to become competent, contributing adult members of society. Leaders of today will soon need others to serve in their capacity and take on roles in areas such as government and community.

What has been done
Each year new members are introduced to 4-H project work through the project book for new members. A WVUES 4-H team created two levels of curriculum, one for younger first year members, and the other for older members. At WVUSU, the 4-H Mentoring Program community members and students from WVSU to serve as positive role-models and mentors to youth in the Charleston area, where violence is at an increased rate. These mentors engage in lessons related to leadership, citizenship, STEM, the arts, and nutrition. Career and life goals are discussed.

Results
4000 4-H youth gained knowledge of key 4-H information and became inspired to participate in 4-H activities.
4000 4-H youth gained leadership and communication experience by completing their first 4-H project.

In the WVSU 4-H Mentoring Program, participants were given pre, mid, and post surveys to assess their level of self-esteem, independence, and sense of belonging. All participants reported an improvement in all areas

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being
806	Youth Development

Outcome #4

1. Outcome Measures

Number of youth who increase their appreciation for cultural diversity and respect for other cultures.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	800

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Global education has increased significantly, in importance and prominence, for youth and adults over the last decade. Not only are we learning about the world through new technology, we are also interacting with it. Being fully immersed in the 21st century has placed new importance on understanding diversity and cultures other than our own.

What has been done
WVUES hosted international delegations from China, Mexico, Vietnam, and Japan. These youth and adults took part in Alpha I and II state camps. At Alpha II Vietnamese campers facilitated daily cultural assemblies that showcased their talent and increased cross cultural understanding with American youth. There were about 800 youth and adults at the Alpha I and II camps.

Results
At Alpha and Alpha II 4-H camp, the Chinese, Mexican, Japanese and Vietnamese delegations increased their understanding of 4-H, American culture, and camp expectations. 4-H youth gained cultural knowledge.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being
806	Youth Development

Outcome #5

1. Outcome Measures

Number of youth who improve or increase healthy living skills including consuming healthy foods and engaging in physical activity.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	85

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
West Virginia was ranked the second-most obese state in the U.S. The CDC (2010) cites the need for better youth health education to address problems related to childhood obesity in West Virginia. West Virginia youth often have limited opportunities for choosing among a variety of healthy living learning experiences that are often available to youth in urban and suburban areas. In addition, low-resource families do not have expendable income to give to their youth for extra-curricular activities.

What has been done
As part of the healthy living track at the State 4-H Teen Leader Weekend, WVUES Extension agents provided youth with three healthy living options including: self-defense, media literacy, and yoga. WVSU implemented the national 4-H curriculum 'What's On Your Plate' which explores food science as a comprehensive curriculum set with hands-on experiment's, some of which learners can eat as they discover the science behind food preparation. Youth learn the building blocks of food science using chemistry, biology, and physics in a kitchen laboratory setting

Results
After taking the self-defense session, 95% of respondents agreed that they feel better prepared to protect themselves. After the media literacy presentation, 90% of respondents agreed that they learned how to analyze media messages and 76% agreed that they can find hidden or unspoken

messages in media. After the yoga presentation, 100% agreed or strongly agreed that they learned new yoga poses and 81% said they planned to practice the yoga techniques they learned. The 'What's On Your Plate' curriculum increased participants' knowledge, attitudes, skills, and aspirations to promote optimal physical, social, and emotional health habits.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being
806	Youth Development

Outcome #6

1. Outcome Measures

Number of youth who increase or improve their literacy skills.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	871

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Studies have shown that children, particularly those who in low-resource families, lose a significant amount of their reading and math skills over the summer. Teachers must spend time during early fall catching the children up before they can begin making progress in the new term.

What has been done
The Read Aloud program has been coordinated through the WVSU Agent in Summers County. This program encourages early childhood reading through placement of 45 volunteers in the public school system who read to children. The volunteers are supported by 40 teachers. The WVSU Agent serves as the Summers County Read Aloud Coordinator, providing communication and materials for monthly chapter meetings as well as the direct communication with school coordinators and Read Aloud WV. WVUES implements the Energy Express Program each summer for 2500 children in 81 sites where they engage for six weeks in a hands-on literacy program.

Results
Children in the program are encouraged to read during the summer months which helps bridge the learning gap between the end of school in June and the beginning of the new school year in August. The Read Aloud program also encourages parental bonding with children through reading. In the Energy Express program, youth maintain or increase broad reading skills.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being
806	Youth Development

Outcome #7

1. Outcome Measures

Number of youth who increase knowledge and skills about risky behavior avoidance.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	15

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There is evidence that if parents and youth develop healthy relationships there will be a reduction in risky behaviors by youth. Parents and youth benefit from learning about how to support each the others goals and dreams and build strong family communication. Youth need to learn how to deal with stress, follow rules, and make good friends.

What has been done
The West Virginia University/Iowa State University CYFAR SCP has developed PROSPER community collaborative teams to provide evidenced-based, family skills-focused, SFP 10-14 programming for 6th grade students and families in four communities. This evidence-based program has been shown to reduce substance abuse in youth. Four rounds of family programming and two booster sessions were held in 2016. Teens serving on local PROSPER collaborative teams play significant roles in recruiting families to the program. Strong support has been garnered from local partners. Schools have dedicated time for teams to work with youth and

share information with families.

Results

Youths increased their knowledge of issues related to showing appreciation for things parents do, knowing how to sit down and work through a problem with parents, taking on responsibilities such as household chores, and telling parents when they feel stressed. The combined mean pre-score of 2.54 increased to 2.70 on the post-test. Quotes from youth after training include: 'I look at things from other people's point of view to help better understand them.' 'I will spend a lot more time with family.'

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being
806	Youth Development

Outcome #8

1. Outcome Measures

Number of youth who participate in service learning activities, community activities or issues.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	28

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

To address the concerns around health and nutrition in the rural, economically disadvantaged state of West Virginia, WVUES, in collaboration with the WV Statewide Afterschool Network (WVSAN) expanded the WV 4-H Healthy Lifestyles Program to include youth serving in afterschool environments to implement health and nutrition programs. The service experience will also make a difference in the lives of the teens and their families who are serving as the ambassadors.

What has been done

WVUES 4-H and Youth educators enlisted 4-H Teens as teachers to deliver healthy lifestyles programming to other youth. Over 120 teens completed the training and acted as teen teachers in a cross-age design. Over one half of those teens completed the Teen Ambassador Survey modified from the Common Measures instrument as designed by National 4-H Council. In addition, over 25 4-H Teen Health Ambassadors completed a success story. A grant was obtained to fund this program from Walmart.

Results
1200 youth learned how to live healthier lifestyles because they were trained by Health Ambassadors
120 teens gained six to ten hours of instructional experience as a Health Ambassador.
120 teens gained 21st-century skills that can be used to better prepare them for college and careers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being
806	Youth Development

Outcome #9

1. Outcome Measures

Number of youth who express an interested in engaging in service learning activities, community activities and issues later in life.

Not Reporting on this Outcome Measure

Outcome #10

1. Outcome Measures

Number of youth who engage in safety practices.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	44

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
An unacceptable number of drownings were occurring on Bluestone Lake and the Bluestone, Greenbrier, and New Rivers flowing through Summers County West Virginia. The majority of fatalities could be attributed to the failure of victims to wear a life jacket while on or around water.

What has been done
A steering committee comprised of rangers with the US Army Corps of Engineers, National Park Service, and West Virginia State Parks; representatives of the American Red Cross; and local volunteers was organized in 2004 to address the problem. The program focused on the importance of wearing a properly fitting life jacket anytime someone is around a body of water. The 44 youths that participated in the Safety on the Blue Festival educational program received a properly fitting life jacket free of charge.

Results
44 youths increased awareness of water safety and the importance of wearing a life jacket whenever they are around water.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being
806	Youth Development

Outcome #11

1. Outcome Measures

Number of youth participants who use a new skill that they learned in a 4-H activity.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1260

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Complex information and multi-skill levels are necessary to demonstrate mastery of livestock management and quality assurance. We need knowledgeable livestock project instructors and well-researched, modern curricula to meet the modern day requirement of 4-H livestock projects.

What has been done
WVU created an online 4-H Youth Quality Assurance training that brought together livestock subject matter, exhibitor learning, and instructor training. In 2016, as part of this program, there were over 800 livestock exhibits and 400+ exhibitors.

Results
1100 youth gained knowledge and skills related to livestock and quality assurance through an online program that included onsite experience doing livestock exhibits.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being
806	Youth Development

Outcome #12

1. Outcome Measures

Number of youth attending expressive arts programs who demonstrate mastery of their creative art.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	25

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
With cuts to school art and music programming, youth have less outlets and access to this type of programming. The expressive arts "visual arts, movement, drama, music and writing" offer countless ways to promote the academic, career and personal/social development of students, which are goals of a comprehensive youth development program.

What has been done
4-H Creative and Expressive Arts Camp at WVSU was created to provide distinct programming to address the growing needs that youth have in developing life skills and becoming more

productive members of their society. It provides activities in the theatre, film/visual arts, culinary arts, and agriculture.

Results
Through partnerships with volunteers, local businesses and community organizations, youth are able to foster their desires to learn certain expressive arts and agriculture skills with caring adults who have already mastered the skills. Providing this healthy and nurturing way as an outlet for youth to express themselves will ensure less criminal acts in the community, higher student achievement by these participating youth and an increased sense of self-worth by participants while being given productive ways to spend their time.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being
806	Youth Development

Outcome #13

1. Outcome Measures

Number of youth who improve their grade point average or other assessment score related to academic achievement.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1560

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
During the summer months, children are most at risk for falling behind on reading levels -- a preventable loss known as the "summer slide." Summer reading programs are most effective when they are fun and when they occur in a safe, enriching environment focused on reading, writing, art and drama.

What has been done
Energy Express, a summer reading program, supports communities that identify the effects of the "summer slide" and nutritional loss as a priority. Local key stakeholders unite and build collaboratives to support the establishment and implementation of Energy Express sites.

Through the efforts of WVUES faculty and staff, communities successfully implemented the Energy Express Program in 2016. Children participated at 81 community sites across the state with 2,405 attending at least 50% of the program days.

Results
Children showed significant increases in letter-word identification, reading fluency, passage comprehension and broad reading.
65 percent of children either maintained (60.5%) or increased (4.8%), and the average child gained 1.9 months in broad reading achievement.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes
- Economy
- Appropriations changes
- Public Policy changes
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

WVSUES

4-H Mentoring

100% of youth participating in the 4-H Creative and Performing Arts Camp displayed increased knowledge and skill in their chosen course track of dance, culinary arts, photography, and percussion. 100% of youth attending the year-long Youth and Families with Promise program reported an increased level of independence, self-esteem and sense of belonging.

STEM programs

After attending the HSTA Summer Institute, 92% of HSTA participants reported that the summer program had an impact on increasing their interest in pursuing health care careers. 72% reported an increased interested in science after attending the program. 100% of

participants were able to display increased knowledge in the laboratory on topics of DNA Analysis, fingerprinting, and chromatography. Overall: 2,370 HSTA students have completed the program since 1998; 99% of our graduates have attended college; 91% of those students have earned a degree from a West Virginia college or university; 85% of our college graduates continue to live and work in West Virginia; $30,000 per year is what they earn on average above their parents' highest salaries.

EFNEP

Youth participating in the Expanded Food and Nutrition Education Program improved their choice of fruits and vegetables by 43%. Youth adopted and practiced 1 or more behavior(s) necessary to handle food safely by 43%.

WVUES

In 2016, we held 4-H camps in 58 county sites. An evaluation was done at each site that included questions related to the essential elements of youth development. 4,123 campers completed the survey. The following is a short summary of the results.

Essential Elements of Youth Development - four point scale from strongly disagree to strongly agree.

- Opportunity to build a relationship with a caring adult - 3.503
- Opportunity for independent learning and mastery - 3.400
- Emotionally safe and inclusive environment - 3.136
- Physically safe environment - 3.5953

The emotionally safe and inclusive environment is always a little lower than the other elements. This is especially true for boys. We are working on enhancing that element at our camps.

Campers said at camp they:

- Had lots of fun - 3.729
- Made new friends - 3.657
- Learned new songs - 3.587
- Had an opportunity to help others - 3.518
- Reconnected with old friend - 3.511
- Learned a new skill - 3.485
- Ate great food - 3.4328

Campers were asked to give their camp a grade from F to A and 67.6 percent graded it as an A and 25.7 percent graded it as a B

Key Items of Evaluation

Beginning In 2018, WVUES will be adopting the new 4-H Common Measures at camp.

VI. National Outcomes and Indicators

1. NIFA Selected Outcomes and Indicators

Childhood Obesity (Outcome 1, Indicator 1.c)	
16335	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.