2017 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 includes the combined 2017 Annual Report of Accomplishments for three entities: West Virginia University Agriculture and Forestry Experiment Station (WVU-AFES), held within 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 reflects the joint plan of work for the period 2017 - 2021 and includes ten goal areas. The previous reporting period (2016) was the second year the three entities submitted a joint annual report of accomplishments. This approach will continue until the 2021 reporting year (as approved by NIFA).

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 and 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 resides in 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 integrated through joint appointments, (nine of 104 faculty in the Davis College have partial extension appointments). Coordination of activities and planning occurs 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 of 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 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, Healthy Children Program, Energy Express, STEM Education, Soil Testing, Pesticide Recertification Training, Beef Quality Assurance, Farm Management, Forest Stewardship, Labor Education, Workplace Safety, 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 agriculture and forestry. In 2017, WVUES agriculture and natural resource programs tallied 130,916 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 2017, 4-H youth development programs at WVUES tallied 522,768 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 2017, family and health programs tallied 275,385 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 2017, WVUES community development and workforce programs tallied 37171 direct

contacts.
WVU Extension and its educational programs tallied 966,240 direct contacts in 2017, 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 36 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:

1. Global Food Security and Hunger: Production/Sustainable Agriculture
2. Climate Change and Environmental Quality
3. Sustainable Energy
4. Childhood Obesity, Nutrition, and Health
5. Food Safety
6. Community, Economic and Workforce Development
7. Production/Sustainable Forestry
8. Fundamental Plant and Animal Systems
9. Strengthening Families
10. Youth Development

Progress for 2017 in each of these goal areas is summarized in the Planned Programs section.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	160.0	25.0	44.0	12.5
Actual	130.0	24.5	48.0	11.5

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

2. Brief Explanation

1. The Merit Review Process used in the Current Reporting Year

- Internal University Panel
- External University Panel
- External Non-University Panel
- Expert Peer Review
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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 family and community 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 WVU's Digital Measures reporting system. The evaluation specialist writes a summary of the data collected, as well as outcome statements which are used to report to NIFA/USDA.

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. The Dean of Extension, Steve Bonanno, will be reviewed in 2018. Extension administrators are reviewed by their supervisors annually.

5. The administration of the WVU Extension Service conducted four "Listening Session" with faculty and staff in 2017. At these listening sessions, Steve Bonanno and other administrators informed faculty and staff about upcoming events and budgetary and staffing 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 organizations as providers of quality educational opportunities. WVU Extension professionals won the following awards in 2017:

From the National Association of County Agricultural Agents

- Distinguished Service Award - Brian Wickline
- Achievement Award - Daisy Bailey
- Audio Recording: WVU/OSU Extension Radio- Karen Cox - Audio Recording National Finalist
- Personal Column: The Backyard Gardner -J.J. Barret - Regional Winner
- Fact Sheet: Fall Pregnancy Exams Save Money - J.J. Barrett
- Team Newsletter: IPM Chronicle - National Winner - Rakesh Chandran, Mira Danilovich, Daniel Frank, Shelden Owen, Mahfuz Rahman
- Applied Ag Research Poster: Personal Size Watermelon Trial J.J. Barrett, Lewis Jett, John Johnson - National Finalist

From the National Association of Extension 4-H Agents, Northeast Division

- Meritorious Service Award - Michael Hall
- Distinguished Service Award - Becca Fint-Clark and Jennifer Murray
- Achievement in Service Awards - Lewis Honaker and Andrea Mender

- Educational Piece (Individual) Regional Winner - Jennifer Robertson-Honecker
- Personal Column Regional Winner - Becca Fint-Clark
- Published Photo - National Winner - Carole Scheerbaum
- Excellence in Geospatial Programming - Regional Winner - Lewis Honaker

From the National Extension Association of Family and Consumer Sciences

- Distinguished Service Award - Andrea Bennet
- Continued Excellence Award - Margaret Miltenberger
- Extension Educator of the Year - Eastern Region - Elaine Bowen
- Early Childhood Child Care Training Award: "WV Healthy Children Project" 1st Place Eastern Region - - Elaine Bowen, Kelli Crabtree, Gwen Crum, Hannah Fincham, Cindy Fitch, Lisa Hess, Dianna Lewis, Emily Murphy, Nancy O'Hara-Tompkins, Amanda Wallbrown, Barba Wolfe
- Educational Curriculum Package "Love Your Heart Partnership - 1st Place, Eastern Region, 1st Place National - Elaine Bowen, Kay Davis, Elizabeth Metheny, Eric Murphy, Brenda Porter, Dana Wright
- Marketing Package Award - "Rethink Your Drink" - 1st Place, Eastern Region, 1st Place National - Lisa Bell, Elaine Bowen, Abbey Castleman, Heather Cook, Gwen Crum, et al.
- Community Partnership Award "Fayette County Living Well Work Group" - 1st Place, Eastern Region, 2nd Place National - Lauren Weatherford
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From the National Association of Community Development Extension Professionals - Community Development Society

- Joint NACDEP-CDS Award - Michael Dougherty
- Excellence in Teamwork - Northeast Region: Sharing Scholarship and Innovations in the First Impressions Program - Douglas Arbogast, Daniel Eades, Allison Nichols
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From the Association for Communication Excellence

- Outstanding Professional Skill Award and Gold Award for Promotional Publications -- "Garden Calendar" - Greg Jacobs, Zane Lacko, Lori Costello Rigden, Matthew Scarfo, Lindsay Wiles, Sherry White
- Gold Award for a Single Marketing Item: "Did You Know?" Booklet - Greg Jacobs, Lori Costello Rigden, Matthew Scarfo, and Lindsay Wiles

Scientific Merit and Peer Review at WVU-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. Peer reviewers are selected by the Division Director, Experiment Station Director or designee and asked to assess the 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 pertaining to 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 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 presented annually to the Station visiting committee who are offered opportunities to assess program relevance and impact. Programs are also reassessed annually and every five years through a College planning processes.

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.

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

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. Many program teams work on evaluation projects. Many of these evaluations have been published in peer-reviewed journals.

Brief explanation: 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.

Another indication of stakeholder participation is willingness to financially support Extension programming. WVUES gifts and pledges through the WVU Foundation totaled more than $3,500,000 in 2017.

WVU-AFES
A great deal of stakeholder input is collected in tandem with West Virginia University Extension (administratively distinct from the College of Agriculture, Natural Resources and Design) since we share a majority of stakeholders. Special meetings were discontinued that had as their sole purpose the gathering of stakeholder input. Instead, the WVU AFES has 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.). The new procedure has proven more efficient representing 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, through web-based surveys, 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.

1. Method to identify individuals and groups

Each county has a county advisory committee that meets regularly and advises 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.

Brief explanation

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 will work

with our agents and specialists to build and cultivate relationships on a local, county, state, and national level.

WVU-AFES
The focus of the Service/Outreach agenda for the College is to continue to enhance communication and working relationship with Extension partners, commodity and industry groups, state agencies and community organizations that represent College disciplines within the State of West Virginia. The impact of these efforts by the College will continue to enhance relationships with academic partners and stakeholders resulting in programs that are more relevant to needs of the State and therefore 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 the 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.

WVSU

-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 Dean and 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 participants in 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.
WVSU leadership including the University President and Vice President for Research and Public Service meet with legislators and community stakeholders to solicit input and ensure we are effectively addressing the needs of the state through relevant research and extension programs. Additionally, extension professions and research faculty maintain active relationships with local stakeholders to ensure program remains relevant.

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. Recent budget cuts from the state and the University resulted in the loss of some positions including some county positions. In order to meet the most

pressing needs of the state, WVUES is identifying strategic priorities and the best use of limited resources.
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 Committees, 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. High rate of opioid addiction in the state.
2. Low workforce participation among eligible adults including lack of new industries moving to the state.
3. Workforce readiness for youth.
4. 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 PROSPER Project, an evidence-based family and youth program to address substance abuse addiction has been implemented in two counties and will be expanded in the state.
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. 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.
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.

In the Action Plans and To Set Priorities

The four Extension units in this report have been combined into three units: Agriculture and Natural Resources, 4-H and Youth Development, and Family and Community Development (formerly Families and Health and Community Economic and Workforce Development). Each of these three units are working on strategic plans. When the new Plan of Work is developed in 2019, it will reflect these three units as well as national indicators. 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:
As a pilot hiring strategy, beginning in July 2018, we have decided to hire agents twice a year - July 1 and January 1 - so we can offer induction training to the group that will participate as a larger cohort.

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 building 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 processing 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 ongoing annual State budget cuts, 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 and efficiencies increased without jeopardizing mission-critical programs.

Brief Explanation of what you learned from your Stakeholders

1. 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.
2. Substance abuse disorders have impacted children and families; many children are cared for by relatives or are in the foster-care system. We have partnered with WVSU to support non-parent relatives who are providing care for children.
3. Substance abuse disorders have impacted the economy, raising healthcare costs and contributing to low workforce participation.
4. Local foods systems can drive economic development, but producers need education to manage risk, increase productivity, identify new markets, and develop value-added products.
5. Animal agriculture is an important part of West Virginia agricultural production and producers need education to manage risk, increase productivity, and enhance marketability of their livestock.
6. West Virginia youth need high-quality out-of-school-time activities that offer opportunities to try new activities and master life skills.
7. West Virginia adults need high-quality life-long learning opportunities that increase their exposure to cultural and ethnic diversity and increase awareness of global issues.

Stakeholder feedback is used on a continual basis at WVSU to improve research and extension programs. Stakeholder needs form the basis of strategic planning, budget priorities, target communities, programming 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
{No Data Entered}	{No Data Entered}	{No Data Entered}	{No Data Entered}

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	4257972	1715356	3470243	1621999
Actual Matching	5589965	588779	6085674	893297
Actual All Other	0	4082861	4459543	1689834
Total Actual Expended	9847937	6386996	14015460	4205130

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	0	0	3245529	0

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%	5%	10%	0%
102	Soil, Plant, Water, Nutrient Relationships	10%	10%	10%	0%
111	Conservation and Efficient Use of Water	0%	10%	0%	0%
201	Plant Genome, Genetics, and Genetic Mechanisms	0%	0%	0%	34%
202	Plant Genetic Resources	0%	0%	5%	24%
205	Plant Management Systems	10%	5%	10%	0%
211	Insects, Mites, and Other Arthropods Affecting Plants	0%	5%	10%	28%
212	Pathogens and Nematodes Affecting Plants	0%	0%	10%	14%
216	Integrated Pest Management Systems	10%	5%	5%	0%
301	Reproductive Performance of Animals	0%	0%	10%	0%
302	Nutrient Utilization in Animals	0%	0%	15%	0%
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	10%	10%	0%	0%
503	Quality Maintenance in Storing and Marketing Food Products	10%	10%	0%	0%
604	Marketing and Distribution Practices	10%	10%	0%	0%
607	Consumer Economics	0%	10%	0%	0%
806	Youth Development	5%	10%	0%	0%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	17.0	4.0	8.0	6.5
Actual Paid	14.0	4.0	7.4	0.0
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	280069	816654	423134
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
346129	96145	1165701	233033
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	666596	911158	440828

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
Progress in the current reporting year included design of a soil sampling strategy to help guide practices to sustain production in high-yield tunnels. Additional progress included improvement of long-term sustainability of small farms producing organic vegetables by minimizing the use of off-farm inputs, and reducing tillage. Projects in animal health provided new methods of gastrointestinal nematode (GIN) management in sheep and goats; advancements in understanding energetic losses that occur in the conversion of consumed energy into usable animal protein, and understanding of varying substances released during inflammatory responses during pregnancy. Advances in food production and nutrition effects of nutritional management on composition of muscle from turkeys and rainbow trout and development of approaches to improve texture assessment of rainbow trout fillets and turkey breast to advance quality; advances in n-3 fatty acid metabolism to maximize tissue growth, health benefits and reduce side effects; development of a testing protocol to sample poultry feed during manufacture for nutrient, feed additive, and mycotoxin content; and advancements in marketable protein powder. Other progress included development of a spatially-targeted pest management system using geospatial and aerospace technologies for detection of pests and delivery of control measures.
Research program highlights for 2017 include:

- Improved best management practices for landscape management sites, high-tunnel and organic farm food production.
- Parasite control programs presented to over 500 producers at WV Extension.
- Development of testing protocol to sample poultry feed during manufacture for nutrients, pellet quality, and production economics.

- Developed aerial vehicle (UAV) and aerial delivery systems for pest control measures.

WVUES

At WVUES, the following planned program activities were emphasized: 4-H youth agriculture, feeder cattle marketing, livestock improvement/management, grassland management, homeowner and commercial horticulture, integrated pest management, horticulture education, nutrient management, agriculture literacy, agritourism, and farmers market management.

WVUES implemented conferences and educational series such as the Small Farms Conference, the Women in Agriculture Conference, Appalachian Grazing Conference, WV Market Ready Program, Annie's Project, Master Gardeners, Advanced High Tunnel Course, Agriculture in the Classroom, Feed Mill Managers Seminar, and a variety of state fair activities.
WVUES has offered individual training programs to improve skills in gardening, animal care and welfare, apple grafting, backyard poultry, beef cattle management, beef quality assurance, common insects, container gardening, diagnostic consultations, edible landscapes, entomology, forage testing, fruit pruning, gardening, goat nutrition, grazing management, high tunnel, local food production, nutrient management, farmer market management, pasture, pesticide recertification, beekeeper education, secure milk supply, small ruminant nutrition, soil testing, southern bull and heifer evaluation, tomato grafting, and veterinary feed.

WVSU-GRDI

WVSU Extension is assisting in the development of alternative agricultural endeavors with the end goal of developing increased revenue streams for small West Virginia farms. Training in post-harvest processing and handling will maximize implementation of best practices to increase the quality and quantity of locally grown foods in the marketplace. Development of urban growing spaces for youth and young adult at risk populations will aid in access to nutritious locally grown produce as well as improvement in quality of life for area residents. Junior Master Gardener programming will continue to be the foundation for youth agriculture training and entrepreneurship.

At WVSU, research programming continues to focus efforts in areas of: aquaculture, genetic mapping, genomics and breeding of selected vegetables and fruits, and trialing of vegetables including developing value-added pumpkin and pepper varieties.

One WVSU research group is focused on developing pest resistant fresh market tomato varieties with superior organoleptic traits for protected culture production. Molecular markers for pest resistant traits will be verified prior to using them to transfer these traits into advanced breeding lines and vintage varieties. New methods to assess phenotypic traits will be incorporated into the breeding program to develop new open pollinated lines and hybrids that can be evaluated with growers. Insect resistance mediated by acylsugars or sesquiterpenes will also be evaluated for potential deployment to verify it will not interfere with the use of beneficial insects in production

WVSU aquaculture researchers continue to perform analyses and feeding trials on interactive effects of fish meal- and plant protein-based diets and water temperature, on growth performance characteristics, feed utilization and mitochondrial function in rainbow trout.

Watermelon plants do not grow well in acidic soils of West Virginia. WVSU researchers identified bottle gourd (Lagenaria siceraria), a plant native to southern Africa, which can grow well in acidic soils and also is tolerant to Fusarium Wilt and drought stress.. Ggenomic driven improvement of fruit quality in watermelon continues to be a focus.

Highlights for 2017 include:

- Agricultural producers are diversifying to include aquaponics systems.
- Watermelon flesh microbiome analysis identified beneficial and ripening enhancing bacteria.

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, seed companies, 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

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	49419	229739	39481	5261

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

Patent Applications Submitted

Year: 2017

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	67	34	101

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of General Press Articles

Year	Actual
2017	22

Output #2

Output Measure

- Number of Professional/Academic Presentations

Year	Actual
2017	76

Output #3

Output Measure

- Number of Graduate Students Earning Degrees

Year	Actual
2017	1

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 a skill in nutrient management.
5	Number of producers indicating adoption of recommended or best practices.
6	Number of people certified or licensed to practice in the field.
7	Number of new groups or organizations that are established or enhanced.
8	Number of producers who utilize best practices with alternative agricultural enterprises to diversify their income portfolio.
9	Development of a new diet formulation for rainbow trout.
10	Development of value-added, disease resistant cultivars.
11	Increase in the number of producers and other members of the food supply chain.
12	Growth in state sales of beef- % increase.
13	Growth in state broiler, egg and turkey sales- annual % increase.
14	Improved best management practices for landscape management sites, high-tunnel and organic farm food production.
15	Parasite control programs presented to over 500 producers at WV Extension.
16	Development of testing protocol to sample poultry feed during manufacture for nutrients, pellet quality, and production economics.
17	Developed aerial vehicle (UAV) and aerial delivery systems for pest control measures.

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

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	800

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The state of West Virginia has very diverse horticultural needs in areas of commercial fruit and vegetable production management, landscaping, nursery production, and consumer horticulture through backyard gardening, lawn and landscape management.

What has been done
Extension specialists provide extension personnel, farmers, and general public with individual attention about garden/landscape issues through farm visits and answers to questions (Q&A) via emails and phone calls. Each answer is then formatted into a fact sheet that is used at the county, state and national level (eXtension). A Q & A list is being formulated and will find a "home" on one of the web-pages under "Ask an Expert" or as a "Consumer Horticulture Blog".

Results
As a result of the activities described above, clientele have found solutions to their garden/landscape issues. We are maintaining and growing our institutional and personal reputation for reliability, competency and trust.

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
205	Plant Management Systems

211	Insects, Mites, and Other Arthropods Affecting Plants
216	Integrated Pest Management Systems
806	Youth Development

Outcome #2

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	34

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Due to tight profit margins facing many beef farmers, increasing attention to farm finances is a must. It is easier to deal with the symptoms of financial strain through awareness than through the escalation of the reality of financial difficulty. Farmers possess a wide skill set to tackle the demands of an agriculture operation. With the development of a simplified financial analysis program, farmers become more open to farm record analysis and further adopt good record-keeping habits.

What has been done
BEEF TRANS is a computer generated spreadsheet that calculates a beginning and ending net worth statement, net farm income statement, and annual cash flow statement. WVUES offered a one-on-one consultation with farms using the Beef Trans 4 program to capture information from balance sheets, Schedule F tax forms, and production data. Thirty four beef/cow/calf producers completed the Beef Trans 4 Spreadsheet Program in 2017. WVUES specialists evaluated data from nine WV producers and built in average expenses and incomes as target benchmarks for WV producers.

Results
Nine farms have had a financial analysis completed. This represented 933 cows on 4,344 productive acres. The average farm size was 117 cows on 543 acres, which is an average of 4.66 productive acers per cow.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems
604	Marketing and Distribution Practices
607	Consumer Economics

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
2017	325

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Pesticide safety education is necessary to protect public health and the environment from pesticide hazards due to improper handling and application of pesticides and to bring quality products to market. Commercial and private pesticide applicators need training in order to comply with federal and state pesticide certification and licensing requirements. Small and beginning farmers need technical support to reduce pressures on native pollinators and to ensure a productive growing season.

What has been done
the WVUES 2017 Pesticide Re-certification Program Video was created and distributed to all county Extension offices to provide approved pesticide re-certification training to pesticide applicators. WVSU Extension held training sessions in plasticulture, integrated pest management and proper use of pesticides covering traditional as well as alternative agriculture growing situations.

Results
Continuing education units for pesticide re-certification were approved for participants attending and viewing the video. 300 commercial and private pesticide applicators completed the re-certification training. Through WVSU Extension efforts, small farmers gained skills in identifying the effects of pesticide and fungicide applications on fruit quality and quantity, removing and

composting plant debris to prevent the spread of disease, and using IPM for high tunnel production, particularly with aquaponics where fish are sensitive to chemical applications.

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 #4

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
2017	519

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Aquaponics, hydroponics and container gardening require proper management of nutrient systems to ensure targeted growth rates for plants and fish. Maintaining healthy plants and fish reduces product loss to pests and disease. Grassland production of hay and pasture is the largest crop acreage in WV. Management of this resource has improved, however, grassland productivity is well below its potential due to sub-optimal nutrient management and grazing management.

What has been done
WVSUES provides nutrient management training and support as part of its ongoing workshop and producer support programming. WVUES addressed these issues by: 1) developing fertilizer recommendations for hay and pasture crops; 2) calibrating a standardized falling plate meter for measuring light interception; 3) providing guidance on using light interception to manage seedling in pasture; 4) publishing findings; and 5) conducting research on simplifying plate meter calibration for measuring and budgeting forage from pastures.

Results
(1)Producers can use new fertilizer to improve grassland production or at least cost per unit yield; 2) The calibration of the plate meter vs. light interception enables producers to use grazing management to reduce plant completion with legume seedlings when establishing legumes into pastures without the use of herbicides as in organic production; and 3) The new techniques significantly reduces the labor requirement for clipping samples with little loss of precision. This will be of use to technical service providers and through them to the producers in the state.

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

Outcome #5

1. Outcome Measures

Number of producers indicating adoption of recommended or best practices.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	175

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Best practices provide greater opportunity to provide high quality product to market. The efficiencies associated with adoption of proven methods to address vegetable and fruit blight and disease and proper post-harvest handling can lengthen shelf life, reduce food borne pathogens and broaden the bottom line of a small business. One issue that was addressed this year was that tomato production in WV has been hampered by disease named "Septoria leaf spot."

What has been done
Both WVSUES and WVUES deliver instruction to growers on successful methods of production appropriate for local conditions. They address the challenges facing farmers; whether it be acid mine spoil, lack of sunlight, water quality or composting, and post-harvest handling and cooling of vegetables. This year, WVUES developed a new variety of tomato with higher disease tolerance and made it available to producers in WV.

Results
150 farm producers adopted the new tomato seeds, and as a result, increased local tomato production with less pesticides. Due to WVSUES efforts, both rural and urban growers are increasing their opportunities through alternative agriculture programming. In 2017, there was an increase in the number of community gardens and high tunnels which provide tangible evidence of the movement toward smaller scale yet highly productive food systems.

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
202	Plant Genetic Resources
205	Plant Management Systems
216	Integrated Pest Management Systems
503	Quality Maintenance in Storing and Marketing Food Products
604	Marketing and Distribution Practices

Outcome #6

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	247

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The demand for local, fresh foods outpaces the current production level in the state, although capacity is attainable through education, training and resources. People are involved in the Master Gardener Program for many reasons including "something to do" in retirement, socializing, opportunities to learn something new, and interest in where food comes from. This gardening renaissance is rapidly moving food gardening towards the top of the nation?s pastime.

What has been done
The Master Gardener program at WVUES involves close collaborative work with local EMG Programs, Extension Master Gardeners, and WVEMG Association through various committees and boards of directors. WVSU Extension delivers integrated training to small and urban farmers interested in bridging the gap from farm to table. With emphasis on alternative agriculture techniques, food security and nutrition are a part of the lexicon of rural America that has been missing for the past 5 decades.

Results
In 2017 WVUES added 190 new EMG Trainees; they have completed the training and have 2017 and 2018 to complete their volunteer requirements to become certified Extension Master Gardeners. At WVSU Extension, youth programming has certified 19 individuals for the Junior Master Gardener Program and WVSU?s youth agriculture programs are growing and reaching more schools in rural regions of the state.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
216	Integrated Pest Management Systems
604	Marketing and Distribution Practices
607	Consumer Economics

Outcome #7

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	7

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Institutional customers are reluctant to purchase local products because large food distributors are an easy single source of contact and they carry all of the items normally required.

What has been done
WVUES worked with local producers on the steps necessary to create a marketing cooperative designed to provide locally grown foods to institutional customers in Preston County. The cooperative provides a single source of contact for a wider range of products than a single producer could provide. The group was established as a legal registered entity in 2016.

Results
In 2016 the Co-op recorded $18,250 worth of gross sales. As of December 5, 2017 the Co-op recorded $35,155 worth of gross sales, an increase of 92% and an indicator that his is a growing program that is providing a valuable service to its members. This service provides a new source of income to farmers and improves the nutritional status of residents, local students and locally-based military personnel.

4. Associated Knowledge Areas

KA Code	Knowledge Area
604	Marketing and Distribution Practices
607	Consumer Economics

Outcome #8

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

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
By producing and processing food locally, the nation could save 8 billion dollars a year. By encouraging WV farm families to increase the production and processing of local diversified crops and the general population to consume these agricultural products, producers/farmers can run more profitable and sustainable operations.

What has been done
Using our locally grown cider and heirloom apples, we helped develop, grow, and brand the hard-cider industry in WV and tie it to the Appalachian Region. We presented half-day educational session at the Small Farm Conference in Charleston, WV. We addressed small farm diversification through hard-cider apples, heirloom apples, and plums with fresh market potential.

Results
As a result of efforts over the last few years, there are five new orchards in the state: Barbour, Marion, Monongalia, Pendleton and Pocahontas Counties. All of them have apples for fresh and hard cider and two (Barbour Marion and Marion Counties) are more diversified with addition of pears and some stone fruit in the mix.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
216	Integrated Pest Management Systems
503	Quality Maintenance in Storing and Marketing Food Products
604	Marketing and Distribution Practices
607	Consumer Economics

Outcome #9

1. Outcome Measures

Development of a new diet formulation for rainbow trout.

2. Associated Institution Types

- 1862 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Fish feed manufacturer, fish breeders, and farmers. Dietary formula with improved nutrient utilization will lead to farmed rainbow reach market-size in less time with less nutrient input. Less nutrient input and higher nutrient retention have environmental 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
Analyses of samples from the 2 x 4 factorial experiment conducted to evaluate the effects of temperature (10 °C, 14°C, and 18°C) and four experimental diets (1) 40/10FM/PP (40% crude protein from fishmeal and plant protein and 10% lipid); (2) 40/20FM/PP (40% crude protein from fishmeal and plant protein and 20% lipid); (3) 40/10PP (40% crude protein from plant sources only and 10% lipid); and (4) 40/20PP (40% crude protein from plant sources only and 10% lipid) have continued. Nutrient utilization efficiencies and mitochondrial function data have been analyzed. The mitochondrial gene expression analyses is ongoing.

Results
Nutrient Utilization Efficiencies (protein efficiency ratio (PER), protein productive value (PPV), lipid efficiency ratio (LER) and lipid productive values (LPV) - The diet × temperature interaction had significant effects on PERish fed the diet 40/20PP at 18 °C showed the highest LPV. Mitochondrial Function - The biochemical evaluation of mitochondrial complexes enzyme activities showed that there were differences among the three different tissues (liver, muscle and intestine) evaluated. The activity of complex I in the liver was significantly lower in fishes reared at 10 °C than those reared at 14 °C or 18 °C. For the intestine, fish grown at 18 °C had the highest complex III and citrate synthase enzymatic activities, followed by those reared at 14 °C, while those reared at 10 °C had the lowest complex III and citrate synthase enzymatic activities. For the muscle, increasing temperature generally led to an increase in muscle mitochondria enzyme activity. The fish fed 40/20FM/PP diet had a significantly higher complex I activity than those fed all the other diets. However, a significant diet × temperature interaction was observed on the activity of complex IV with fish fed 40/20FM/ PP diet at 18 °C had a significantly higher muscle mitochondria complex IV activity than those fed all the diets at 10 °C as well as the diets 40/10FM/PP and 40/10PP at 14 °C.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)

Outcome #10

1. Outcome Measures

Development of value-added, disease resistant cultivars.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Cultivars of watermelon share a narrow genetic base and are susceptible to a large number of pests and diseases, including whiteflies. Developing new cultivars possessing nutraceutical traits combined with disease and insect resistance has thus far proven difficult, and has been identified by producers as the major problem. The primary goal of our program is to use genomic assisted characterization of nutraceutically enriched watermelon germplasm.

What has been done
In the past, we have developed SNPs, genetic maps, molecular markers linked to various fruit traits and nutraceutical traits. During this year, we have cloned genes important for various nutraceutical traits including flavor and citrulline. We further expanded our GWAS panel from 180 to 1600. Further 1600 watermelon lines are sequenced to generate an additional 19,000 SNPs using which we are currently using for identifying genes for whitefly resistance and anthracnose. To complement with plant genomics, we profiled watermelon flesh specific microbiome and identified beneficial and ripening enhancing bacteria.

Results
A diversity panel consisting 1600 watermelon accessions was used for genome wide association study for whitefly and anthracnose resistance. This enhanced panel facilitated to identify 25 genes for citrulline, 128 genes for flavor and 190 genes for trichome density and length. Watermelon diversity research facilitated to identify various genomic regions underwent selection. We identified a set of candidate genes that underwent evolution through positive and purifying selection and gave rise to domesticated watermelons. We are in process of registering watermelon pre-breeding lines with enhanced citrulline and flavor related compounds. We are currently evaluating six crosses of wild and cultivated watermelons to identify novel watermelon pre-breeding lines with enhanced nutraceuticals and resistant genes using genomic selection approaches.

4. Associated Knowledge Areas

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

Outcome #11

1. Outcome Measures

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

Not Reporting on this Outcome Measure

Outcome #12

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
2017	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area

302	Nutrient Utilization in Animals
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)
604	Marketing and Distribution Practices
607	Consumer Economics

Outcome #13

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
2017	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
302	Nutrient Utilization in Animals
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)
403	Waste Disposal, Recycling, and Reuse
604	Marketing and Distribution Practices

Outcome #14

1. Outcome Measures

Improved best management practices for landscape management sites, high-tunnel and organic farm food production.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The State has invested heavily in landscape restoration and high-tunnels (Natural Resource Conservation Service, etc.). Increased efficiencies in management of these investments is critical for advancements and ongoing deliberate investment

What has been done
There are ongoing improvements to methodologies and understanding of how best to manage marginal landscapes to improve practices, prepare sites for use, and increase efficacy of planned investments. There is also burgeoning movement in terms of increasing deliberate markets for high tunnel production activities in West Virginia.

Results
Progress results in statewide and region wide improvements in understanding of how to best manage these types of programs to the best benefit of production and economic gains for managers.

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
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
205	Plant Management Systems

Outcome #15

1. Outcome Measures

Parasite control programs presented to over 500 producers at WV Extension.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Control of parasites is critical for animal production industries in WV and Appalachia. Parasites reduce productivity and fecundity of all production animals, and dissemination of information regarding new findings and/or methods of control are critical to regional food production, livelihood and health of human populations.

What has been done
Parasite control programs were presented to over 500 producers in collaboration with WV Extension.

Results
Information was disseminated to science and agricultural production community?s thereby increasing awareness and presumably parasite control efficacy in animal production industries.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
307	Animal Management Systems
313	Internal Parasites in Animals

Outcome #16

1. Outcome Measures

Development of testing protocol to sample poultry feed during manufacture for nutrients, pellet quality, and production economics.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In situ sampling of poultry feed during manufacture for nutrients and pellet quality, can increase efficiency and assessment of feed products as the feed is manufactured. This is important to drive down production costs and increase feed efficiencies, which, if effective will drive down production costs.

What has been done
A testing protocol was developed to sample poultry feed during manufacture for nutrients, pellet quality, and production economics.

Results
Results are early, but promising and indicate a need for methodological validation through ongoing work.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
307	Animal Management Systems

308 Improved Animal Products (Before Harvest)

Outcome #17

1. Outcome Measures

Developed aerial vehicle (UAV) and aerial delivery systems for pest control measures.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There is a great need to reduce costs for pest control delivery methods. This is particularly the case in complex terrains such as those in Appalachia. This is important in order to best target pest control agents to a) not affect unintended areas, b) increase efficacy of intended areas, and c) reduce costs associated with application (among other reasons)

What has been done
An aerial vehicle (UAV) and aerial deliver system was developed for pest control measures.

Results
The development of the method was tested with some success. Results are promising, and there is a great need for further testing and validation of application methods to advance the needs noted above.

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Weather remains a constant challenge to program outcomes due to the requirements of horticulture and gardening practices. Workshops and training were delayed or cancelled throughout the year due to weather. Changes in site locations and scheduling issues were also a challenge. Ongoing program budget cuts and delays affected a number of projects. With increasing workloads, new personnel has been mandatory, and hiring and training new personnel has remained a major focus, necessary prior to program and project implementation(s).

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

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.
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 to both food security and alleviation of world hunger. In 2017 research productivity, measured by refereed journal articles, continued to generally increase. In recent years there has been great investment in plant and soil science and animal and nutritional science programs by means 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 variously paid off, resulting in increased publications , with total numbers of publications approximately doubling as per Google Scholar tallies. There are also increased grant proposal submissions and recently, increased success at NIFA and NSF. We migrated to a uniform faculty productivity report using Digital Measures. This move allows us to better track productivity in each of our goal areas.

WVSUES

Evaluations of programming based on survey of willing participants indicated that WVSUES delivers relevant and useful training and technical support. >50 percent of participants provided favorable comments to queries. Respondents requested additional and/or continuation of technical support, increased incorporation of new technology and follow up training and/or forums.

WVUES

Example of evaluation results from this knowledge area:

ASP AND GROWER TRAINING PROGRAMS

Project evaluation consists of 3 phases to evaluate multiple outcomes (based on Rossi et al., 1999):

Phase One: Process Evaluation - Document the occurrence of events against planned project activities (Pre and Post Evaluations), so that outcomes can be validly and scientifically interpreted, and to allow others to replicate the project in other regions and benefit from our lessons learned. To enhance reliability and validity, team members systematically monitored, reflected and developed a post-training annual report the following: recruitment activities, development of curricula, mentorship and coaching process, planning and implementation of training events, and collaboration challenges.

Phase Two: Formative Evaluation of the Curricula - Assess the efficacy of the curricula for the target audience - we pre-tested all curricula using two focus groups with likely users, using established criteria for evaluating educational materials (Kiernan, 2002; Bertrand, 1978). iii. Phase Three: Impact Evaluation - Assess the effectiveness of our overall program in terms of recruiting, educating and mentoring producers. First, we monitored participation at educational and mentoring events to evaluate recruiting techniques; and monitored participation in and monitored page views of the online curriculum. Second, we measured pre- and post-changes (i.e., farmers' knowledge, attitude, skills and intent to change specific management practices) at each training event. We evaluated the effectiveness of the mentorship experience; and identified the challenges and advantages of online delivery compared to face-to-face delivery, and incorporated best practice recommendations for adult learners in subsequent online programs. We conducted follow-up online and mail surveys (six-months and one year post-training), to measure extent of

adopted changes within each project track. Additionally, we interviewed ten participants/year to provide in-depth information about unique factors that facilitated/hindered their success. Third, we measured the extent to which participants expanded their networks with mentors, other farmers or agricultural agencies in the end-of-program follow-up survey.

More than 147 participants (ASP and Growers) attended one of 4 short-courses.

Post-evaluations in 2017 show:

- 100% of post-survey respondents intended to implement at least
- 2 produce safety risk management strategies introduced during the course;
- 76% either intend to or have already started writing their food safety plans;
- 56% indicted an intent to apply for 3rd party audit verification.
- As a result of participating in this an related programs in the state, the number of GAP Certified Operations in WV now stands at 21 in 2017, from 6 in 2015 (a 250% increase)
- 92% indicated GAP Certified Operations in WV now stands at 21 in 2017, from 6 in 2015 (a 250% increase)
- 92% indicated some positive benefit to their enterprises as a result of participating in the course, including, higher returns, lower costs, less wastage, new markets, new products, new partners or alliances, or access to resources or programs from other agencies.
- 41% indicated they have reviewed current farm insurance policies and discussed food safety-related risks with their insurance provider and have/intend to updated or obtained new insurance coverage to protect their farm and family assets as appropriate.
- As a result of overall program participation, participants reported starting new or expanding current enterprises, accessed new or expanded markets, improved food safety compliance, reviewed and improved liability coverage, improved profitability, and improved record-keeping and financial management.
- Project partners have indicated an increase in request for their services and programs from participants of this program. Project has seen increase support (technical and financial) from statewide partners (WVDA), which has allowed us to continue to offer this valuable program into the future

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, remains a very effective strategy. We will plan on using this strategy of selective (deliberate) investment in the future.

- **Continuation of relevant educational and technical training**
- **Explore additional and/or new technology**
- **Greater than 50 percent of respondents found training and support to be a positive experience**
- **80 percent of participants changed behavior to incorporate best practices**

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%	0%
102	Soil, Plant, Water, Nutrient Relationships	25%	10%	10%	30%
111	Conservation and Efficient Use of Water	0%	15%	0%	0%
112	Watershed Protection and Management	10%	0%	15%	0%
124	Urban Forestry	0%	10%	0%	0%
131	Alternative Uses of Land	5%	15%	0%	0%
132	Weather and Climate	0%	0%	10%	0%
133	Pollution Prevention and Mitigation	10%	0%	15%	15%
135	Aquatic and Terrestrial Wildlife	0%	0%	20%	0%
136	Conservation of Biological Diversity	10%	0%	0%	12%
211	Insects, Mites, and Other Arthropods Affecting Plants	0%	10%	5%	9%
212	Pathogens and Nematodes Affecting Plants	0%	10%	0%	9%
403	Waste Disposal, Recycling, and Reuse	15%	10%	0%	25%
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: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	3.0	1.0	7.0	2.0
Actual Paid	3.0	1.0	12.0	4.8
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
220000	70014	296157	669954
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
7950	24031	1423801	368971
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	166647	1496421	697974

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

The over-arching program goal is to improve management and stewardship of West Virginia's water resources in light of expected climatic changes to minimize detrimental habitat impacts and ensure a high-quality environment for future generations. Individual research programs are focused on improving understanding of wildlife populations that are endangered or threatened by either habitat loss, climate change, or both including the Cheat Mountain Salamander, brook trout, and black duck. In particular, the assessment of historic and future freshwater resources and the sensitivity of aquatic ecosystems, including seasonal pond wetlands (i.e. vernal pools), through the use of watershed models that enable prediction of future aquatic conditions. Integrated watershed research programs to improve understanding of pollutant loading and transport associated with nutrient cycling are in progress to enhance understanding of water quality issues and build more socially functional and ecologically sustainable green spaces. Biogeochemical cycling and ecosystem water availability of West Virginia's forested ecosystems are of particular interest, including effects associated with the re-introduction of the American chestnut. Recent soil survey efforts resulting in remapping large tracts of WV land to better develop ecological site descriptions needed to support forest restoration, soil carbon management, and improve habitat suitability while simultaneously allowing for profitable timber management. Additional research efforts are under way to investigate the best management practices for abundant nuisance wildlife such as white-tailed deer, black bears, and coyotes through the development of predictive habitat use and multi-species occupancy modelling techniques. The success of economic incentive mechanisms (i.e. public policy) requires information on the trade-offs among environmental, social, and economic goods and services (i.e. valuation) to support sustainable ecosystem management through the use of cost-benefit analyses. Therefore, protecting West Virginia's rich water, soil, and wildlife resources through extensive data collection efforts and modeling exercises will help to balance sustainable economic growth, environmental quality, and the use and conservation of natural resources.

Research program highlights for 2017 include:

• Implementation of a globally unique watershed scale project including 22 stream gauge monitoring sites using a scale-nested and paired experimental watershed study design.
• A long-term collaborative research program between federal, state, and private stakeholders to elucidate relations between fish and streamside management practices
• Development of watershed models to enable prediction of future aquatic conditions under alternative watershed development scenarios (i.e. active mining areas) or climate change.
• 1580 youth at the National Scout Jamboree (July 2017) earned a badge focused on environmental sciences

WVUES

WVUES planned program activities include work with conservation district plans, the Mine Drainage Taskforce, various activities related to integrated pest management such as the pesticide recertification and private applicator recertification, storm water management to reduce erosion, flooding, and pollution, and the organic certification program. Invasive weed control using small ruminants, co-grazing goats and sheep with cattle, and 4-H youth climate control-related activities are also included in this planned program.

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 2017 include:

• Optimal varieties of zucchini and garlic for high tunnel production in the WV climate were identified
• Biochar amended soil was found to be resilient to changes in nitrogen levels

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, plant breeders and geneticists, students, 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

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	5800	13975	1663	1678

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

Patent Applications Submitted

Year: 2017

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	2	31	33

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of General Press Articles

Year	Actual
2017	1

Output #2

Output Measure

- Number of Professional/Academic Presentations

Year	Actual

2017	44

Output #3

Output Measure

- Number of Graduate Students Earning Degrees

Year	Actual
2017	1

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	Development of value-added products through pyrolysis process of biomass-to-energy conversion.
5	Creation of new knowledge in horizontal directional drilling mud co-product use and impact.
6	Creation of new knowledge regarding the effects of human impacts on riverine and watershed microbial ecosystem services
7	Evaluation of forestry reclamation practices on soil water quality
8	Number of participants who increase their knowledge of the potential for illness do to bio-contamination.
9	Added knowledge of growing practices under climate variability and change.
10	Added knowledge about adaptation and climate mitigation strategies for production agriculture and natural resources management.
11	Implementation of a globally unique watershed scale project including 22 stream gauge monitoring sites using a scale-nested and paired experimental watershed study design.
12	A long-term collaborative research program between federal, state, and private stakeholders to elucidate relations between fish and streamside management practices
13	Development of watershed models to enable prediction of future aquatic conditions under alternative watershed development scenarios (i.e. active mining areas) or climate change.
14	1580 youth at the National Scout Jamboree (July 2017) earned a badge focused on environmental sciences

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

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	10000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Resource extraction has and continues to damage land and water resources.

What has been done
Research, demonstrations projects, regulations, and practice have improved techniques before, during and after mining to improve the soil and water quality, and to establish vegetation to a designated post-mining land use. Meetings, workshops, publications, and media have provided information to practitioners, land owners, coal operators, regulators and scientists on better methods and technologies to reduce pollution and improve restoration efforts.

Results
Efforts have produced cleaner water and land and healthier communities and citizens.

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 #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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	525

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
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. Extension can train farmers on how to manage winter feeding to return nutrients to grow future crops, to grow crops to recover nutrients, and to grow crops that provide ground cover to prevent soil erosion.

What has been done
Field demonstrations were conducted on five sites. Re-vegetated sites were evaluated for forage growth, ground cover, weeds versus planted crop, forage yield, and animal unit grazing days. Case studies were written to quantify the cost of re-vegetation and the value of ground cover and forage production. A video was produced using three of the sites showing the benefits of re-vegetating winter feeding areas. This video reach 525 people. The 2016 video was used as part of the 2016 pesticide re-certification training.

Results
Producers at the Cattlemen's College took this information back to the farm to improve their winter feeding management and increase growth and yield of BMR Sudan Grass especially with the drought conditions. The swine forage site estimated a savings of $582 utilizing the BMR Sudan Grass. When farmers adopt re-vegetating winter feeding areas they can save themselves about $100 per animal unit in saved fertilizer value. They also protect their soil from erosion and the local surface water from sediment and nutrient pollution.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships

112	Watershed Protection and Management
131	Alternative Uses of Land
132	Weather and Climate

Outcome #3

1. Outcome Measures

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

Not Reporting on this Outcome Measure

Outcome #4

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
2017	0

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. However, soil nitrogen levels, and resulting different C/N ratios, may accelerate carbon decomposition in biochar-amended soils.

What has been done
CO2 emission from biochar amended soil treated with different levels of nitrogen was evaluated in an incubation study. Soil amended with highly recalcitrant woody biochar was tested at different biochar application rates and at different nitrogen additions.

Results
Soil respiration and CO2 released from biochar-amended soils was independent of nitrogen addition, suggesting high resiliency to changes in soil C/N ration and/or N-fertilization.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
131	Alternative Uses of Land
133	Pollution Prevention and Mitigation
403	Waste Disposal, Recycling, and Reuse
605	Natural Resource and Environmental Economics

Outcome #5

1. Outcome Measures

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

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Creation of new knowledge regarding 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
2017	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 support for industrial manufacturing. Managing watersheds for long-term

viability requires understanding how to manage the microbial ecosystem processes that provide biodegradation and bioremediation services.

What has been done

We are studying the microbial diversity and microbial ecosystem processes found in the sediment of the Kanawha River. We also sampled chemical diversity in the sediment using ICP-OES, and measured hydrological dynamics of the Kanawha River using automated multi-probe sondes. This research was funded through the NSF EPSCoR RII Appalachian Freshwater Initiative grant.

Results

Microbial diversity of river sediment was sampled at six locations using Illumina sequencing of 16S rRNA gene diversity. Geographic differentiation of diversity was found. Spatial differences in sediment chemical diversity were also found to be correlated with microbial diversity indicating that the effects of local geochemistry are not overwhelmed by river flow as determinants of diversity patterns. In addition, variations in standard freshwater chemical variables (oxygen, salt, conductivity, nitrogen, etc) were found to be related to water flow dynamics.

4. Associated Knowledge Areas

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

Outcome #7

1. Outcome Measures

Evaluation of forestry reclamation practices on soil water quality

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Appalachian region is mind for coal for more than a century. Surface mining operations result in destruction of natural ecosystem and landscapes. Proper reclamation of such sites is essential for restoration of natural ecosystem services, such as clean water. Different reclamation practices

have been developed and practiced over the years with varying levels success. Assessing performances of reclamation practices on restoration of ecosystem services is essential for proper development and adaptation of best management practices. The current research evaluates the effect of different reclamation practices on soil water quality.

What has been done

Previously established experimental site on reclaimed mine site is used in this study. Experimental treatments include use of different spoils as topsoil replacement material (brown vs. gray sandstone), and different placement practice thereof (loosely place vs. compacted). The different plots were instrumented with soil water sampling devises early during the spring of 2017 and water monitoring and sampling ensued and conducted throughout the 2017 growing season.

Results

Preliminary results point to wide variability in water yield and solution composition among the different spoil materials and placement practices. In addition, soil solution composition changes during the growing season. In all, initial findings suggest that redox processes affect soil solution composition, pH and total dissolved solids. While varied widely, and excluding redox-sensitive elements, much of the measured parameters were within range typical to surface water in non-mining-affected areas in Appalachia.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation
403	Waste Disposal, Recycling, and Reuse

Outcome #8

1. Outcome Measures

Number of participants who increase their knowledge of the potential for illness do to bio-contamination.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	12445

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Since the flooding in the northern panhandle of WV contained both surface and sewer water, there was a great potential for illness due to bio-contamination. Information was needed to aid community in flood recovery.

What has been done
PSAs were initially published in 2016 and were re-released in 2017 for an informational outreach campaign on Facebook during two summer floods in the northern panhandle. The posts were widely shared.

Results
PSAs were viewed by 12,445 people with 1,632 individual engagements. Since the information was quickly distributed it is believed that the quantity and severity of flood related illnesses was decreased.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
132	Weather and Climate

Outcome #9

1. Outcome Measures

Added knowledge of growing practices under climate variability and change.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
West Virginia farmers have experience changes in weather patterns that bring wetter and cooler than normal springs and extended warm season growth into late fall and early winter. As alternative agricultural trends are increasingly adopted to manage wide swings in rainfall and temperatures, the need for crop varieties that work well in controlled environmental conditions are an integral part to the success of the growing season.

What has been done
Five varieties of parthenocarpic zucchini were trialed in a high tunnel. Data was collected on harvest date and fruit number, length and weight. Nineteen garlic varieties were trialed in a high tunnel and compared to outdoor planting.

Results
Of the zucchini varieties trialed, Noche and Partenon were superior performers in terms of fruit number and weight. Partenon produced fruit earlier than other varieties and maintained production throughout the trial. All garlic trials were planted in January 2017. Garlic was harvested in the high tunnel in late June and in the field in mid-July. IN the high tunnel, Inchellium Red and Idaho Silver along with Purple Stripe Variety Purple Glazer were top performers. In the field, Madrid, Polish White, Idaho Silver, Inchellium Red and Silver White were the top performers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships

Outcome #10

1. Outcome Measures

Added knowledge about adaptation and climate mitigation strategies for production agriculture and natural resources management.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The diversity of crops and the extension of the season causes growers to leave managing pests to the end with few choices. This limits their ability to produce the best crops and maximize profitability for now and into the future. Recommendations that are based on local research trials evaluating pest control and production costs will provide the most information for a grower to make informed decisions for their farming operation.

What has been done

A two-year trial of herbaceous ornamentals for the University of Minnesota was initiated in 2016 with data collected on 120 lines: 1 Lamium, 15 Chrysanthemum and 104 Pyrethrum. Data was collected on transplantbility, weeks of flowering, plant height and width as well as floral characters. These trials were to see if the plants could survive our hardiness zone and if we could grow and produce lines generating pyrethrin compounds for use in insecticides and value related compounds for the industry. An additional ten Chrysanthemum lines, seven Gladiolus, 34 Pyrethrum and 10 Sabadilla lines were planted on the WVSU campus in June 2017.

Results

A number of the ornamental lines did not survive the winter. The majority of the Gaura overwintered and flowered by the beginning of July and throughout the summer. Some of the mums planted in 2016 began to flower in mid-July which was more than a month in advance of the same lines planted in 2017. The Gladiolus lines began to flower in September, however, there were concerns about purity since various flower colors were seen. The Pyrethrum lines that overwintered began to flower in May with a large number of flowers on some of the varieties in the first harvest. The second planting of pyrethrum in 2017 transplanted better due in part to the weather and the field site. Flower harvest on the new lines began in July and continued until frost in mid-November. Flowers were counted and fresh weight recorded, then dried to obtain the dry weight prior to sending them to our collaborator in July and December for pyrethrin extraction. Over 2,000 Sabadilla seedlings were transplanted in the field on plastic mulch with drip irrigation in June of 2017. However, none of the seedlings established and we had problems identifying them versus the nutsedge plants that are rampant in that field.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
605	Natural Resource and Environmental Economics

Outcome #11

1. Outcome Measures

Implementation of a globally unique watershed scale project including 22 stream gauge monitoring sites using a scale-nested and paired experimental watershed study design.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Human pressures on natural resources and water availability and quality have never been greater in the history of human civilization. There is a great need to better understand the implications of land use impacts on the environment and water. This is particularly important given the location of West Virginia straddling the Chesapeake Bay Watershed and the Mississippi River Basin. West Virginia therefore has an opportunity to serve as an interface between two major watersheds with similar land-use, land-impact, water quality issues including (but not limited to) gulf and bay hypoxia, an issue that spans 34 states of the US.

What has been done
A globally unique scale, paired and nested experimental watershed study design, with 22 permanent hydrology and biogeochemical monitoring sites were established in a representative Appalachian contemporary watershed.

Results
The project has resulted in three publications in its first year and broad awareness in the Chesapeake Bay Program.

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
124	Urban Forestry
131	Alternative Uses of Land
132	Weather and Climate
133	Pollution Prevention and Mitigation

Outcome #12

1. Outcome Measures

A long-term collaborative research program between federal, state, and private stakeholders to elucidate relations between fish and streamside management practices

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Fish production is an ecologically relevant and recreationally relevant issue as is riparian zone management given the riparian zone serves as the interface between aquatic (fish) and terrestrial (mixed land uses, agriculture, etc.) environment. Basic science and applied advances are necessary to improve management of critical riparian environments that serve as the buffer between upland impacts and aquatic fish populations.

What has been done
A long-term collaborative research program between federal, state, and private stakeholders was continued to elucidate relations between fish and streamside management practices

Results
While this natural resource issue is ongoing and has been a focus of concern nationally for decades, new relationships are being cultivated in West Virginia to advance techniques and practices in WV and the Region. Some of this is very new and as of yet challenging to assess.

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
124	Urban Forestry
131	Alternative Uses of Land

132	Weather and Climate
133	Pollution Prevention and Mitigation
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity

Outcome #13

1. Outcome Measures

Development of watershed models to enable prediction of future aquatic conditions under alternative watershed development scenarios (i.e. active mining areas) or climate change.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Advancements in landscape management models are critically necessary to improve planning for management changes and predictions of potential outcomes to those decision processes. This is important because land managers and policy makers vehemently wish to avoid unintended consequences of land use planning (flooding, water pollution, air pollution, human health issues, etc.) and also wish to be strategic and deliberate in planning and implementation processes.

What has been done
Models are being calibrated and validated to test for sensitivity to changes in practices. Those tests include responses to historic observed, and anticipated future climate change scenarios.

Results
This work is resulting in publications that advance understanding of climate and land-use practice impacts on natural resources, fish communities, water quality, human health, and development practices.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management

131	Alternative Uses of Land
132	Weather and Climate
133	Pollution Prevention and Mitigation
135	Aquatic and Terrestrial Wildlife

Outcome #14

1. Outcome Measures

1580 youth at the National Scout Jamboree (July 2017) earned a badge focused on environmental sciences

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
West Virginia hosts the largest Boy Scouts of America meetings in the entire United States each and every year, total population of attendees can reach forty thousand! This celebration is an incredible opportunity to educate youth with regard to many aspects of environmental concern nationally and globally. WVU-AFES is investing more in this opportunity. This is important because of enrichments to Jamboree educational programs and an opportunity to have nationwide impacts to youth in terms of educating them on the importance of Appalachia in so many ways, and the special role that West Virginia plays for their education; now and in the future.

What has been done
1580 youth were educated on environmental sciences at the National Scout Jamboree (July 2017) and earned a badge of achievement.

Results
Increased education of youth in environmental science, Increased youth awareness of natural resources in Appalachia and West Virginia; Increased youth and adult awareness of West Virginia programs and educational opportunities (college education, etc.)

4. Associated Knowledge Areas

KA Code	Knowledge Area

102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
131	Alternative Uses of Land
132	Weather and Climate
133	Pollution Prevention and Mitigation
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity

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

Complications due to weather resulted in problems at 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 are 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 in terms of a) Professional presentations, b) Referee journal articles and books, c) General audience papers, and news reports, d) M.S. and PhD graduates, e) Trends in terms of competitive funding; and in terms of longer-term impact criteria, including:

- 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 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 well being of the citizens of West Virginia. These programs have become even more critical given the extra stresses and uncertainty imposed by a changing climate. Thus, research related to environmental quality: climate change, fisheries and wildlife, environmental economics and water science have always been strengths of the Davis 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. WVU has supported a new Institute of Water Security and Science, and WVU-AFES is now realizing great benefits of that investment after only 2 years!, particularly in terms of funded proposals (over $3M/2017 and publications 12 in 2017). However, we are simultaneously cautious about investing further in the environmental quality area because of concerns about the funding prospects for science in general and environmental quality and climate change in particular.

Results indicate that particular varieties of zucchini and garlic should be selected for high tunnel production.

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 funding climate has made it difficult for us to capacity build in this important area.

Results of trials will be disseminated through annual Climate Hub Partner meeting

Results will be used to WV growers to assist in early production and increased yield.

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%	0%	20%	15%
511	New and Improved Non-Food Products and Processes	0%	0%	35%	20%
605	Natural Resource and Environmental Economics	0%	0%	15%	0%
610	Domestic Policy Analysis	0%	0%	10%	0%
	Total	100%	0%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	9.0	0.0	3.0	4.5
Actual Paid	8.0	0.0	3.4	3.8
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
340000	0	305764	528911
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
324500	0	305036	291293
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	140993	551032

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 feedstocks 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 feedstocks examined so far include algae, switchgrass and mixed grasses, and residual woody biomass from forestry operations.

WVU-AFES

A programming model was developed to optimize the multiple biomass feedstock supply chains, including feedstock establishment, harvest, storage, transportation, and preprocessing. A sensitivity analysis was conducted to evaluate the effect of feedstock availability, price, moisture content, procurement radius, and facility demand. Advancements to hydrothermal carbonization of lignin and hemicellulose resulted in advancements in homogeneous base catalysis. Advancements were made to the understanding of mechanical, electrical, physical, and chemical attributes of thermochemically treated wood. Advancements were made to understanding of the interaction between energy consumption, economic growth and market impacts; land cover changes are one of the key factors that influence environmental impacts at micro and macro levels. State and regional energy security investigations showed that transmission constraints often limit the flow of electricity and boundary policies for energy use may need reexamined. Advances in production of power and second-generation liquid biofuels, including biomass-derived power regeneration showed that differences in moisture content and time of drying depends on drying media. Small food business owners were engaged to motivate them to transform waste to value added products through extension presentations and workshops.

Research program highlights for 2017 include:

- Low value hardwoods were successfully converted into thermal materials using thermal processing.
- Advances in understanding of energy consumption, economic growth and market impacts lead to policies to strengthen surface owner rights.
- CO2 emission intensities were shown to be converging across China.

WVU-ES
At WVUES this year, educational programs in this planned program focused mainly on work with the Monongalia Solid Waste Authority.

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. Additionally we are 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.

Highlights for 2017

- A bioenergy crop genetically engineered to accumulate less carbohydrate and more oil in its tissues was found to undergo normal growth and development stages.
- Using ethanol as a co-substrate resulted in increased biogas production 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

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	8	65	10	20

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

Patent Applications Submitted

Year:	2017
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	4	4

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of General Press Articles

Year	Actual
2017	0

Output #2

Output Measure

- Number of Professional/Academic Presentations

Year	Actual
2017	19

Output #3

Output Measure

- Number of Graduate Students Earning Degrees

Year	Actual
2017	2

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 improvements to the operational parameters that have been used to control thermophillic poultry waste digesters.
4	Creation of new knowledge concerning how microbial diversity gives rise to anaerobic microbial energy conversion and anaerobic digestion.
5	Knew knowledge in plant lipid metabolism.
6	New knowledge concerning the effectiveness of current mine site reclamation methods for restoring soil microbial processes
7	Low value hardwoods were successfully converted into thermal materials using thermal processing.
8	Advances in understanding of energy consumption, economic growth and market impacts lead to policies to strengthen surface owner rights.
9	CO2 emission intensities were shown to be converging across China.

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
2017	5000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Students need training in soil science and practical applications of soils to farming and home site development.

What has been done
The Land Judging Program was established at WVU in 1953 and continues today. High school and middle school students are taught soil science principles in FFA and Vocational Agriculture programs throughout West Virginia.

Results
Youth have increased their knowledge of soils and practices concerning soil use, management and sustainability are understood and applied.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships

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 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
2017	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Organic wastes are produced in large quantities through agricultural, municipal and industrial processes. These wastes can be converted into bioenergy (methane) through the process of anaerobic digestion. Our research is aimed at advancing thermophilic anaerobic digestion technology by improving the stability and efficiency of the process. The use of anaerobic digestion has been growing in the United States but still lags far behind its potential. 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.

What has been done
Two projects address the issues of improving operational controls in anaerobic digestion. First, we are setting-up a new pilot-scale (2 cubic meter) thermophilic bioreactor that will be used for anaerobic digestion, bioenergy, and other biomass-to-bioproduct research. This project has been funded by a USDA 1890 Research Capacity Building Grant to David Huber (PI). The second project involves measuring the stability and resilience of a thermophilic digester microbiome

during co-digestion with a stress-inducing substrate (crude glycerol).

Results

The set-up of a two cubic meter bioreactor on the WVSU campus is underway but is not yet complete. For the second project, digester stability was measured during an experiment lasting more than 400 days with five replicate thermophilic digesters. The digesters were stabilized on poultry litter substrate and were challenged with crude glycerol which is a waste from biodiesel manufacturing. Digesters received pulses of crude glycerol to evaluate stress responses and resilience. Microbial community dynamics were also measured using Illumina DNA sequencing in conjunction with the co-substrate pulses. The digesters showed pronounced changes in performance (metabolism) during the pulses but process resilience still occurred after the pulses demonstrating stability.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land
133	Pollution Prevention and Mitigation
403	Waste Disposal, Recycling, and Reuse
511	New and Improved Non-Food Products and Processes
605	Natural Resource and Environmental Economics

Outcome #4

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
2017	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Microorganisms are the single most important resource for biotechnology and will be key to the development of biomass-to-bioproduct industries. Microbial diversity encompasses enormous

varieties of metabolism, but harnessing these properties for the development of products is challenging. Mixed microbial consortia offer tremendous opportunities for converting complex organic wastes into useful products. However, these processes are still underdeveloped and require research to understand how to engineer microbial communities. Carboxylates are short chain fatty acids that are used as platform (precursor) chemicals for many industrial chemical products. Carboxylates are also produced as intermediate metabolites in the anaerobic digestion process. 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. This research will also benefit industries that produce large quantities of organic wastes and wish to convert the wastes into useable energy.

What has been done

We operated two sets of replicate thermophilic anaerobic reactors to test whether carboxylate intermediates, which are produced in the methanogenic food web, could be increased and maintained at higher levels. We also continued a long-term experiment to evaluate the variability in structure/function relationships of a methanogenic microbiome using replicate digesters.

Results

The first experiment evaluated whether stable high-levels of carboxylates could be produced in a thermophilic digester microbiome over an extended time period by greatly increasing the COD (chemical oxygen demand) concentration of the feedstock. We found that very high levels of acetate were maintained for more than 200 days. In addition, elevated levels of i-valerate were maintained during this time. The digesters with significantly elevated volatile acids were stable. In another set of experiments, glycerol but not ethanol was found to increase short-chain carboxylate production when used as co-substrate in thermophilic poultry litter digesters. However, ethanol as co-substrate greatly increased biogas production which could make it useful for increasing the economic value of anaerobic digestion.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land
133	Pollution Prevention and Mitigation
403	Waste Disposal, Recycling, and Reuse
511	New and Improved Non-Food Products and Processes
605	Natural Resource and Environmental Economics

Outcome #5

1. Outcome Measures

Knew knowledge in plant lipid metabolism.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	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
We compared the effect of co-cultivation duration on callai infected with Agrobacterium GV3103:pMP90RK strain consisting binary plasmid with WRI1 transcription factor under the control of monocot promoter. Longer co-cultivation of callai under room temperature up to 3-4 days improved regeneration of antibiotic resistant shoots. Using callai infected with above agro culture, we have tested the effect of plant growth regulators and antibiotic concentration on the shoot regeneration. Higher concentrations of BAP and lower concentration of NAA was effective on shoot proliferation. Further, shoot length can further improved by supplementing the medium with lower concentrations of GA. Lower concentrations of hygromycin (15-20 mg/l) was effective on the selection of putative shoots. Shoots cultured on higher concentrations of hygromycin failed to grow and turned brown with 2 weeks. In order to improve shoot length and vigor, we have introduced additional subculture step in between shoot regeneration and rooting that considerably increase shoot length. In shoot elongation medium, we completely eliminated auxin and supplemented very low concentration of BAP

Results
Under optimal transformation, conditions we developed found to be effective on both type of callus. We have tested effect of medium, PGR, antibiotic concentrations and incubation conditions on rooting of in vitro regenerated shoots. Half-strength MS medium with vitamins and lower concentration of IBA under partial light condition (4-6 weeks) found to be a favorable condition for rooting. Application of right concentration was critical for successful root initiation. Using optimum rooting condition, we have successfully generated putative transgenic plants. Further, in vitro rooted plants were subjected to hardening processes in growth chamber before transfer to soil condition. Putative transgenic switchgrass plants exhibited high rate of survivability under growth chamber conditions and undergone normal growth and developmental stages.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
201	Plant Genome, Genetics, and Genetic Mechanisms
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants

Outcome #6

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

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Mine lands have been reclaimed to current regulatory standards but they often are left unmanaged and unused. Methods and technologies are needed to rehabilitate these lands for sustainable and economically viable crop production.

What has been done
WVUES is involved in research and demonstrationsto show that fruit and vegetable production can occur on reclaimed mine soils. Commercially-valuable trees can be grown and achieve marketable timber size in shorter times on mined soils than on natural soils. Switchgrass, Miscanthus, and giant cane have been shown to establish and produce large amounts of biomass for bioenergy. Greenhouses and apple orchard are being established on reclaimed lands.

Results
Based on this research we have shown that healthier food sources for people can and are grown locally. Income opportunities for land owners have been made available to those with just a few acres of land to grow high value crops.

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

Low value hardwoods were successfully converted into thermal materials using thermal processing.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Total utilization of hardwood materials and utilization of lower value hardwoods for thermal materials has been impractical due to cost ratios between extraction energy and material outputs. If methods scan be devised that reduce energy requirements of less available woody components more of the material can be used, with reduced waste. The outcome would be increased profit margin for all individuals/organizations in the supply chain

What has been done
Low value hardwoods were successfully converted into thermal materials using thermal processing methods.

Results
While additional testing and validation studies are warranted, and could take a number of years to complete, this technological concept and technologies show great promise for improving profitability of forest harvest practices to energy and materials conversion processes.

4. Associated Knowledge Areas

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

Outcome #8

1. Outcome Measures

Advances in understanding of energy consumption, economic growth and market impacts lead to policies to strengthen surface owner rights.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Land owners need improved and obtainable methods to advance understanding of land valuation relative to energy potential. This is important because better understanding of extraction costs and energy demand and growth can be useful evaluative measures for future land management valuation and practices

What has been done
Advances in understanding of energy consumption, economic growth and market impacts are leading to policy reformation that will strengthen surface owner rights.

Results
Investigations are showing methods of improved evaluation of surface valuation with regard to energy consumption, economic growth and potential market impacts. Improved information in this regard is directly affecting policy makers decisions with regard to surface owner rights.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
131	Alternative Uses of Land
133	Pollution Prevention and Mitigation
605	Natural Resource and Environmental Economics

Outcome #9

1. Outcome Measures

CO2 emission intensities were shown to be converging across China.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
CO2 emissions have been shown to be directly related to atmospheric CO2, which is a leading correlate to the greenhouse effect, a global phenomenon directly related to human development that is correlated to changes in air quality and climate variability. China has an opportunity to learn from other countries and to utilize expertise of scientists from WVU to advance understanding of CO2 emission processes in China. This is important since this information can assist China to improve practices and policies to mitigate adverse effects of a rapidly growing Chinese economy to best protect human health while responsibly pursuing economic growth.

What has been done
Research was done that shows that CO2 emission intensities are converging (normalizing) across China.

Results
Results have led to technological transfer between WVU researchers and the Chinese research and policy community, and publication(s).

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
133	Pollution Prevention and Mitigation
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

WVU-AFES
None in the current reporting year.

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.

This program area includes research and extension programming on biofuel and bioenergy production, and emergent shale gas associations. The program is currently largely focused on examining different biomass feedstocks 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 feedstocks examined so far include algae, switchgrass and mixed grasses, and residual woody biomass from forestry operations.
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 stakeholders, 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 received very strong positive feedback through 2017. While this general area is a strength of the College, the resources supporting our programs have continued to dwindle over the past several years as EPA and DOE funding has declined. It is an ongoing concern 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. WVU has supported a new Institute of Water Security and Science, and WVU-AFES is now realizing great benefits of that investment after only two years, particularly in terms of funded proposals (over $3M/2017 and publications 12 in 2017). However, we are simultaneously cautious about investing further in the environmental quality area because of concerns about the funding prospects for science in general and environmental quality and climate change in particular.

Key Items of Evaluation

WVU-AFES
We have a strong stakeholder constituency in West Virginia that supports WVU-AFES work in environmental quality, water resources, biofuels and climate change. However, the unfavorable future funding climate create ongoing challenges for investing in this important 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%	32%	0%	0%
702	Requirements and Function of Nutrients and Other Food Components	10%	0%	20%	0%
703	Nutrition Education and Behavior	30%	48%	30%	0%
724	Healthy Lifestyle	30%	5%	20%	0%
801	Individual and Family Resource Management	10%	0%	0%	0%
802	Human Development and Family Well-Being	10%	0%	0%	0%
806	Youth Development	10%	15%	0%	0%
	Total	100%	100%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	14.0	4.0	6.0	0.0
Actual Paid	12.0	3.5	5.0	0.0
Actual Volunteer	0.0	1.0	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	245049	303036	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
561072	84108	715938	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	583265	687158	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

Multi-faceted nutritional interventions were shown to improve diet quality and reduce chronic disease risk in midlife and older adults in rural WV. The effectiveness of identifying biomarkers and influencing and promoting healthy weight in middle aged adults via increased fruit, vegetables and grains intake and increased physical activity was shown. A Healthy Community Index pilot study advanced understanding lifestyle behaviors and environmental factors that influence healthy behaviors and the health status of young adults. Advanced understanding of mechanism(s) by which conjugated linoleic acid (CLA) reduces body fat in pigs and rodents and enhances intramuscular fat in pigs and establishing a model for human insulin resistance and type II diabetes. Studies advanced understanding of n-3 fatty acids metabolism and diet therapies were investigated to slow polycystic kidney disease (PKD) progression to renal failure. Studies showed utility of by-products of fruits and vegetables for agricultural weed and foodborne pathogen control.

Research program highlights for 2017 include:

- Several related projects are assessing and addressing individual and environmental factors that influence eating behavior of young adults with the goal of reducing obesity and obesity-related illnesses
- Distribution of a survey to community representatives; and translation of study materials and findings into teaching materials.
- Four (4) teams created a footprint report of 75 university sites and 6 high school sites as part of a new dissemination model (eB4CAST).

WVUES

WVUES units and program teams conducted the following programs within this program area: the 4-H Health Initiative, the Adult and Youth Family Nutrition Program (EFNP and SNAP- ED), Dining with Diabetes, Health Rocks, Early Childhood Obesity Prevention, Healthy Children Project, Choosy Kids, Health Motivator, Eat a Rainbow, Farmer's Market Voucher Program, Health Science Technology Academy, Kids Cooking Camp and Farmers Market, and Key 2 Healthy Start Physical Activity Physical Activity Technical Assistance. Other activities include CEOS health-related lesson plans, Pre-school

Farmers Market, Rethink Your Drink, Smarter Lunchroom Assessment, Stress Less with Mindfulness, Summer Foods Training for 4-H Camps, Take Charge, Active for Life, Aging Gracefully, Apple a Day and health fairs.

WVUES has offered individual training programs to improve skills in nutrition, chronic disease management, and general health behaviors. They include cooking classes at schools and camps, physical activity instruction such as yoga and adult exercise; community wellness programs including cancer awareness, dental health prevention, farm to school, food allergies, menu planning, general nutrition, and smokeless tobacco.

WVSU-GRDI

Programming in human nutrition and health is implemented and evaluated to target the aspects of personal behavior and environmental barriers that hinder personal healthy lifestyles. Through the Expanded Food and Nutrition Education Program adults and youth are educated on proper serving sizes, healthy food selection and preparation, and monitoring intake. WVSU Extension Service faculty and staff instruct lessons about kitchen and food safety, food preparation, healthy food selection, and economical ways to practice health and nutrition, and engage in physical activities. The EFNEP program partnered with local hospitals, addiction recovery centers to provide programming to underserved audiences such as pregnant women, individuals transitioning from prison and/or recovering from drug abuse. Ag and Natural resources programming focuses on education of how to grow healthy foods.

Highlights for 2017 include:

- 95% of participants in drug recovery programs increased their consumption of healthy foods.

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

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	78562	1673215	159012	111523

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

Year:	2017
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	9	10	19

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of General Press Articles

Year	Actual
2017	13

Output #2

Output Measure

- Number of Professional/Academic Presentations

Year	Actual
2017	78

Output #3

Output Measure

- Number of Graduate Students Earning Degrees

Year	Actual
2017	0

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	Several related projects are assessing and addressing individual and environmental factors that influence eating behavior of young adults with the goal of reducing obesity and obesity-related illnesses
10	Distribution of a survey to community representatives; and translation of study materials and findings into teaching materials.
11	Four (4) teams created a footprint report of 75 university sites and 6 high school sites as part of a new dissemination model (eB4CAST).

Outcome #1

1. Outcome Measures

Number of youth 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
2017	11994

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
WV ranks 4th in the nation in the number of adults who eat less than one fruit or vegetable daily. This is a major risk factor for citizens of WV, who already suffer from high rates of obesity, diabetes and heart disease. Children in WV are at a disadvantage when it comes to establishing preferences for and accessing fruits and vegetables due to the lack of consumption by adults. Once students have a better understanding of where their food comes from, they are more likely to make healthier choices at home.

What has been done
The WVUES Family Nutrition Program, which targets limited income children, expanded the "Kids Coupon" project statewide which allows children to receive $4 in farmers? market vouchers to purchase fruits and vegetables from a market brought to childcare centers, schools or community events. Families participate in nutrition education and food sampling and receive recipes, shopping bags, and small kitchen items. Through WVSUES programs, youth are instructed on science and gardening and have been given opportunities to grow, taste, or learn about producing fresh fruits and vegetables. The WVSUES 4-H Mentoring program has 20 students who participate with their parents at evening events to gain awareness about eating more healthy foods.

Results
In 2017, kids markets were hosted at 53 sites in 30 counties, reaching 5,400 children. 724 parent evaluations were completed with 91% reporting their child ate the produce they purchased. Over 40 farmers participated in the markets and proceeds supplemented their incomes. In addition to the $20,000 gained from kids? coupons, farmers made an additional $6,177. Through WVSUES

efforts, the schools in their catchment area have become more involved with school gardens. More parents have come to volunteer on plant/STEM Days. The high school FFA program members have become mentors to elementary school children and community members have volunteered to come into the classrooms to share their skills and knowledge.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
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
2017	1160

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
West Virginia is ranked first in the nation for adult rates of obesity and ninth for youth ages 2-4, seventh for youth age 10-17, and fifth for high school students. SNAP serves 363,000 people or 1 in 5 West Virginians. 66% of all WV SNAP participants are in families with children (CBPP, 2015) which is the EFNEP target audience. The WVUES EFNEP Program served 575 adults in 2015. This represents a 5% effort toward adult programming which was well below the national average of 20%.

What has been done

The WVUES EFNEP administrative team began to pursue both state and local partnerships that could enhance the program's outreach to limited resource adults. It developed formal and informal relationships with partner agencies that helped both parties achieve mutual goals of increasing service to adult populations. Many of these relationships continue and new partnerships are developed as opportunities arise. One such partnership is with the WVSU EFNEP that enrolled 148 adults. 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

In 2017 the EFNEP program was able to serve 1180 adults which represents a 105% relative increase in reach (and an 8% actual increase in adult participating in overall programming). The adult graduation rate (minimum of 6 of 8 lessons) was 79% compared to 70% at baseline. Eighty-seven percent of participants improved one or more nutrition practices, 60% improved food safety practices and 82% improved food resource management. Ninety % (133 of 148) participants showed improvement in one or more food resource management. In the WVSUES EFNEP program, 90% (133 of 148) participants showed improvement in one or more food resource management practice; 97% (144 of 148) participants showed improvement in one or more nutrition practice; 46% (68 of 148) participants showed improvement in one or more food safety practice; 94% of adult participants reported a positive change in food group intake. The healthy eating index showed improvement at exit of adult program.

4. Associated Knowledge Areas

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

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
2017	1178

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
According to the National Survey of Children?s Health, WV is ranked 3rd highest for the prevalence of childhood obesity, with nearly a one third of children being classified as overweight or obese. Young children spend much of their day within an early childcare and education setting, often eating the majority of their meals within this setting and having limited access for physical activity opportunities.

What has been done
WVUES, in partnership with the CDC and the WV Prevention Research Center, implemented the WV Healthy Children Project (WVHCP) to promote proper nutrition and physical activity within early childcare and education settings in Barbour, Gilmer and Pleasants counties. In addition, the WVHCP implemented strategies for these best practices to be extended into the children?s home and community environments. The initiative awarded $66,000 in mini grants to 12 community organizations. The Youth EFNEP program at WVSUES implemented gardening activity programs for middle school youth in the Eastern Kanawha County, Charleston area schools and Huntington WV in Cabell County.

Results
-39 early childcare providers serving 400 children within Pre-K/Headstart classrooms, child care centers and in-home facilities gained skill in implementing best practices for nutrition and physical activity;
-32 Farm to Early Childcare providers were able to teach gardening skill by receiving garden supplies;
-11 child care sites and 74 families improved their healthy food intake by receiving weekly CSA boxes as did Pre-K/Headstart families who shopped at 10 pop-up markets at their classrooms;
-600 family members gained knowledge of how to have a healthy lifestyle by being exposed to healthy family messages;
-12 community organizations in 3 counties enhanced their physical activity and nutrition opportunities by receiving a mini grant provided by the project.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
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
2017	2500

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Health education and chronic disease prevention efforts targeting women are supported by health statistics. Women who have knowledge and skills may be able to create healthy home environments and make the best health care decisions for themselves and their families. Women's personal actions and attitudes will likely influence those of family and community members. Another compelling reason for women?s health education is that health problems are costly and debilitating.

What has been done
Since 2008, the WVUES has partnered with the WV Community Educational Outreach Service (CEOS) Clubs and other groups to share research-based health information through a designated "Health Motivator" member (HM). An annual Health Motivator theme-based curriculum includes engaging health activities which groups use during meetings. Statewide training is offered every fall and local training sessions are held to prepare Health Motivators. A study was conducted to determine the effectiveness and impacts of the initiative.

Results
Surveys were conducted with 46 Health Motivators, 265 CEOS club members, and 46 Extension Agents. Respondents perceived that the program led to improved health habits and conditions among Health Motivators and club members. Examples: 97% of HM reported the program affected their everyday health habits; 75% of group members reported increased physical activity and 14.7% improved their blood pressure measurements.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior

724	Healthy Lifestyle
801	Individual and Family Resource Management
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

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	683

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
West Virginia is ranked first in the nation for adult rates of obesity and ninth for youth ages 2-4; seventh for youth age 10-17; and fifth for high school students. Discussing healthy life choices, including nutrition, is essential and must begin as early as possible if we hope to see real change. According to the 2015 county health rankings by the Robert Wood Johnson Foundation, Kanawha and Cabell counties rank 38 and 39, respectively, out of 55 counties in health outcomes. Each targeted county has been labeled by Appalachian Regional Commission (2015) as distressed, at-risk, or transitional, whereas Cabell County alone was reported an average US poverty rate of 145% from 2009-2013.

What has been done
WVSUES has a program called PLANTERS that provides several tastings in which students have had the opportunity to taste fresh fruits and vegetables as well as simple, healthy recipes such as smoothies or salads. PLANTERS also has school gardens at most school sites. Children work in the gardens as well as grow food and eat what they grow. PLANTERS has also partnered with schools to make outdoor spaces integrate with the garden and include physical activities such as trike trails. The adult nutrition program has provided lessons on accessing healthy foods through the Eating Smart Being Active curriculum.

Results
During tastings a few students who are eager to try new things can change the dynamic classroom. Their positive feedback encourages more students to taste unfamiliar foods. Students are quicker to eat what they have grown. Results of the WVSUES EFNEP program through the

national evaluation tool WebNEERS this year showed that there was self-reported improvement of food shopping habits, healthier selections and storage of foods. Of concern is that more than a quarter of the students said that their access to foods decreased: 17% improved their access to foods, 56% stayed the same and 27 % decreased.

4. Associated Knowledge Areas

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

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
2017	12906

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
According to the findings of the 2016 National Survey of Children?s Health more than 46% of U. S. youth in the US have had at least one ACE or Adverse Childhood Experience. In WV, 52.4% of children under age 18 have had at least one adverse childhood experience. Cabell County, WV, with a population of just under 100,000 is often referred to as Ground Zero for the drug epidemic. It is still among the highest in the nation for overdoses. One solution to this problem is to give those in recovery the skills that they need to replace nutrients that addiction has stolen from them, abstain from use of alcohol, illicit drugs, and non-prescribed medications, and make informed, healthy choices that support physical and emotional well-being. The role of family and community in solving the drug program is critical.

What has been done

The WVSUES EFNEP adult educator taught 11 nutrition and physical education lessons to 148 program participants who were enrolled in a drug recovery program. WVUES has two programs that address substance abuse: Health Rocks and the PROSPER program. Health Rocks provides information to youth participants at 4-H camps, clubs and after-school programs. The PROSPER program, an evidence-based program that is funded through the CYFAR project engages parents, community members, and school personnel in family life and life school programs, which taken together, have been shown to reduce the use of substances by youth.

Results

In the WVSUES EFNEP program, the overall impact was a 95% change in their consumption of healthier foods and a 54% increase in the number of participants who increased their physical activity to one hour per day. Participants in the WVUES PROSPER program increased in measures of workforce preparation, supportive relationships, positive social norms, and opportunities for skill building,

4. Associated Knowledge Areas

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

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
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	39000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Soda and 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
At WVUES, A Rethink Your Drink (RYD) campaign was implemented to address high rates of sugar sweetened beverage intake. Educational messages have been integrated into all Family Nutrition Programs, the RYD@Camp and the RYD@School programs. A media campaign has promoted these messages reach 39,000 West Virginians who were exposed to the messages. WVSUES, through the EFNEP program, taught a specific lesson on drinking more water and no sodas. Each participant was given a water bottle and every time they came to class with that bottle filled with water and consumed the water they received points toward an established goal.

Results
West Virginians of all ages have gained understanding of the sugar content of beverages and healthier options. People who make better choices have the potential to improve health, lower their healthcare costs and improve their quality of life. Students at WV schools in WVUES catchment area have reported consuming more water and less sugar filled beverages.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
703	Nutrition Education and Behavior
724	Healthy Lifestyle
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
806	Youth Development

Outcome #8

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual

2017 6011

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Heart disease is the leading cause of death of women in West Virginia. Programming is needed to raise awareness of the risk factors and prevention methods associated with heart disease. Resources and information on heart health, specifically for women are needed.

What has been done

The Love Your Heart Partnership is a collaboration led by WVUES in partnership with various organizations. Partially funded by the Foundation of the National Institutes of Health, 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 training of organizational partners to use woman-to-woman strategies to disseminate Heart Truth® messages, and a public media campaign. Direct education activities reached participants in 39 of West Virginia's 55 counties which covered 70% of the state. These activities took place 2015-2017.

Results

Organizational partners are equipped to serve as heart health advocates. Pre/post participant surveys (n=469) showed positive impacts (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; and 97.2% said they gained new heart health information. A two-tailed paired non-parametric t-test showed statistically significant (p=0.000) improvements in five key areas of heart health (knowledge of the signs of heart disease, questions to ask a doctor, ways to reduce risks, personal behaviors that increase heart disease risks, and awareness of heart health resources).

4. Associated Knowledge Areas

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

Outcome #9

1. Outcome Measures

Several related projects are assessing and addressing individual and environmental factors that influence eating behavior of young adults with the goal of reducing obesity and obesity-related illnesses

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Many factors contribute to contemporary issues related to eating behaviors (preferences) and obesity of young adults in West Virginia and the United States. Conceivably, improved information about environmental factors that influence such decisions will improve health care workers ability to mitigate this problem, thereby resulting in reduced young adult obesity and improved life-long health

What has been done
Several related projects are assessing and addressing individual and environmental factors that influence eating behavior of young adults with the goal of reducing obesity and obesity-related illnesses

Results
Multiple new projects have been initiated to address this(ese) issues. Preliminary results are informative and encourage ongoing work. It is anticipated that future reporting will provide more specific results including publication and dissemination.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
703	Nutrition Education and Behavior
724	Healthy Lifestyle
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
806	Youth Development

Outcome #10

1. Outcome Measures

Distribution of a survey to community representatives; and translation of study materials and findings into teaching materials.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Particularly pertaining to young adult obesity, but more broadly the technique(s) of polling citizens for information (sometimes sensitive) that can be informative towards finding solutions.

What has been done
Surveys were distributed through community representatives for dissemination for collection and translation for teaching materials.

Results
Results to date seem to indicate that survey thoroughness and specificity can be improved by dissemination through trusted community representatives, thereby resulting in more targeted and better translated materials for teaching. Ongoing work will include analyses and reports (publications).

4. Associated Knowledge Areas

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

Outcome #11

1. Outcome Measures

Four (4) teams created a footprint report of 75 university sites and 6 high school sites as part of a new dissemination model (eB4CAST).

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
eB4CAST is an evaluation tool used to help justify program needs, determine both positive and negative outcomes within the program, and predict the continuation of the program in needed communities. Using a community based research approach, eB4CAST captures the overall impact and effect of evidence based programming in implementation and dissemination. eB4CAST is an evaluation of the concepts of capture, assemble, sustain and timelessness of a research project used as an evidence-based dissemination tool. Without eB4CAST, evidence-based community research fails to reach its full potential and maximize beneficial outcomes for communities.

What has been done
Four (4) teams created a footprint report of 75 university sites and 6 high school sites as part of a new dissemination model (eB4CAST).

Results
eB4CAST provides researchers and administrators with the necessary data to create a footprint that will measure the impact, reach and longevity of the research project. The project resulted in at least two publications in 2017.

4. Associated Knowledge Areas

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

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 program implementation in the current reporting year. As shown in previous years, it is challenging to keep a consistent schedule due to class schedule changes and unforeseen issues at the recovery centers.
At WVUES, funding constraints have resulted in a reduction in staff and an evaluation of the programmatic strategic plan.

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.

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. Given the prevalence in West Virginia, this goal area is of high importance to our State constituents. We invested in faculty positions in this area over the last few 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.

WVUES
An example of an evaluation done in this planned program:
Healthy Children Project

A formative evaluation and outcome evaluation was employed to measure project results including:

- Key Informant Interviews
- Parent Focus Groups
- Provider Surveys
- Tracking ECE GoNAPSACC self-assessments, goals, and improvements related to healthy foods and beverages, PA and screen time 3. Environmental changes and impacts resulting from funded community projects
- Community Advisory Committee meetings and progress
- Community Project Tracking Forms to document mentors progress
- Observations of participation in Choosy classroom visits, and other events
- ECE Provider Surveys of knowledge and behavioral assessment related to healthy foods and beverages, PA and screen time
- Ripple Effect Mapping

Outcomes and Impacts

The grant began in October 2014. Following are the 2017 (3rd Year) highlights:

- Partnership Development (Service) The project continues to build strong partnerships with these organizations/individuals: o Centers for Disease Control and Prevention o WVU Extension Service faculty and staff from three program units o WV Prevention Research Center o WVU School of Public Health o Choosy Kids, LLC o Barbour, Gilmer and Pleasants County Boards of Education, Head Start, Pre-K, Childcare center staff (29 classrooms) o Parents, caregivers and their pre-k children (396 two to five-year olds enrolled) o Community stakeholders represented by the Community Advisory Committees · Healthy

Community Environments (Service) o Counties have 8 new painted play spaces to engage young families.

- There are 28 total funded community projects (See descriptions below.) Round 2 projects were completed in 2017. Round 3 funded 7 additional projects.
- State and Local Advisory Committees have met regularly throughout the project.
- Further analysis of key informant interviews and focus groups is in process.
- Two rounds of EPAO classroom assessments were completed.
- Go NAPSACC self-assessments were all completed.
- NAPSACC - Extension agents continue the monthly technical assistance process.
- Three IMIL Booster trainings were conducted and evaluated.
- Choosy visits were made to classrooms where children got excited about their healthy habits.
- Raised garden supplies and kid garden reference books were distributed to 29 providers,
- Grow Light Tables to grow plants inside were distributed to 16 providers.
- 4 Pleasants County Pre-K classrooms were engaged in in Taste the Rainbow.
- Purchased $50,000 in physical activity and nutrition related items to enhance the ECE environments.
- 396 children plus their parents received monthly messages starting in 2017. The magnet is designed to frame the child's artwork depicting himself/herself doing the health behaviors referenced in the monthly handout.

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.

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%	0%	25%	0%
724	Healthy Lifestyle	10%	0%	0%	0%
806	Youth Development	10%	0%	0%	0%
	Total	100%	0%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	20.0	1.0	1.0	0.0
Actual Paid	14.0	0.0	1.3	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	0	159320	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
573590	0	316983	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	112607	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. Salmonella and Campylobacter prevalence were evaluated in broilers. Escherichia coli, and yeast/molds (Y/M) of carcasses were analyzed on petrifilms. Ceca and carcass samples underwent microbial analyzes for Salmonella and Campylobacter spp. using the modified USDA method and confirmed by API-20e test (Salmonella), latex agglutination immunoassay (Campylobacter), and Gram staining (Campylobacter). Broilers (n=147) were reared for 38 days. Broiler carcasses were spot inoculated, and dipped (or not) in peroxyacetic acid. Raising broilers on clean shavings (CS) and applying post-chilling antimicrobial treatment can reduce Salmonella and Campylobacter on processes broiler carcasses. Microbiological quality and efficacy of antimicrobials were evaluate5d in terms of ability to inactivate unstressed or cold-stress adapted Salmonella and Enterococcus on broiler carcasses. The reduction of Salmonella and Enterococcus on carcasses and wings increased. Applying post-chilling antimicrobial dipping treatments could be an intervention to control Salmonella. Enterococcus faecium could be a Salmonella surrogate for in-plant validation studies.

Research program highlights for 2017 include:

- Raising broilers on clean shavings (CS) and applying post-chilling antimicrobial treatment can reduce Salmonella and Campylobacter on processes broiler carcasses.
- Applying post-chilling antimicrobial dipping treatments could be an intervention to control Salmonella.
- Enterococcus faecium may serve as a Salmonella surrogate for in-plant validation studies.

WVUES

The food safety planned program at WVUES works toward reducing the incidence of food-borne illness by eliminating causes of microbial resistance to contaminants, educating consumer and food safety professionals, and developing safe food processing technologies. Extension specialists and county agents at WVUES generate vital information through evaluation to increase understanding of how to better utilize food safety technologies, preserve foods, and handle foods safely.

WVUES faculty are involved in local and regional efforts to train producers, adults, youth, and other Extension faculty and staff. Activities include: food preservation and canning workshops, Venison 101, ServSafe® Manager Food Safety Training Food for Profit, Food Handler training, and the Germ Bug Handwashing Program. EFNEP and SNAP programs also teach food safety. Programs help participants gain skills in home food preservation, commercial food preservation, quality beef assurance, implementing food businesses, egg embryology, electric pressure cooker and slow cooker safety, fruits and vegetables drying, gardening and food safety, and hand washing.

WVU-AFES

The WVU-AFES recently added a joint faculty position with WVUES in the food safety area.

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

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	6609	279945	18250	1221

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

Patent Applications Submitted

Year: 2017

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	10	10

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of General Press Articles

Year	Actual
2017	2

Output #2

Output Measure

- Number of Professional/Academic Presentations

Year	Actual
2017	22

Output #3

Output Measure

- Number of Graduate Students Earning Degrees

Year	Actual
2017	0

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 youth who disseminate information about food safety to their families.
5	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 temperatures
6	Number of growers, producers, and food workers completing food safety certification.
7	Number of projects characterizing social, economic, and/or cultural practices attributed to foodborne illness.
8	Raising broilers on clean shavings (CS) and applying post-chilling antimicrobial treatment can reduce Salmonella and Campylobacter on processes broiler carcasses.
9	Applying post-chilling antimicrobial broiler dipping treatments could be an intervention to control Salmonella.
10	Enterococcus faecium may serve as a Salmonella surrogate for in-plant validation studies.

Outcome #1

1. **Outcome Measures**

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

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

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

Not Reporting on this Outcome Measure

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

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	116

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There is a need for food safety trainers in West Virginia as evidenced by the number of requests for classes and the number of food safety questions that are received by the State Food Safety Specialist and county Extension educators.

What has been done
Food safety training in WV is offered to educators, producers, processors, and home preservers in combination with workshops such as Food For Profit, Food Preservation, and ServSafe®. There were 36 professionals in West Virginia, Pennsylvania, Tennessee, and Oregon who

delivered food safety programs and consults about managing food ventures. Between 2013 and 2017, WVUES field faculty facilitated/made 13 presentations in WV.

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
504	Home and Commercial Food Service
703	Nutrition Education and Behavior
724	Healthy Lifestyle

Outcome #4

1. Outcome Measures

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

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	535

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
It is important that students understand how to safely interact in different environments to keep themselves and their friends safe. It is also important that students understand that they are responsible for the safety of others.

What has been done
In youth programs at WVSU, safety practices are discussed and implemented in all activities. With regard to food safety program youth learn how to be safe in the garden and with regard to food allergies For instance, in the high tunnel we begin by talking to pre-school children about

the rules e.g. sitting until it is our turn to plant, not putting seeds in our mouth. During food tastings we talk to students with food allergies and their parents about ingredients and cross contamination. Students are directed not to touch other student?s plates or share food across plates.

Results
Students eventually accept the guidelines and monitor one another; they encourage other students to follow the rules and lead by example.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #5

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 temperatures

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	3000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Research by West Virginia University has found that 539,911 West Virginians--29.3 percent of the state?s population--reside in areas that have low to extremely low access to quality foods. In addition, many children go without nutritional, safe meals during the summer when schools are closed.

What has been done
In 2017, the Energy Express program, a six-week summer literacy program, served 154,480 nutritious breakfasts and lunches to children participating in the program. In addition, they served 18,968 meals to other community youth. Each of these meals are balanced nutritionally and are prepared at school cafeterias at safe temperatures.

Results

Over 3000 children ate balanced nutritional, well-prepared, safe meals during the summer of 2017, during a time period when schools are closed and many children are not well-fed.

4. Associated Knowledge Areas

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

Outcome #6

1. Outcome Measures

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

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

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

Not Reporting on this Outcome Measure

Outcome #8

1. Outcome Measures

Raising broilers on clean shavings (CS) and applying post-chilling antimicrobial treatment can reduce Salmonella and Campylobacter on processes broiler carcasses.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Raising broilers in clean environments and mitigating post ?processing microbes is an ongoing issue. Advancements to reducing microbial problems as well as associated treatment costs is very important for human health and production costs.

What has been done
A study was conducted to show that raising broilers on clean shavings and applying post-chilling antimicrobial treatment can reduce Salmonella and Campylobacter on processes broiler carcasses

Results
Results indicate that raising broilers on clean shavings and applying post-chilling antimicrobial treatment can reduce Salmonella and Campylobacter on processes broiler carcasses. However, additional studies (replication) are needed to advance the process including cost-benefit analyses.

4. Associated Knowledge Areas

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

Outcome #9

1. Outcome Measures

Applying post-chilling antimicrobial broiler dipping treatments could be an intervention to control Salmonella.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Advancements to reducing microbial contamination as well as associated treatment costs is very important for human health and production costs.

What has been done
A study was undertaken to test whether applying post-chilling antimicrobial dipping treatments could be an intervention to control Salmonella

Results
Results indicate that applying post-chilling antimicrobial dipping treatments could be an intervention to control Salmonella. Further studies (replication) will further validate the method.

4. Associated Knowledge Areas

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

Outcome #10

1. Outcome Measures

Enterococcus faecium may serve as a Salmonella surrogate for in-plant validation studies.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Conceivably, a suitable surrogate microorganism for in-plant critical control point validation could be used to serve as an alternate for validation of destruction of Salmonella could better target and reduce associated costs, thus better targeting the organism and reducing associated costs.

What has been done
A study has been initiated to test whether Enterococcus faecium may serve as a Salmonella surrogate for in-plant validation studies.

Results
Results indicate that thermal treatments of ground beef at 58 to 68 degrees C that kill E. faecium will also kill Salmonella. However, additional studies are needed for validation purposes

4. Associated Knowledge Areas

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

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

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.

The Food Safety planned program in West Virginia works 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. An additional faculty has recently been hired 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 as the program grows. It is too early to evaluate the success of this goal area.

WVUES

An example of a program evaluation in this planned program

Food for Profit Program

This multistate program was adopted in WV and will be offered through the multi-state NE SARE Professional Development Program (train-the-trainer) Project. It consisted of training 50 agricultural

- Approximately 83.33% participants said they were having their first exposure to food safety training such as GHPs/GAPs, GMPs, HACCP.
- Approximately 83.33% participants said they were having their first exposure to allergen notification, product liability insurance, and developing a proactive recall plan training in this FFP and 100% of participants said that the food safety instruction taught in FFP was important and they will follow it.

- 100% of participants said that the target market identification taught in FFP was important and they will follow it.
- 100% of participants said that the business plan taught in FFP was important and they will follow it.
- 100% of participants said that the "How To Make Profit" taught in FFP was important and they will follow it.

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.

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%	20%	10%	0%
134	Outdoor Recreation	10%	10%	15%	0%
602	Business Management, Finance, and Taxation	10%	2%	10%	0%
604	Marketing and Distribution Practices	0%	2%	15%	0%
605	Natural Resource and Environmental Economics	0%	10%	10%	0%
608	Community Resource Planning and Development	40%	30%	20%	0%
723	Hazards to Human Health and Safety	20%	0%	10%	0%
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	5%	2%	0%	0%
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures	0%	2%	5%	0%
805	Community Institutions, Health, and Social Services	10%	2%	0%	0%
903	Communication, Education, and Information Delivery	5%	20%	5%	0%
	Total	100%	100%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	19.0	6.0	7.0	0.0
Actual Paid	11.0	8.0	8.3	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**
500000	560112	669302	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
368179	192248	735183	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	1333176	199974	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
Investigators contributing to program area 6 have generated a multitude of benefits for the citizens of West Virginia, and communities globally. Through a combination of scientific and social research, the program activities have advanced understanding of the various factors (e.g. economic, environmental, cultural) contributing to West Virginians' quality of life. For example, ongoing research is being conducted to characterize sector-specific market dynamics, in order to more accurately predict market changes, more effectively develop West Virginia economic resources (e.g. agriculture, energy, knowledge), and thereby improve the livelihoods of citizens across the state. Additionally, efforts are underway to advance understanding of how economic development impacts people and the environment, to ultimately reduce the negative consequences of land use change and shifting economies. As a function of its unique physiography and culture, tourism comprises an important economic sector for the state, and investigators are working to describe in detail the interplay between tourism resources, regional culture, and local economies, which can subsequently aid efforts to leverage unique environmental and cultural resources for community improvement. Collectively, the various activities included in program area 6 are helping the people of West Virginia balance the often competing and confounding factors that influence economics at the community-level.

Research program highlights for 2017 include:

- Advancing understanding of agricultural and energy commodity markets
- Quantitative and qualitative characterization of the knowledge-based economy of Appalachia
- Describing the impact of new energy development on rural community economics and quality of life, and the interplay between rural community economics and opioid abuse
- Created a spatial database of WV tourism resources, and comparing that distribution to local economic development
- Analyzing the life cycles of community-level tourism resources, in order to optimize economic benefits to local communities

Study and characterization of Appalachian cultural landscapes, in order to provide enhanced community benefits, improve community environments, and generate cultural economic resources for WV communities

WVUES

At WVUES program activities were carried out within the following units: the Fire Institute, Aircraft Crash Rescue Firefighting program, Institute for Labor Studies and Research, Safety, and Health Extension, Community Development. Major programs include Education Outreach Service organization (CEOS); the Master Gardener volunteer program; The First Impressions Program; Tourism; Government Planning and Public Policy; and Business Retention and Expansion, and Community Leadership Academy.

Activities and educational events in this planned program include; county development strategic planning, Title IX training, agritourism, social media training, bovine emergency response training, cultural competency training, current labor problems, developing recreation economies, facilitator training, Histories at the Museum program, international programming for counties, tourism, labor history, Real Colors, Self-Awareness, Poverty Simulations, and Power of Attraction.

WVUES Extension specialists and agents work collaboratively with community agencies and organizations on projects such as the Construction Supply Conference, development in the Monongahela National Forest, planning with festival boards, workshops for the United Mine Workers of America, Elkins Railroad Avenue Design, training for Extension Service Committees, Farmers Markets, Forum for Rural Innovation, Foundation for Safety Leadership, Glass Molder and Pottery Workers International Union, Hatfield McCoy Feud site tours, International Mountain Bike Ride Cente, Land Use Academy, Landscape Design School, Local Emergency Planning Committee, Road Scholar Bus Tour, OSHA construction, Roofers and Allied Waterproofers Local, and Safeland Oil and Gas.

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 2017:

- 63 small business were provided economic development technical assistance
- Local community organizations were able to increase the about of funding available for civic project through grants writing assistance from Extension agents.

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

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	59598	961226	25980	1842

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

Patent Applications Submitted

Year:	2017
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	20	19	39

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of General Press Articles

Year	Actual
2017	2

Output #2

Output Measure

- Number of Professional/Academic Presentations

Year	Actual
2017	87

Output #3

Output Measure

- Number of Graduate Students Earning Degrees

Year	Actual
2017	0

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 youth.
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 government or civic groups that use a new skill or procedure.
9	Number of community specific plans developed and adopted in whole or in part to help enhance economic development and quality of life.
10	Number of grants, financial awards or partnerships awarded or developed for use to support community, economic, workforce development initiatives.
11	Number of programs developed to increase employment opportunities for citizens of WV
12	Added knowledge of the effects of workplace noise
13	Number of initiatives to increase economic investment in West Virginia
14	Number of employees who gained knowledge and skill in workforce safety hazards
15	Number of agricultural workers who gained information and skill related to accommodations to improve work environments for those with disabilities
16	Number of business and civic leaders who gained skills in building organizational partnerships related to improving communities
17	Number of participants who increase their knowledge and skills related to tourism.

18	Advancing understanding of agricultural and energy commodity markets
19	Quantitative and qualitative characterization of the knowledge-based economy of Appalachia
20	Describing the impact of new energy development on rural community economics and quality of life, and the interplay between rural community economics and opioid abuse
21	Created a spatial database of WV tourism resources, and comparing that distribution to local economic development
22	Analyzing the life cycles of community-level tourism resources, in order to optimize economic benefits to local communities
23	Study and characterization of Appalachian cultural landscapes, in order to provide enhanced community benefits, improve community environments, and generate cultural economic resources for WV communities

Outcome #1

1. Outcome Measures

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

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	268

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
West Virginia continues to adapt to rapidly changing local economies. The primary economic drivers of many local communities have traditionally been based on the coal industry or other extraction industries, in fact many were literally created by and to support these currently declining industries. As the coal industry continues a rapid decline, there is an increase in displaced workers, who are unemployed due to layoffs, shutdowns or other industry-related changes who are actively seeking new employment or other entrepreneurial opportunities. These individuals lack the skills and resources required to start a new business or enter emerging, alternative industries such as media technologies.

What has been done

Three of the primary engines for economic development and a diverse economy are education, workforce training and information technology. WVSU Extension operates the Economic Development Center which combines all three by offering training, workshops and a business start-up coworking program focused on new media technologies. The WVSU Creators program packages the expertise of university professors, local organizations and successful business owners to deliver a series of workshops, talks and panels aimed at both continuing education efforts for job retention as well as new job creation and placement. Similar workshops were also held within the nine county footprint that WVSU Extension serves through the partnership with the Hatfield-McCoy Regional Recreation Authority.

Results

During the past year, 268 individuals have attended media related training events and workshops resulting in an increased knowledge in the areas of independent publishing, digital photography, website design, media production, digital illustration, creating musical theater, and 3D Animation. These individuals have used the skills acquired to further their education as it relates to their current employment or seek new opportunities in the areas of digital media and technologies. Other areas of training include: Leadership skills, human resource and financial assistance, and small business start-up workshops.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
604	Marketing and Distribution Practices
605	Natural Resource and Environmental Economics
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

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual

2017	250

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Emerging and established leaders need to understand, use and develop their community assets effectively. Community development Extension educators need to support robust community engagement and further community growth.

What has been done
The Community Leadership Academy (CLA) offers education and training to public officials and other local leaders in West Virginia and beyond. Through partnerships and programmatic expansion it has become a premiere activity for community leaders. CLA was becoming stagnate therefore the committee identified a new partner (Leadership WV) and program (IGNITE style).

Results
Participation increased from 184 in 2015 to 250 in 2017. Sponsorship's more than doubled since last conference. Two counties (Lewis and Webster) reported that based on what they learned at CLA they became more strategic in their planning which resulted in community growth.

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
805	Community Institutions, Health, and Social Services
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

2017 926

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

As West Virginia's population continues to age, civic organizations consistently lose membership therefore impeding their ability to impact positive change in the community. In the past, these organizations and individuals have played a critical role in improving the quality of life in small rural communities. 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

WVSUES provided support for community volunteer teams, aimed at facilitating revitalization, beautification, and heritage development. The agents connected communities to resources, provide leadership, coordinate projects, and enhance operations. The Community Engagement Lab at WVU engaged landscape architecture and other faculty members in providing design and planning services to a variety of constituent volunteer groups including Camp Pioneer- Randolph County, New River Gorge Learning Center, Marlinton Opera House Empty Lot Design, Upshur County Youth Camp- EPA Tarpit Mitigation, and Westside Fairmont Neighborhood Design, Elkins Railroad Avenue Design, and Lost Creek Design.

Results

Almost 1000 volunteers have been trained to serve on community projects and committies. Nine community volunteer groups now have design plans and will pursue funding before implementation.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures
903	Communication, Education, and Information Delivery

Outcome #4

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	300

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In 2017 we celebrated the 102nd year of 4-H Camping in West Virginia. We have a long and rich history 4-H camping in WV that has impacted the lives of thousands of youth but we are now challenged with the task of maintaining camping excellence while updating our program to meet the needs of the modern day member, parent and volunteer.

What has been done
In 2017, each of the 50+ 4-H camps developed a plan of action and updated their vetting and training processes to assure quality counselors and staff. Risk management training was conducted with 300 adult volunteer employees working with the 4-H. At the same time 4-H camps matched their education offerings and programs with the learning styles of mindset of today's campers.

Results
The new camp program plans of action build on a solid 4-H camp program foundation, maintain the support of WVU, and engage parents and partners who want to be a part of a positive youth development program. In 2017, 300 adult volunteers completing online training "Best Volunteer Practices" and were vetted by WVU Children on Campus with background checks.

4. Associated Knowledge Areas

KA Code	Knowledge Area
805	Community Institutions, Health, and Social Services
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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	200

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Across industries, supervisors often lack basic leadership knowledge and skills. Many newly promoted supervisors are required to take the OSHA-30-hour course which trains them to recognize workplace hazards and communicate compliance issues. However, the OSHA course does not currently have a formal elective on leadership principles.

What has been done
WVUES wrote a proposal to OSHA to improve safety climate on construction work sites across the US. The leadership training program was approved by OSHA as an elective topic in the OSHA 30-hour training program.

Results
A preliminary analysis from 20 companies across 3 geographic areas indicates that leadership skills and safety climate improves 2 and 4 weeks after the training. Leaders understanding of safety leadership skills improved and they perceived an increase in their crew's safety reporting practices. Workers perceptions of their leaders' safety leadership behaviors also improved as did improved relationship with the leader. Workers self-reported that they increased compliance with safety procedures.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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
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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	92972

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
OSHA?s Directorate of Training and Education realized that education centers would be necessary to help serve the public in meeting their goal in training the workforce in the recognition, avoidance and prevention of unsafe and unhealthful working.

What has been done
In 1994, WVU Safety and Health Extension was selected to become an OSHA Training Institute Education Center (OTIEC) covering the District of Columbia, Delaware, Maryland, Pennsylvania, Virginia, and West Virginia. In 2017, it offered 232 courses to 3,090 students and ranked 3rd out 27 education centers. It trains those with safety education job-related responsibilities to deliver the OSHA 10 & 30 hour hazard awareness courses.

Results
Students must pass both a written evaluation and performance evaluation of their training delivery skills. The average post-test score was 94.8% (n=326). The average performance assessment was 94.1% (n=326). A 6-month follow-up survey showed (n=185) that 93% of respondents used the training techniques when delivering training and 58% made changes to company safety and health programs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety
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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	50

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
A major factor that impedes the creation and growth of new groups and organizations in the community is a lack of resources. While an organization may have a strong vision and the desire to accomplish it, a lack of resources can prevent progress. Without connection to resources and expertise community organizations are limited in their ability to carry out their missions. For example, Brooke County did not have an annual event that showcased the county such as a fair or park. The Brooke County Museum was small and in a hard-to-find location. As a result, people were going out of the county to spend money.

What has been done
The WVSU Economic Development Center (EDC) provides entrepreneurs and local organizations with access to a low-cost production facility that enables them to start and grow a business without facing prohibitive costs. Resources offered at this facility include development assistance, office and co-working space, meeting space, and a fully equipped multimedia production studios. WVUES established the Brooke county fair and developed its leadership. An agent wrote a grant to purchase a larger facility located along the Historic Scenic ByWay. Extension is working with the board to increase public awareness of the Brooke County Museum, bring in new partners, and identify volunteer labor to keep the museum open longer.

Results
The City of Richwood has developed an inventory of over 100 properties, begun the process of contacting owners for remediation, received grants for the removal of dilapidated structures, and fulfilled the legal process resulting in key structures being removed. In Charleston, the EDC provided assistance and resources to 63 area small business start-ups, non-profit groups and community development organizations. WVSUES, New River Gorge Regional Development Authority, Raleigh County Commission, Coal Heritage, and Turn this Town Around Whitesville

have begun acquiring 15 miles of CSX owned rail in order to boost recreation activities. In Brooke County the county fair has drawn thousands of people to the county to spend money, visit the park, hear local musicians, and learn about 4-H. The new museum building can accommodate a higher volume of visitors who are able to learn more about WV heritage.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures
903	Communication, Education, and Information Delivery

Outcome #8

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
2017	7

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
To identify economic development goals and strategically promote a community, leaders must evaluate their communities? assets and obstacles. Although regional socio-economic data are available, communities often have a difficult time knowing what data exists, where to find them, analyze and interpret them, and place them in the context of their daily lives.

What has been done
WVUES specialists submitted community housing reports to the Weston Better Buildings Committee, the City of Richwood, and the Mill Town Community & Economic Development Corporation, and the City of Princeton. The WVUES tourism team works with Recreation Parks and Tourism and leadership in the Monongahela National Forest. WVSUES has embedded Extension agents with local government through a partnership with a regional development authority. These agents connected municipal and civic leaders to local, state and national

resources. The WVSUES agent in Nicholas County provided ongoing organizational and developmental support via the City Building Commission, Nuisance Property Committee, Main Street Alliance, and Blueprint/HubCAP organizations among others.

Results

Richwood has made progress with rehabilitation and continues to implement community recovery initiatives. The Downtown Beckley Business Association (DBBA) has received official 501c3 status and has accomplished numerous successful events toward revitalization in downtown Beckley. The formation and efforts of the DBBA have helped bridge communication gaps between community leaders. Leaders participate in community meetings regularly and are highly involved in all city activities in the downtown area. Leadership from the Princeton Renaissance Project are increasing their dialogue with locally owned, downtown businesses. WVUES has used data from Tucker County as a baseline to track the county's tourism economy and evaluate the impact of interventions. The Tucker County survey instrument will be used by the Forest Service to collect business and economic data from tourism based businesses. A follow-up survey will take place.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
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 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
2017	13

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The city of Williamson wanted to become more amenable medical professionals looking to move to the area. Tucker County leaders wanted to update its land use regulations. The city of Westover faced problems related to off-street parking and zoning ordinances. The Westside of Fairmont, home to a large African American population, wanted to increase minority-owned local businesses, entrepreneurship opportunities.

What has been done

WVUES engaged Williamson residents in projects to improve quality of life. A specialist provided Tucker County Planning Commission county subdivision regulations and planner position descriptions. In Westover, the specialist helped the Planning Commission draft changes to city parking ordinances. The Fairmont Westside Action Coalition selected projects and WVUES and the Entrepreneurship Support Clinic trained community members on the benefits of local entrepreneurship and ?economic gardening?. In each community WVSUES works closely with the mayors, city managers and local officials to develop strategies for community re-development.

Results

The Williamson community undertook small funded projects and developed wayfinder signage and other promotional materials. The Tucker County Planning Commission hired a planner and drafted a subdivision ordinance. Westover made changes to its parking regulations and added a "planned unit development" category to its zoning regulations. In the Westside of Fairmont, community initiatives and university based entrepreneurship programs such as the Westside Action Coalition, the Fairmont Community Development Partnership "Excelerator",and the WVU Women's Business Center held an educational program. Three community members pledged money to support a local entrepreneur. The community garden plan in Welch has been accepted by management, a new park plan in Richwood was completed, a community organization in Beckley applied for the ON-TRAC program while they are using Nation Main Street methods for downtown revitalization, and a community organization in Talcott was provided with organizational leadership and direction to focus their efforts.

4. Associated Knowledge Areas

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

Outcome #10

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

- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
With strained budgets from struggling local economies, many rural governments and organizations lack the kind of experienced grant-writing that is necessary to successfully fund public projects. In challenging economic times, partnerships also become more critical to developing resources and providing sustainability for projects and organizations.

What has been done
WVSU Extension agents actively pursue grants on behalf of communities. Through training and experience our staff keeps track of pending grant cycles and works to connect the appropriate organizations and projects with viable grants. By working from within the community, WVSU Extension staff have a great understanding of the active local organizations and individuals that are necessary to achieve success. This knowledge helps to put the right people and organizations together so that scarce resources can be utilized to the greatest potential

Results
In Richwood, a $60,000 Collins Foundation grant was awarded to the Richwood City Building Commission. This grant is facilitating the refurbishment of a historic building on Main Street. WVSU extension service has assisted with two recent successful Appalachian Regional Commission (ARC) POWER Grant projects forth over $1.5 million combined. The Downtown Beckley Business Association (DBBA) has received 2 Try This WV mini grant awards for about $3,000 in total funding.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
805	Community Institutions, Health, and Social Services
903	Communication, Education, and Information Delivery

Outcome #11

1. Outcome Measures

Number of programs developed to increase employment opportunities for citizens of WV

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Fewer construction users are now willing to relocate construction managers or site engineers to the construction locations to learn skills but would prefer enroll managers in programs that upgrade management skills. According to Engineering News Record, 80% of 1,000 construction firms contacted stated that shortages of skilled employees at the craft and professional levels continue to be a problem and 87% reported difficulties in filling positions from the energy sector.

What has been done
The Appalachian Construction Users Committee (ACUC) granted a $650,000 three-year contract to create a construction-specific credit certificate program in construction management. We oversaw the development of the curriculum, taught a pilot at WVU at Parkersburg and at WV Northern Community College. The 12-credit hour certificate program is the first for-credit industrial construction management certificate program in WV. It contains 180 hours of instruction, including 135 hours of core subject matter and an additional 45 hours of software application material.

Results
This program provides West Virginia citizens with an employment credential and career path in a high-demand area of the labor market. 25 students received certificates during the 2015-2017 project phase. Once fully implemented, this program will train hundreds of industrial construction managers over the next few years

4. Associated Knowledge Areas

KA Code	Knowledge Area
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and

	Commercial Structures
903	Communication, Education, and Information Delivery

Outcome #12

1. Outcome Measures

Added knowledge of the effects of workplace noise

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In 2002, MSHA issued a citation to U.S. Silica?s Berkeley Springs plant related to noise exposures. They performed an acoustic field investigation including personal and area noise sampling. They found all mechanics were exposed above the Permissible Exposure Level of an eight-hour time-weighted average of 90 dBA. MSHA then assigned each mechanic a P-Code.

What has been done
WVUES research in 2017 was broken into five phases: noise exposure assessment: data acquisition; analysis of the noise exposure data to inform Phase 3 decisions; feasibility and applicability research of administrative and engineering controls based on Phase 2 data analysis; introduction and assessment of chosen administrative or engineering control(s); and analysis of the effectiveness of administrative or engineering control(s).

Results
The main conclusions from Phase 2 included: 1) sound frequencies between 250 (Hz) and 4,000 (Hz) are responsible for all noise sampling locations that exceeded the action limit of 85 (dBA); 2) Sound frequencies less than 250 (Hz) and greater than 4,000 (Hz) are not contributing to the noise exposures; 3) Noise abatement technologies and noise abatement equipment need to be effective within the 250 (Hz) through 4,000 (Hz) frequency range to be able to reduce noise exposures; 4) The sound frequency of 500 (Hz) is contributing to the noise exposures in all sampling locations; 5) The sound frequency of 500 (Hz) is the main contributing frequency to noise exposures.

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety

Outcome #13

1. Outcome Measures

Number of initiatives to increase economic investment in West Virginia

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
West Virginia is rich in natural resources. It needs significant financial investment to promote economic development in the state.

What has been done
A WVUES specialist is working with a state team to attract investment from China and promote export to promote economic investment in WV.

Results
CEIC committed to invest $83.7 billion US dollars in West Virginia, which may create about 5,000 direct jobs and 50,000 indirect jobs in WV.

4. Associated Knowledge Areas

KA Code	Knowledge Area
605	Natural Resource and Environmental Economics

Outcome #14

1. Outcome Measures

Number of employees who gained knowledge and skill in workforce safety hazards

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	708

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Workers in high hazards industries and industries with high fatality rates experience a disproportionate number of injuries, illnesses, and fatalities compared to other industries and worker populations.

What has been done
WVUSHE developed, conducted and evaluated training and provided assistance programs to address the recognition and prevention of safety and health hazards. Additionally, WVUSHE has identified training topics and industries that are not served by WVUSHE programs. WVUSHE reached 608 workers through 40 training sessions which resulted in 2342 training contact hours. WVUSHE reached 100 workers through safety and health consultations.

Results
Knowledge gain was determined to be significant at +30.3% from pre- to post-test. 72 students responded to a level 3 follow up survey that was provided 6 months following the training. 79% expected to make changes to improve workplace safety; 79% used information to identify health and safety hazards at their workplace; and 98% responded to be more aware of health and safety hazards. WVUSHE?s success of program development, delivery and evaluation has provided a working model of collaborative efforts with industry, industry associations, organizations and safety and health professionals to address safety and health training and assistance needs.

4. Associated Knowledge Areas

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

Outcome #15

1. Outcome Measures

Number of agricultural workers who gained information and skill related to accommodations to improve work environments for those with disabilities

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	875

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The vision of AgrAbility is to enable a high quality of life for farmers, ranchers, and other agricultural workers with disabilities. It addresses not only conditions such as spinal cord injuries and amputations but also many other conditions, such as arthritis, back impairments, and behavioral health issues.

What has been done
WVA, a collaboration between WVUES, WV State University and the partnership of ARCMOV and WVATS. It provides education to farming communities and farmers with disabilities on agriculture, disability accommodations and secondary injury prevention and networks through farm site assessments and peer support and marketing to clients and service providers using traditional methods and social media.

Results
Participants with disabilities in agriculture-related occupations gained independence because of minimized obstacles. Agricultural workers completed the McGill Quality of Life Survey. The MQOL measures physical well-being. Consumers score themselves on ten items including assistive technology, how to continue farming with a disability, and independence in daily living. The results suggest that 83% of individuals surveyed indicate they are highly satisfied with the information received and 17% are satisfied.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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
903	Communication, Education, and Information Delivery

Outcome #16

1. Outcome Measures

Number of business and civic leaders who gained skills in building organizational partnerships related to improving communities

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In the northern panhandle, local elected officials were not effectively promoting positive community development efforts. People were disinterested and suspicious of elected officials. Declining employment and lack of community leadership is leading to community blight, unemployment, impediments to tourism and community health and beautification.

What has been done
Extension established programs to engage the county commissioners with the public including a volunteer recognition program hosted by the county commission with youth participation. In collaboration with the EDA, WVUES initiated or expanded 6 businesses in the northern panhandle and mentored new leadership. Through collaboration with the Northern Region Brownfield Team, funding was secured to remove contaminants, create green space on condemned properties, and promote tourism.

Results
New community and government partnerships were created and established. New job were created and businesses developed. New leaders gained skills working with citizens and creating partnerships. Because of beautification efforts, locales were made more attractive, which will eventually lead to improvements in tourism as well as an increase the number of people buying properties and establishing businesses in the area.

4. Associated Knowledge Areas

KA Code	Knowledge Area

608	Community Resource Planning and Development
805	Community Institutions, Health, and Social Services
903	Communication, Education, and Information Delivery

Outcome #17

1. Outcome Measures

Number of participants who increase their knowledge and skills related to tourism.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	2142

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Hospitality for state visitors has been identified as West Virginia?s top competitive strength. Community leaders agree that there is a lack of training and support for front line hospitality employees. The time commitment and expense of sending employees to classroom trainings was identified as barriers to participation in training.

What has been done
In 2012 the online version of WV Welcome was implemented and classroom hospitality trainings continue to be offered. The WV Welcome training has been offered to front line employees at State parks, CVB's, and private resorts. This year WVUES specialists partnered with Hollywood Casinos in Charlestown to test a new hospitality training approach. Online asset maps were utilized in a training and posted on the destinations tourism websites.

Results
In 2017, 1,992 individuals completed the online WV Welcome hospitality training and 150 tourism employees attended the tourism summit in Tucker and Jefferson counties in 2017. A pre/post evaluation of the online and classroom trainings demonstrated an increase in knowledge in each of the major components of the course. The highest mean differences between pre- and post-scores were in how to deal with different types of visitor needs, how to deal with upset guests, and knowledge of attractions. Since pre-course evaluations indicated that participants had low knowledge of visitor attractions, a new course on local attractions was developed.

4. Associated Knowledge Areas

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

Outcome #18

1. Outcome Measures

Advancing understanding of agricultural and energy commodity markets

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Advanced understanding of the relationships between agricultural and energy commodity markets is of ongoing interest internationally. In West Virginia there are great opportunities for development of agriculture and advancements in agricultural crops that also serve the energy sector are greatly appealing.

What has been done
Work has been ongoing to advance understanding of how agricultural entrepreneurial opportunities can be enhanced in West Virginia that may also take advantage of energy infrastructure. I.e. are there opportunities to develop crops that may also provide energy, or are there opportunities to advance current bioenergy cropping systems in West Virginia and Appalachia?

Results
This is an ongoing area of investment in the WVU-AFES and will continue to be in the future. Results and advancements are continuing to show the benefit of forestry exploitation for energy, and also benefits of agricultural crops (former mountain top mining sites) to serve as an energy commodity, provide jobs and improve economic well-being in WV communities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land
602	Business Management, Finance, and Taxation
605	Natural Resource and Environmental Economics
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 #19

1. Outcome Measures

Quantitative and qualitative characterization of the knowledge-based economy of Appalachia

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
West Virginia populations suffer from some of the greatest poverty and health related problems in the country. Knowledge is now recognized as the driver of productivity and economic growth, leading to a new focus on the role of information, technology and learning in economic performance. Advancements that reduce these issues will benefit human health and well-being and economic security in the State.

What has been done
Work continues to be conducted to push the knowledge-based economy concept through education efforts and assessments in Appalachia.

Results
Characterization (quantitative and qualitative) assessments of the development of a knowledge-based economy in Appalachia are showing great promise. Further investigations will better elucidate current state, progress, outcomes and needed areas of future development.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land
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 #20

1. Outcome Measures

Describing the impact of new energy development on rural community economics and quality of life, and the interplay between rural community economics and opioid abuse

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The impact of new energy development is important for rural communities in West Virginia. Advancements in understanding of the relationships between economics and human health, particularly the opioid crisis are critical to justify economic programs and reduce opioid addiction and mortalities.

What has been done
The impacts of new energy development on rural community economics and quality of life, and the interplay between rural community economics and opioid abuse are being investigated

Results
Compelling results support the need for economic (re)vitalization in rural communities in West Virginia, and the importance of economics and economic status to quality of life and opioid abuse. Ongoing investigation will continue to result in discovery, justification of investment, publication and dissemination.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land
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
805	Community Institutions, Health, and Social Services
903	Communication, Education, and Information Delivery

Outcome #21

1. Outcome Measures

Created a spatial database of WV tourism resources, and comparing that distribution to local economic development

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
West Virginia is one of the most natural resource rich states in the United States. There is untapped market potential for tourism in the state, but requisite to this is improved understanding of what tourism resources exist, in what condition and at what potential. This is important because this information could be very telling in terms of deliberate market development (i.e. where to most reasonably make investments to advance tourism in the state).

What has been done
A spatial database of WV tourism resources was developed. This database was then compared to locations of local economic development.

Results
Results indicate that locations of needed investment do not necessarily overlap with areas of current local development and that there are disconnects between these areas, energy production (where funds often exist) and best areas ripe for exploitation for tourism. Ongoing work will better quantify these differences and provide insights for best investments.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land
134	Outdoor Recreation
605	Natural Resource and Environmental Economics
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
903	Communication, Education, and Information Delivery

Outcome #22

1. Outcome Measures

Analyzing the life cycles of community-level tourism resources, in order to optimize economic benefits to local communities

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Optimizing tourism opportunities can improve location appeal, and maximize economic benefits to local communities. Studies that can show economic potential in many tourist attractions in a given area can help to identify areas most appropriate for development and justify investment in needed development to build the industry. Lifecycle analysis can be used to also assess how much tourism can be absorbed by an area without detrimental impacts to the resource.

What has been done
Work is being done to analyze the life cycles of community-level tourism resources, in order to optimize economic benefits to local communities, while identifying potential impacts, including quality of life to local communities.

Results
The environmental problems that are a consequence of the development of tourism in West Virginia are being identified. On the basis of many factors, the hypothetical limits of further development of tourism are being described.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land
134	Outdoor Recreation
602	Business Management, Finance, and Taxation
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
903	Communication, Education, and Information Delivery

Outcome #23

1. Outcome Measures

Study and characterization of Appalachian cultural landscapes, in order to provide enhanced community benefits, improve community environments, and generate cultural economic resources for WV communities

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Culture (anthropology) is often overlooked amidst resource extractive opportunities. However, if included such information can advance contemporary and future planning to enhance community benefits, improve community environments, and generate cultural economic resources for WV communities. This is important since such information can improve human health, well-being, satisfaction and also advance economic prosperity.

What has been done

Studies are being undertaken to characterize Appalachian cultural landscapes, in order to provide enhanced community benefits, improve community environments, and generate cultural economic resources for WV communities

Results

Studies show the benefit of including cultural anthropology in order to provide enhanced community benefits, improve community environments, and generate cultural economic resources for WV communities. Continued work is warranted as cultural landscapes vary locally, geographically, regionally, etc.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land
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

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

At WVUES, funding shortages have resulted in reduced staff and rethinking of programmatic strategies.

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

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. 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 coming in 2018. 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, and have been pursuing those relationships.
At WVUES

An example of an evaluation in this planned program:

Documentation of Community Need

West Virginia's small hospitals are key suppliers of health care in rural areas, providing both inpatient and emergency services vital to the isolated communities that they serve. Unfortunately, physician shortages in rural areas have troubled West Virginia for decades: Fifty-two of the state's 55 counties are designated as medically underserved by the U.S. Department of Health and Human Services; 47 counties contain regions classified as primary care Health Professional Shortage Areas.

Overview and Resource Acquisition

To help alleviate this situation, the Recruitable Community Program (RCP) was created in 1999. The RCP focuses on increasing rural communities' health care provider recruiting potential by addressing economic conditions and the quality of life communities' offer, making them more desirable locations for medical professionals. Since 2015, the RCP has utilized a model led by the WVU Extension Service that incorporates design and place making tools to initiate conversations, followed by planning activities that occur over a six-month time frame. Communities are provided with grants of $10,000 from the WV Department of Health and Human Resources (DHHR) to develop programs, seed projects, and pay related expenses to address community health and community development.

Objectives

West Virginia University Extension Service (WVUES), Community Resources and Economic Development (CRED) specialists (Daniel Eades and Michael Dougherty) were contracted to assist in RCP planning activities. While the RCP specifically focuses on increasing rural communities' health care provider recruiting potential, the program is unique in its approach to rural recruitment, relying on both traditional healthcare topics and broader community development issues. The program provides beneficial advice, assessment, and suggestions for enhancing community development and recruitment and retention techniques. It also reinforces recruitment and retention efforts by strengthening community ties to training programs and state agencies and funding resources. Most importantly, the RCP seeks broad and extensive community participation in the process of planning for community improvements to make places more desirable destinations for health care professionals

Evaluation

RCP planning activities have occurred in three communities since 2015 -two (Keyser, WV and Williamson, WV) have been completed, the third (Harrisville, WV) is ongoing. Evaluation included follow-up conversations with program sponsors and community leaders, and field observations. The follow-up conversations have provided insights into the impact of the program (see below) while the field observations have highlighted outstanding program delivery.

Impact of the Program

In Keyser and Williamson, the program has achieved both CD process impacts and impacts to the built environment. Medium-term impacts, as defined in the USDA logic model, were realized in Williamson and are described below:

- **Physician recruitment**: Keyser has recorded 11 new physicians since program participation; Williamson has recruited 10 new physicians -- 5 at the local hospital and 5 at the local wellness center.

- **Participation in community meetings nearly doubled** from 17 initial attendees to 31 in Keyser, and 8 initial attendees to 16 attendees in Williamson.
- **Community and stakeholder participants represented a diversity of organizations and interests** including local businesses, city and county officials, a local arts organization, the local Chamber of Commerce and Convention and Visitors Bureau, local/regional hospitals, and local health and wellness centers.
- **In Keyser, the grant program successfully funded seven programs and organizations**: Projects include signage improvements, child focused exercise equipment and free activity programing; flowers and planters for community beautification; and the purchase of an Electronic race timer and clock to be made available for free to any county organizations holding benefit races in the community.
- **In Williamson, the grant program is successfully funding signage improvements** in the business district and as part of a "Share the Road" campaign. **Multiple entities** (such as the Williamson Health & Wellness Center (WHWC), the City of Williamson Visitors & Convention Bureau, Tug Valley Chamber of Commerce, Williamson Redevelopment Authority, Williamson Board of Parks & Recreation, Wildwood Garden Club, The Hatfield & McCoy Trails Authority, and local businesses and government authorities) **have committed to continuing the development, planning, and funding of additional phases of improvement and beautification**. This includes **significant financial commitments** from Williamson Health & Wellness Center and Williamson Memorial Hospital.
- **Participants initiated projects before and outside of those explicitly funded by the grant program**:
  - In Williamson, one participant coordinated an open mic night at a local bar and restaurant. The initial event included eight performers and 2½ hours of music; this event is continuing on a monthly basis. The events are already making a positive economic impact for the business and demonstrate that residents will come out for well-organized activity.
  - A group, led by Williamson Health and Wellness has begun work on a community-operated webpage for internal (community) marketing and news.

Program Sustainability

The current model is the fourth iteration of the program since 1999. Our version requires a higher level of citizen involvement than previous iterations but has resulted in increased community capacity and projects that are accomplished as a result of community buy-in. Staff from WV DHHR and faculty from WVU have increased the guidance they provide the community, even as we require more local ownership for decision-making and action. The success of the WVU Extension Service model has led to work in additional communities; work is currently scheduled through spring 2019.

Collaboration

The RCP is a joint effort led by the WV DHHR, Division of Recruitment within the Office of Community Health Systems, with technical assistance provided by West Virginia University Extension Service. These and other state provider organizations work collaboratively to assist community efforts to alleviate health care provider shortages.

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.

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%	5%	60%	0%
124	Urban Forestry	0%	75%	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%	5%	0%	0%
605	Natural Resource and Environmental Economics	15%	0%	0%	0%
	Total	100%	100%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	2.0	1.0	4.0	0.0
Actual Paid	0.0	1.0	2.2	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	70014	20984	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
34329	24031	198996	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	166647	244606	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

Weeding was shown to be efficacious for tree crown expansion and increased herbivory occurrence. Willow establishment performance studies showed that survival and growth were lower for horizontally-planted cuttings relative to vertically planted cuttings. Studies of perennial nut crops for bioenergy production showed that manure treated seedlings had significantly higher nutrient concentrations for N, P, and Mg relative to controls. Urban tree tensile/stress studies showed that tree branches become co-dominant at aspect ratios of 0.8 or higher. High-performance computing clusters and geospatial random approaches were used to show a globally consistent positive effect of biodiversity on ecosystem productivity. The value of biodiversity in maintaining commercial forest productivity in the US is $396-579 billion/yr. GIS maps were created that show spatial patterns of shale gas industry employment in West Virginia. These were used to begin to develop economic models that show how employment in shale gas industry influences employment in the forestry sector. Investigations of beech bark disease and the role of Fusarium spp., is being investigated among other forest, woody species pathogens. Studies in lignocellulosic biomass materials identified improved methods for materials extractions, concentration estimations, and methods of pyrolysis

Research program highlights for 2017 include:

- Strip cutting can provide benefits to wildlife and increase biomass.
- The value of biodiversity in maintaining commercial forest productivity in the US is $396-579 billion/yr.
- Established the Global Forest Biodiversity Initiative (http://www.gfbinitiative.org/.
- Economic models show how employment in shale gas industry influences employment in the forestry sector
- Published studies in 2017 resulted in dozens of landowner outreach efforts.

WVUES

WVUES Extension programs target youths, landowners, and commercial enterprises. Activities this year included: forestry, logging and milling, WV GreenUp logging, forest conservation, woods and wildlife presentations, and a presentation on timber transaction research.

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 2076 include:

- Memorial Tree Project continues to be 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 urban forestry, urban fruit production, proper tree pruning 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

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	17351	19317	18344	6813

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

Patent Applications Submitted

Year:	2017
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	17	14	31

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of General Press Articles

Year	Actual
2017	3

Output #2

Output Measure

- Number of Professional/Academic Presentations

Year	Actual
2017	15

Output #3

Output Measure

- Number of Graduate Students Earning Degrees

Year	Actual
2017	3

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 program and workshop participants who gain knowledge or skills in urban forestry practices.
3	Development of new bioproducts and chemicals from underutilized hardwood species and forest industry by-products in Appalachia
4	Strip cutting can provide benefits to wildlife and increase biomass.
5	The value of biodiversity in maintaining commercial forest productivity in the US is $396-579 billion/yr.
6	Established the Global Forest Biodiversity Initiative (http://www.gfbinitiative.org/.
7	Economic models show how employment in shale gas industry influences employment in the forestry sector
8	Published studies in 2017 resulted in dozens of landowner outreach efforts.

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
2017	500

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Forests are important ecosystems and provide a variety of benefits in habitats, forest products, economies, and environmental quality. Forest degradation and destruction occurs due to road building, mining, and other land disturbances.

What has been done
Technologies for restoring forests on disturbed lands have been developed through reforestation initiatives. Workshops, meetings, seminars and training materials are available for the public.

Results
As a result of WVUES efforts to educate about 500 WV citizens about managing forest resources, reforestation practices on mined lands have increased three times since 2000. As an example, after highway construction, re-vegetation strategies have been implemented that emphasize native plants for stability and beauty along roadsides.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources
605	Natural Resource and Environmental Economics

Outcome #2

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
2017	47

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
West Virginia is the third most forested state in the US, however the urban and community forest lacks proper upkeep and maintenance, new plantings and species selection, and new and emerging opportunities for urban forests. From education on proper tree care, pruning and maintenance, WVSUES has been a part of leading the charge for urban forestry in WV. Stakeholders of the urban forestry initiatives at WVSUES include homeowners, urban property owners, local and state elected officials and utility companies with overhead lines.

What has been done
During 2017, 11 educational events focused on urban forestry, including urban fruit trees and proper tree pruning. Included in these outreach efforts were the planting of 63 trees in various parts of the state. Additionally, 162 attended workshops and planting events. The fruit tree plantings will be utilized for hands-on demonstration, education and research in the coming years, as well as a source of food for community members. The Ravenswood Memorial Tree Program has continued to thrive as a community forestry project. During this year, 5 more trees were planted, bringing the total to 45 since 2013.

Results
These educational sessions, community outreach and other methods of delivering the urban forestry method have been met with great success over the past year. Workshop participant evaluations indicate that approximately 85% of workshop attendees increase their knowledge of the subject and intend to implement the skills learned at their own homes. The Ravenswood Memorial Tree Program continues to gain recognition in both the community and Ohio River Valley Region by earning two awards from the West Virginia Municipal League. West Virginia State University continues to be the only Tree Campus USA in the state of West Virginia by implementing proper tree care practices on campus.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources
124	Urban Forestry
605	Natural Resource and Environmental Economics

Outcome #3

1. Outcome Measures

Development of new bioproducts and chemicals from underutilized hardwood species and forest industry by-products in Appalachia

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Strip cutting can provide benefits to wildlife and increase biomass.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Ongoing studies are warranted to discover optimal methods of sustainable forestry while also maximizing wildlife habitat. This is important because forests of West Virginia are an invaluable commodity (a crop), yet wildlife populations are arguably an equally valuable ecological commodity as well as valuable tourism, and sportsman commodity.

What has been done
Work is being conducted to further discover optimal forest management and harvest practices that also enhance and sustain valuable wildlife habitats.

Results

Strip cutting has been shown to be a potentially useful methodology for sustaining forest resources while supporting wildlife populations. However, much additional/ongoing work is needed to advance the most effective practices at different locations in the landscape that also include understanding of wildlife population location(s) and need(s).

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources
124	Urban Forestry
125	Agroforestry
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
511	New and Improved Non-Food Products and Processes
605	Natural Resource and Environmental Economics

Outcome #5

1. Outcome Measures

The value of biodiversity in maintaining commercial forest productivity in the US is $396-579 billion/yr.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Studies are needed that show the value of biodiversity in forestry practices. This is often a relative concept, perhaps to monocultures that in the past may have been perceived as more productive. However, studies are showing that for forested landscapes biodiversity can be extremely beneficial financially in terms of diversity of plants and animals and various embedded fiscal opportunities

What has been done
Research showed that the value of biodiversity in maintaining commercial forest productivity in the US is $396-579 billion/yr

Results
Research showed that the value of biodiversity in maintaining commercial forest productivity in the US is $396-579 billion/yr

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources
124	Urban Forestry
125	Agroforestry
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
605	Natural Resource and Environmental Economics

Outcome #6

1. Outcome Measures

Established the Global Forest Biodiversity Initiative (http://www.gfbinitiative.org/.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Forest biodiversity has been shown to be extremely important for forest production and other embedded commodities. There is likewise increasing awareness of connectivity of all forests and coupled to a global economy consortiums are attractive that include expertise to create global agreements in terms of forest practices and objectives. This is important since many timber markets are international and thus subject to international trade agreements, etc. Conceivably, agreement in practices and importance of forestry practices can lead to greater global agreement of sustainability of resources.

What has been done
To advance global communication in terms of forest productivity, the Global Forest Biodiversity Initiative (GFBI) was created.

Results
This initiative, though new, is resulting in broader (international) dialogue pertaining to forest practices and guidelines, etc.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources
124	Urban Forestry
125	Agroforestry
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
511	New and Improved Non-Food Products and Processes
604	Marketing and Distribution Practices
605	Natural Resource and Environmental Economics

Outcome #7

1. Outcome Measures

Economic models show how employment in shale gas industry influences employment in the forestry sector

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
West Virginia is more than 70% forested. The forest industry in West Virginia is very strong, but further exploitation can be subject to the larger commodities in the state including natural (shale) gas extraction. There is thus a direct relationship between shale gas industry and employment in the forest industry. This is important because better understanding of impact of shale gas on forestry in West Virginia may assist policy makers to better target employment incentives in the forest industry, etc.

What has been done
Economic models are being used to show how employment in shale gas industry influences

employment in the forestry sector

Results
Early results support the hypothesis that the shale gas industry is, and will continue to influence employment in the forestry sector. Modeling results have pointed to the need for additional information and further investigation to elucidate where exactly the impacts are being made, and how policies may be altered to incentivize other industries (including forestry) amidst ongoing shale gas extraction.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources
604	Marketing and Distribution Practices
605	Natural Resource and Environmental Economics

Outcome #8

1. Outcome Measures

Published studies in 2017 resulted in dozens of landowner outreach efforts.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Publications are composites of information gleaned from studies that when distilled further can be used for outreach activities to landowners. WVU-AFES is actively pursuing dissemination programing of applied science to improve land management practices. This is occurring through distillation of research publications to palatable information to land owners.

What has been done
Studies published in 2017 contributed to dozens of landowner outreach efforts.

Results

It is clear that the value of peer reviewed articles stretches beyond wrote publication. The process results in an initial phase of research distillation that can lead to fundamental information for land owners and improvements to land use practices.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources
124	Urban Forestry
125	Agroforestry
511	New and Improved Non-Food Products and Processes
604	Marketing and Distribution Practices
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

None in the current reporting year.

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
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- 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 forest products industry is a vital component 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. The State budget and economy are of course very much impacted by the decline in the coal industry and falling energy prices. The College budget has absorbed four major cuts in the last four years with more to come in 2018. 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, and we are actively pursuing those relationships.

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.

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: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	8.0	0.0
Actual Paid	2.0	0.0	8.5	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	899026	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
30057	0	1224036	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	666626	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. Utilizing a combination of biological, physiological, and genetic methods, researchers are studying the various factors that contribute to livestock reproductive success. Studies are being conducted to improve the health of poultry and dairy cattle, in order to increase profits for agricultural producers, provide more specialized care for animals, and better safeguard consumers. Research is also underway to increase the quality and productivity of various crop species, in order to benefit grazing animals, agricultural producers, and the public. Results of such efforts will improve outcomes for the plant and animal food industries in West Virginia, and globally. Additionally, a team of investigators are using a variety of field and laboratory techniques to discover the reflexive impacts of soil microbial communities and nutrient cycling, a relationship with far-reaching implications for the sustainability of land use practices. Collectively, the results of program area 8 research activities will increase the efficiency and success of agriculture in West Virginia, which is an important source of revenue for individuals and local communities throughout the state. However, the benefits of these efforts are not limited to the agricultural industry, and can also be expected to improve the management of land and water resources in urban and wildland settings. Therefore, in addition to advancing scientific understanding of their various fields, investigators are helping to revitalize local economies and more effectively protect the environment.
Highlights for 2017 include:

- Advancing understanding of genetic contributions to bovine reproduction efficiency
- Identification of mechanisms that cause insulin resistance in over-conditioned dairy cattle
- Advancing understanding of the interaction between uric acid, oxidation stress, and inflammation in chickens, in order to improve poultry production
- Identification and biochemical characterization of fungi associated with turf and forage grasses, in order to reduce toxicity to grazing animals
- Evaluating biological controls for chestnut blight, in order to improve chestnut reestablishment in both orchard and forest settings

Characterizing the interactions between microbial community structure, soil biogeochemistry, and microbial activity

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

2017	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: 2017

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	15	15

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of General Press Articles

Year	Actual
2017	1

Output #2

Output Measure

- Number of Professional/Academic Presentations

Year	Actual
2017	29

Output #3

Output Measure

- Number of Graduate Students Earning Degrees

Year	Actual

2017 3

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of new NSF, NIH or AFRI grants secured in area of nutritional biochemistry, insulin resistance, metabolic disorder or diabetes.
2	Number of new NSF and AFRI grants received to conduct research in plant biochemistry or molecular genetics.
3	Advancing understanding of genetic contributions to bovine reproduction efficiency
4	Identification of mechanisms that cause insulin resistance in over-conditioned dairy cattle
5	Advancing understanding of the interaction between uric acid, oxidation stress, and inflammation in chickens, in order to improve poultry production
6	Identification and biochemical characterization of fungi associated with turf and forage grasses, in order to reduce toxicity to grazing animals
7	Evaluating biological controls for chestnut blight, in order to improve chestnut reestablishment in both orchard and forest settings
8	Characterizing the interactions between microbial community structure, soil biogeochemistry, and microbial activity

Outcome #1

1. **Outcome Measures**

Number of new NSF, NIH or AFRI grants secured in area of nutritional biochemistry, insulin resistance, metabolic disorder or diabetes.

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

Number of new NSF and AFRI grants received to conduct research in plant biochemistry or molecular genetics.

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Advancing understanding of genetic contributions to bovine reproduction efficiency

2. **Associated Institution Types**

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Due primarily to a lack of phenotypic data, little research has been undertaken on the genetics of reproductive performance in cattle. Reproductive efficiency is important in animal production systems and is important because advancements in understanding can result in more deliberate selection processes and reduced costs that ultimately increased profitability.

What has been done
Work has been conducted to advance understanding of genetic contributions to bovine reproduction efficiency by assessing contribution of phenotypic differences in reproductive

performance in cattle and to investigate whether routinely available early predictors of genetic merit for reproductive performance exist.

Results
Results to date indicate that genetic selection for improved reproductive performance in cattle is feasible, with considerations of selection criteria. For example, breeding goals that select for muscularity and live weight or growth rate should consider potential deterioration in reproductive performance. Ongoing investigations seek to better understand these trade-offs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
304	Animal Genome
305	Animal Physiological Processes

Outcome #4

1. Outcome Measures

Identification of mechanisms that cause insulin resistance in over-conditioned dairy cattle

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Overconditioned cows exhibit greater insulin resistance and fat mobilization resulting in an increased elevation of circulating nonesterified fatty acids (NEFA) that predispose them to postpartum metabolic disease (PMD) thus compromising milk production, fertility, and health. Consequently, dairy producer profit margins are diminished and sustainability of the American dairy industry is undermined. Approaches to increase insulin sensitivity to reduce fat mobilization represent a new means to prevent PMD in cows. Understanding the mechanisms that mediate insulin resistance in over conditioned cows will enable us to devise strategies to prevent PMD.

What has been done
The goal of this work was to define the mechanisms that mediate insulin resistance in cows.

Results
This work was a joint effort between West Virginia University and Johns Hopkins University, in which mass spectrometry-based metabolomics were used to profile metabolites in adipose and plasma pre- and postpartum in lean and over conditioned cows and assess whether stimulation can prevent insulin resistance in bovine adipocytes. Furthermore, our metabolomics approach will identify prepartum plasma metabolite markers that serve as diagnostic tools to detect cows susceptible to PMD.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
304	Animal Genome
305	Animal Physiological Processes

Outcome #5

1. Outcome Measures

Advancing understanding of the interaction between uric acid, oxidation stress, and inflammation in chickens, in order to improve poultry production

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Heat as a stressor of poultry has been studied extensively. Heat stress affects poultry production on a worldwide basis and has significant impact on well-being and production. The involvement of heat stress in inducing oxidative stress has received much interest. Oxidative stress is defined as the presence of reactive species in excess of the available antioxidant capacity of animal cells. The detrimental effects of heat stress on broilers and laying hens range from reduced growth and egg production to decreased poultry and egg quality and safety.

What has been done

To advance knowledge of basic mechanisms associated to the reported effects, as well as related to poultry behavior and welfare under heat stress conditions studies are ongoing to understand the interaction between uric acid, oxidation stress, and inflammation in chickens, in order to improve poultry production

Results

Results to date are compelling suggesting opportunities for substantial progress in understanding of the association between heat stress and oxidative stress, the means by which phytochemicals can alleviate oxidative stress have been sparsely explored and will be an objective going forward along with additional studies investigating dose-response relationships.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
304	Animal Genome
305	Animal Physiological Processes

Outcome #6

1. Outcome Measures

Identification and biochemical characterization of fungi associated with turf and forage grasses, in order to reduce toxicity to grazing animals

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Fungi associated with turf and forage grasses are important symbiotic assemblages in turf and grazing grasses, particularly perennial forage grasses utilized throughout the moderate- to high-rainfall temperate zones of the world including West Virginia and Appalachia. This is important as fungal assemblages can be toxic to grazing animals, and if so, can reduce health of the grazers and reduce profitability of animal production.

What has been done

Studies are ongoing to advance identification and biochemical characterization of fungi associated with turf and forage grasses, in order to reduce toxicity to grazing animals.

Results
Several years of research has shown that, in infected temperate grasses, endophytes reduce livestock productivity. Evidence further suggests that endophytes may cause various health disorders in livestock. Ongoing research and subsequent publications in coming years will add further insights to ultimately reduce toxicity to grazing livestock.

4. Associated Knowledge Areas

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

Outcome #7

1. Outcome Measures

Evaluating biological controls for chestnut blight, in order to improve chestnut reestablishment in both orchard and forest settings

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The natural biological control of the chestnut blight fungus is known in several locations in North America and Europe. Field and laboratory tests are being designed to understand the mechanisms by which hypoviruses become established and spread. The ultimate goal is to evaluate biological approaches for controlling chestnut blight from the ecological to the molecular level by utilizing knowledge of the fungal and hypovirus genomes to investigate the mechanisms that regulate virulence and hypovirulence in C. parasitica, and Investigate chestnut reestablishment in orchard and forest settings with special consideration of the current and historical knowledge of the species and its interaction with other pests and pathogens.

What has been done
A biological control project at West Salem, WI was conducted to assess movement of hypoviruses in the mixed hardwood stand of which American chestnut is a major component.

Bark samples were taken from cankers from which inhabiting fungi were isolated. Data of the resulting organisms (virus-free Cryphonectria parasitica, virus-containing C. parasitica and other competing fungi) were collected. These data, in conjunction with demographic data on the trees in the stand, were used to assess the level of biological control in the stand. These data were presented to a not only scientific members of the American Chestnut Foundation, but also to local growers and individuals interested in growing chestnuts.

Results
Several field experiments are underway. Annual evaluations of the disease have demonstrated that biological control is possible. The highest level of biological control has been in the area of the stand with the longest history of infection and hypovirus introduction. The transition from high levels of disease to acceptable levels of biological control appears to require significant time; in the current work, more than 20 years. The level of biological control that has been achieved has resulted in seed production allowing for stand perpetuation.

4. Associated Knowledge Areas

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

Outcome #8

1. Outcome Measures

Characterizing the interactions between microbial community structure, soil biogeochemistry, and microbial activity

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Soils are the most biodiverse habitats on earth, with a single gram typically containing thousands of bacterial, fungal, and archaeal ?species? or phylotypes. It is perhaps due to this great diversity that so many fundamental questions about the assembly and functioning of these communities remain unanswered. Studies have shown the relationship between diverse microbial communities and vegetative productivity, both of which can be detrimentally impacted by geochemistry, and environmental pollution. This is important since advancing understanding microbial impacts may

help managers and policy makers improve mitigation practices directed towards healthy microbial communities and thus improved crop performance and ecological resilience.

What has been done

Studies are ongoing to determine if and how nutrient availability structures microbial diversity within natural and agricultural soils. Other investigations are directed at connecting ecosystem biogeochemistry with microbial diversity by assessing phylogenetic organization in microbial activity. Studies collectively are targeting improved understanding of interactions between microbial community structure, soil biogeochemistry, and microbial activity.

Results

Work in the current reporting year has resulted in multiple publications and elucidating the fundamental relationships between land use impacts and water quality on microbial communities in a contemporary mixed-land use watershed of West Virginia, Appalachia.

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Appropriations changes
- Competing Public priorities

Brief Explanation

None in the current reporting year.

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.

Research involving fundamental plant and animal systems in this program area is designed to increase basic scientific understanding of reproductive, nutritional and general physiological systems and processes. Our evaluation for this 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 2017 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 in recent 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 been resulting in great progress and improved productivity, resulting in increased publications each year, with the total number doubling over the last five years, as per Google Scholar tallies. There are also increased numbers of grant proposal submissions and increased success at NIFA and NSF. We moved in 2017 to a uniform faculty productivity report using Digital Measures. This change is allowing 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%	25%	0%	0%
801	Individual and Family Resource Management	20%	25%	0%	0%
802	Human Development and Family Well-Being	60%	50%	0%	0%
	Total	100%	100%	0%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	22.0	2.0	0.0	0.0
Actual Paid	19.0	1.5	0.0	0.0
Actual Volunteer	3200.0	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	105021	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
936322	36046	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	249971	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

In 2017, 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

WVUES aimed at helping West Virginia's families to become more stable and self-sufficient by improving financial management family relationships skills and building community coalitions. Training programs were conducted to strengthen skills in family budgeting, planning for retirement, parenting, personal communication, stress reduction, divorce and separation, and adult relationships. WVUES faculty are involved in local and regional efforts to train family members, social service providers, judges and legislators, and other Extension faculty and staff.

2017 activities can be categorized in four areas:

Financial Education: Reality Store

Adult Relationships: Parenting and relationship programs at WVUES include: Parenting Piece by Piece, The Five Love Languages, Five Love Languages of Children, Stewards of Children, Marriage Preparation, 4-H LIFE: Building Strong Families, Celebrate Equality: WV Women and Education, and couples retreats.

Stress Reduction: WVUES programs that strengthen skills in stress reduction include: Stress Less with Mindfulness and C.A.P.E training-Community Assessment and Education to Promote Behavioral Health Planning and Evaluation.

Childcare: WVUES collaborates with community and state organizations to enhance childcare services including: Apprenticeship for Child Development Specialist, Children's Miracle Network Hospitals, Darkness to Light, Preventing Child Sexual Abuse, and WV Healthy Children Project.

WVSU-GRDI

The "Healthy Grandfamilies" program was implemented in 2017 serving approximately 90 families in response to the rise in grandparents raising their grandchildren as a result of the opioid epidemic in the state. This program provides workshops and ongoing social services to support these grandparents raising their grandchildren. Partnerships were developed with boards of education, Family Resource Networks, United Way, Faith Based community and others to provide robust support for this initiative.

Highlights for 2017 include:

- 97.6% of grandparents felt better prepared to raise their grandchild
- 92.7% of grandparents reported moving toward a healthier lifestyle

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

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	9524	174414	5005	550

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

Patent Applications Submitted

Year: 2017

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	7	0	7

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- General Press Articles

Year	Actual
2017	8

Output #2

Output Measure

- Academic or professional presenations

Year	Actual
2017	10

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 grandparents who gain knowledge and skills related to improving physical and mental health while raising grandchildren

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

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	379

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Effective stress coping skills are very relevant for WV audiences because West Virginia has the lowest well-being scores in the nation (WV score of 58.9; national score of 62.1). In 2017 WalletHub's analysts determined which environmental factors are linked to overall well-being and life satisfaction. WV ranked 50th in this study. Research shows that mindfulness-based interventions appear to produce significant positive changes on measures of depression and anxiety (Carmody et. al., 2009).

What has been done
To address this critical need in our state, the Stress Less with Mindfulness (SLM) program has been implemented to increase self-regulation techniques in responding to stressors. Mindfulness involves training in gently focused awareness with documented results showing a perceived positive quality of life. The five session curriculum for Stress Less with Mindfulness has been revised and edited and is now available for purchase by other interested professionals.

Results
Participants gained skills in mindful breathing, walking, staying in the present monument, and mindful eating.

4. Associated Knowledge Areas

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

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
2017	374

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?ll 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 issue, 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: FDIC Money Smart (221), Fraud Watch (11), Make Your Money Matter (68), Money Habitudes (74),

Results
Participants gained skills in make more effective spending decisions. Participants connected attitudes and habits related to money with emotions and relationships. Participants identified strategies to reinforce positive behaviors and modify any challenges. After participating in the program, participants indicated they wanted to make smart financial decisions (such as avoiding debt and budgeting).

4. Associated Knowledge Areas

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

Outcome #3

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1690

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 was associated with better socio-emotional 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. Fathers and their children attend these events together. In 2017, 14 events were held in Monongalia County. The activities were designed to engage the fathers and their children physical activities.

Results
The number of fathers and their children who participated in the program has increased substantially over the past for years: 22 in year 1,300 in year 2, 1064 in year 3, and 1690 in year 4. Fathers that participated for more than one year verbalized increased and sustained quality engagement with their child for extended periods after event. Fathers acknowledged the iFather program as a catalyst of change in their relationship with their child. The program is now regarded as a state model for fatherhood engagement and will be replicated in other areas of the state.

4. Associated Knowledge Areas

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

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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	916

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
WVUES offered several relationship education programs this year including Five Love Languages, Five Love Languages for Children, How Not to Marry a Jerk, Relationship Smarts, and Love Notes. Relationship education programs cover 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.

Results
On average, over 90% of participants in the 5 Love Language program indicated that they knew their love language as well as the language of their significant other. 100% indicated that the training gave them information that was relevant to them and that they would use that information within the next 6 months. Participants in the Relationship Smarts program increased in understanding of the connection between current decisions that affect future relationships. All participants in the train-the trainer Love Notes program showed proficiency in program?s content area.

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.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	345

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Through poverty simulations and cultural competency programming audience have been able to increase their awareness of obstacles faced by children and family in poverty.

What has been done
Understanding Cultural Competency and Poverty in Appalachia is a fee for service, train-the-trainer style program for social service, school, government, and health care workers. This year 285 community providers (counselors, social workers, nurses, doctors, & nonprofits) attended poverty simulations and received continuing education credit.

Results
60 Extension personnel from WV and neighboring states have expanded their knowledge about serving nontraditional audiences. 285 participants increased their awareness of obstacles faced by children and families in poverty. Partnerships were established with Volunteer WV, WV

Commission for National and Community Service, Potomac Valley Hospital, Garrett County Health Department, Western Maryland Regional Health Systems, United Way of the River Cities, Huntington Housing Authority, BB&T, Underwood Senior Center, Cabell County Community Services Organization, WVU Center for Excellence in Disabilities, National Association of Social Workers WV Chapter and its Huntington Branch, and the Multi-State FNP Conference.

4. Associated Knowledge Areas

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

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
2017	43

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

ACDS is sponsored by the U.S. Department of Labor and implemented in Cabell, Kanawha & Marshall counties. In 2017, there were 26 classes of ACDS offered to 360 apprentices and Extension directly supported 11 of those classes with approximately 150 students. Two Extension county agents who are qualified instructors, 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, 43 students completed the requirements for the course to graduate and were certified as childcare workers.

4. Associated Knowledge Areas

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

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 grandparents who gain knowledge and skills related to improving physical and mental health while raising grandchildren

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	99

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Since 1991, the number of grandfamilies has increased by 64% in the US. WV shares 2nd place for the percentage of grandparents raising grandchildren. These grandfamilies are predominantly low income, have limited access to healthcare, and lack strong social support systems. About 68% of the parenting grandparents in WV are 50 years of age or older and most have one or more chronic disease. Obesity and other health issues are a major challenge as well as the need for legal assistance. Professionals are often ill prepared to help them and specialized resources are needed.

What has been done

WVSU has provided 99 grandparents in Kanawha, Jackson, Clay and Braxton counties with education and training on topics related to health and wellness. Topics include ways to increase the number of healthy meals/snacks, how to manage stress, health-related self-care, strategies to improve family relationships: parenting strategies, social media issues associated with raising a grandchild, legal issues, and ways to address specific school issues.

Results

Results of a satisfaction survey administered to grandparents at the end of the 6-month intervention showed that 97.6% reported that the workshops were relevant to their situation as a grandparent and helped them to feel better prepared to raise a grandchild and 92.7% reported that their participation helped them to live a healthier lifestyle.

4. Associated Knowledge Areas

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

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

At WVUES, shrinking funds have resulted in a reduction in staff and a rethinking of strategic programmatic strategies.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

WVUES

Example of evaluation results from this planned program:

Evaluation of the Stress Less with Mindfulness Program

Results

1. What motivates participants to sign up for the SLM program?

The team choose workplace settings as the venue for holding SLM programs, however, encouragement from supervisors or the convenience of the workshop to job location were not the most important reasons for attending the training. The primary reason participants gave for attending the SLM workshop was feeling stressed themselves. Finding the topic interesting or fun/relaxing were the second and third most common responses

For purposes of analysis, the motivation questions were grouped into four motivational themes related to participation in SLM: personal, helping, obligation, and convenience. Table 6 shows the questions included in each theme, the number of respondents who picked each answer, and the percentage of that number to possible responses. For example the second theme "interest" is composed of three questions, each with 67 possible responses; 67 multiplied by 3 = 201. The total number who chose this motivation was 63 which is 31% of 201.

Based on this analysis, participants were most likely to come to the training because they were feeling stressed "personal" (48% of total answers) and least likely because they felt obligated because of pressure from an employer or relative or "obligation" (21%). Interest in the subject matter (31%) was the second most popular reason for attending.

1. What do participant learn from the SLM program?

Results of examination of pre- and post-answers to knowledge questions show that participants in the SLM learn intended content. They learned about what mindfulness is and is not, what triggers stress, skills related to relaxation, and reasons why one should practice mindfulness techniques. There was an increase in the percentage of correct answers on all but two questions. The subjects of those questions include the definition of thought surfing and the condition that does not contribute to excess cortisol. Participants showed the most improvement on "Which strategy is not recommended to address an upsetting thought?" Table 7 shows each of the knowledge questions in the pre-/post-test, the number/percent of correct answers on the pre-test and post-test.

1. What benefits do participants receive from the SLM program?

Benefits that were mentioned by participants in the inventories included: (1) participation in a no-cost health program at work, (2) confidence in using four coping skills: mindful breathing, relaxing, thought surfing, and taking action; (3) opportunity to practice skills right away; (4) decreased anxiety and stress; and (5) new, positive life perspectives.

In addition to the information gathered from the inventories and discussions, there were two questions about benefits on the post-survey. Almost all participants agreed that the training taught them skills that they could use right away (92.9%) and that SLM helped them understand stress reduction issues (85.7%).

Participants gained the following overall skills: (1) relaxation techniques, (2) coping skills, and (3) skills for identifying the cues of stress. Participants learned how to identify the physical, psychological, and environmental cues of stress. Mindful breathing was the most frequently mentioned skill and was also what participants did immediately after training and what they said that intended to do in the future. As participants progressed in the program, they become more willing to use additional mindful strategies (i.e. walking, eating, and moving).

1. What barriers to practicing stress reduction skills are identified by participants?

Participants said that the barriers they faced in putting the SLM techniques into practice included the following: (1) time constraints, (2) fitting classes into the work schedule, (3) difficulty practicing awareness of self, non-judgmentally, (4) overcoming misconceptions of what you can and cannot control, and (5) inability to give up some bad habits such as using smoking and eating to relieve stress.

Key Items of Evaluation

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	80%	22%	0%	0%
806	Youth Development	20%	78%	0%	0%
	Total	100%	100%	0%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	54.0	6.5	0.0	0.0
Actual Paid	45.0	5.5	0.0	0.0
Actual Volunteer	10173.0	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**
792972	385077	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
2407837	132170	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	916559	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.

WVUES

WVUES worked toward ensuring that youth will become responsible leaders of their state, country, and the world and develop life skills related to citizenship, global understanding, literacy, science and technology, healthy lifestyles, and adult leadership. Educational modalities include 4-H camps, both residential and day-camps, 4-H clubs, on-line educational programs, seminars, workshops, fact sheets, social media, new curricula and individual consultations. In addition, Extension specialists generated vital information through creative projects such as evaluation reports, curriculum development, and journal articles.

WVUES conducted programs in five areas: citizenship, healthy lifestyles, STEM, literacy, and adult leadership.

Citizenship: 4-H Workforce Prep, College 101, Collegiate 4-H, Post-Secondary Education, 4-H Global Exchange, charting, 4-H Officer School, Adulting, Global Citizenship, financial education such as Build a Budget, Don't Be a Cyberbully, Flag Program, High School Portfolio Interviews, iRESPECT, and Teen Leader Weekend.

Healthy Lifestyles: CYFAR/PROSPER Project, 4-H Health Initiative, Health Ambassadors, recreation and sport skill training, ATV Safety, Health Rocks, the Youth Family Nutrition Program, Outdoor Adventure Camp, Shorting Sports and Safety training, agriculture safety, ASAP Drug Trend Training, Germ Bug, Rock Climbing, RELAX, and Stop Spit Tobacco.
S
TEM: 4-H STEM programming includes computer science teen leader training, robotics, Incredible Wearables, Lego Simple Machines, math field days, Rockets to the Rescue, science fairs, CryptoClub and Sugo Robot Tournament. It also includes 4-H youth agriculture programs such as livestock round-ups, beef expos, Sheep 101, judging, Agriculture in the Classroom, forestry judging, garden-based learning and Conservation Camp.

Literacy: Energy Express, Reading Partners, and Agriculture Literacy

Adult Leadership: Camp counselor training, Title IX training, 4-H volunteer training, Essential Elements training, Escape the Usual Team Building Activities, Afterschool Network training, and Parent Express.

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 2017 include:

• The 4H PLANTERS program resulted in a 213% improvement in Early Learning Rating Scale scores for children in a WV school
• 100% of youth in the 4H Mentoring program demonstrated new skills and confidence in making public presentations.

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

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	103459	1560540	424908	34237

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

Patent Applications Submitted

Year:	2017
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	17	1	18

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Articles in the popular press

Year	Actual
2017	8

Output #2

Output Measure

- Academic or professional presentations

Year	Actual
2017	63

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.
14	Number professionals who improve or increase skills in STEM and transfer them to youth.

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
2017	12499

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Studies suggest the U.S. is falling behind in preparing our next generation for the 21st century workforce and there is a shortage of youth entering into the STEM fields. Currently, WV youth, grades 3-11, have proficiency scores that are low in math and science. Youth in WV need to increase their curiosity, knowledge and aspirations toward science, engineering, and technology.

What has been done
WVUES 4-H promoted and selected 4-Hers for the 2017 Camp Science Experiment which reached 10,000 statewide. The STEM specialist sponsored a STEM Track at 2017 Teen Leader Weekend. A new 4-H Code Camp was developed and scheduled for February 2018. WVSUES offered program to youth in Legos, VEX, Tetrix and 4-H Robotics, NASA and other types of Design and Engineering curricula such as astronomy, space science, computer science, health science, agriculture, earth science, physical science, and electronics. WVSUES served 4499 k-12 youth in STEM programming.

Results
More than 12,000 WV youth gained science skills while at camp. Extension professionals were gained skills in training volunteers to include more STEM activities in their counties.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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.

Not Reporting on this Outcome Measure

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
2017	3050

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
4-H Citizenship activities give youth the capacity to move beyond ones individual self-interest and to be committed to the well-being of some larger group. Citizenship programs, including mentorship programs, build assets in four broad areas: Civic Engagement, Civic Education, Service, and Personal Development.

What has been done
WVUES led youth in citizenship related activities such as leadership in local clubs, community service activities, project demonstrations, charting, and camping programs. Youth participated in state events such as Teen Leaders? Weekend or Older Members? Conference and national events such as Leadership Washington Focus, Citizenship Washington Focus, National 4-H Conference, and National 4-H Congress. Youth participated in sessions on Leadership Level Up: Community Connections and "Leadership Level Up: Group Dynamics." The WVSUES 4-H Mentoring program works with members of the community and students o serve as positive role-models and mentors to youth in the Charleston area, where violence is at an increased rate.

Results

Youth and adults gained knowledge of 4-H citizenship activities, lessons, and resources when they visited the Global Education and Citizenship Opportunities for WV Youth table at the WVU Day at the Legislature. Youth gained communication skills while making presentations to legislators and networking skills in the Community Connection workshop. They gained skills related to conducting meetings in the Group Dynamics workshop. WVSUES mentees demonstrated an increase in life skills, self-direction, creativity and innovation, contribution, critical thinking, communication, collaboration and cross cultural skills. They applied life skills through participation in a variety of projects and activities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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
2017	3700

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
As youth grow, they often have questions about their place in the world. By helping youth connect the dots between local and global issues youth gain a greater sense of place in their own lives. Through Global Citizenship programs youth engage in learning opportunities that give them a heightened sense of responsibility and capacity to connect as active members of their communities, nation, and world.

What has been done
Youth participate in internationally themed camps, club events, and community service projects. 4-H programs offer Global Citizenship curriculum, international camper cultural exchanges, and global learning adventures. Five new Global Education Skill-a-thons were peer reviewed and 2 passed national review. Global Citizenship initiatives are coordinated with camp management initiatives. The total number campers experiencing daily cultural assemblies was over 700. Fee for service programming was established. The 2017 4-H China Learning Adventures program was

conducted. A CEOS Adult Educational Topic on Cameroon was disseminated to over 3000 members

Results
Youth learned to think globally while acting locally. Youth and adults at Alpha I and Alpha II were exposed to a new culture without ever leaving the country through WVU 4-H Global Exchange. A WVUES specialist was awarded the Certificate of Meritorious Service from Vietnam?s Minister of Education and Training in 2017.

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

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1250

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
According to the Center for Disease Control, for more than five years, West Virginia has been in the top five states for obesity which is caused by unhealthy eating habits and lack of physical exercise.

What has been done
WVUES has worked with local schools to create school gardens. Our Garden-Based Learning (GBL) program teach youth about healthy foods and ways to grow the foods through school and home gardens. Boards of Education purchase the garden produce through the Farm to School Program. Our training teaches students to plant a productive garden, harvest a safe product, and identify healthy from diseased produce.

Results

Youth gain knowledge about nutritious foods and STEM related information. They also gain gardening skills needed to grow foods their own foods at home. Since 2013, over 1200 students from 5 elementary schools have sold over $3000 worth of produce. Students at GW Elementary improved their math and science West Test scores (13% and 19% respectively) over the previous year?s scores (no GBL).

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #6

1. Outcome Measures

Number of youth who increase or improve their literacy skills.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	2544

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
WVUES is committed to promote school success of low-income children by providing summer learning experiences and nutrition, involving parents and the community, developing strong state and local collaborations, and engaging AmeriCorps members in community service.

What has been done
The Energy Express summer literacy program provided six weeks of "print rich" educational programs at 82 sites in 38 WV counties. Last summer, 2,544 children reached 50% attendance with an additional 585 served. Nutritional meals (154,480) were served to the children and 30,445 take-home books were distributed. Five hundred and two college students and community members served as AmeriCorps members.

Results
Significant increases in letter-word identification, reading fluency, passage comprehension and broad reading. Sixty five percent of children either maintained (58.7%) or increased (6.7%), and the average child gained 2.2 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 youth who increase knowledge and skills about risky behavior avoidance.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	22

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Studies have indicated that there are a number of positive impacts for both the incarcerated parent and their child if the child and parent maintain positive communications and interactions for the duration of the parent's incarceration. Some of these benefits include fewer behavior disruptions from the child, and lower recidivism rates of the parent (La Vigne, 2008).

What has been done
A 4-H Living Interactive Family Education Program (4-H LIFE) was implemented for selected inmates at the Federal Correctional Complex Hazelton in collaboration with National 4-H Council, Office of Juvenile Justice and Delinquency Prevention, and the Federal Bureau of Prisons. The family intervention included a variety of events for youth, caregivers, and 4-H mentors. Weekly parenting classes were held at both the men's and women's prisons at Federal Correctional Complex Hazelton located in Hazelton, WV.

Results
None of the families who participated in the 4-H LIFE program knew about 4-H prior to this program, however 4 youth from the D.C. / Baltimore Metro area attended WVi4-H camps this past summer. The parents and guardians, inmates and care givers, felt comfortable allowing their children to travel over 260 miles from DC to participate in the camping program. Participating youth and their caregivers felt comfortable and safe, and were excited to have these opportunities.

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
2017	36

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The basis for the 4-H Exchange program is that travelers gather knowledge as they "understand, learn, discover, explore, and make sense of other places" (Casella 1997, p. 52). Travelers also provide a service to the citizens of the countries they visit as they exchange cultural information and build relationships. Other ways youth learn is to provide service to community members.

What has been done
A delegation of youth and adults from China have visited the WVU 4-H camping program for five years. This year, a delegation of 9 WV youth went to China to meet youth and adults from a high school as well visit historic and cultural sites. In a WVUSES program youth become mentors at their elementary school, and other youth have served as helpers at the Senior Citizens home.

Results
Youth in West Virginia, many of whom have limited experience with other cultures and societies, gained experience interacting with peers in China. They gained understanding of another culture, while sharing qualities of their own culture. The students in the WVSUES service learning program at the elementary school planned, organized and implanted an agriculture day (on their own). It included education games, relays, petting zoo (farm animals), tea cup garden workshop, and a butter making activity. The youth who served at the senior center built, filled, and planted accessible garden beds for the Senior Citizen Center.

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.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	660

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In the last decade the incidents of personal bankruptcy rose by 69%. More than half of Americans report living paycheck-to-paycheck. Youth need to think about their future at an early age so that they will build financial security.

What has been done
The Reality Store program is a financial simulation for youth in middle school and high school. Wayne county Extension has offered the Reality Store program for 7 years after updating the materials to reflect WV taxes, costs, and prices. The program was delivered to five out of six middle schools middle schools in Wayne County in 2017. Combined these six reality store programs reached 566 youth and involved 94 adults

Results
Youth envision their financial future and become aware of their need for basic skills in financial planning, goal setting, decision-making, and career planning,

4. Associated Knowledge Areas

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

806 Youth Development

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
2017	2646

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
ATV safety programs give youth the knowledge to operate an All-Terrain Vehicle (ATV) safely. The primary goal of these programs is to promote the safe and responsible use of ATV's and reduce accidents and injuries resulting from improper ATV operation by the rider.

What has been done
A Mingo County WVUES Agent and ATV Safety Instructors taught ATV safety instruction to youth and adults using the American Safety Institute (ASI) On-line E-Course, Tread-Sylvania On-line Game, Mingo County ATV Safety Poster Contest, and the ASI RiderCourse. In 2017, 2011 youth and 88 adults received 2 or more hours of educational youth ATV Safety programming and 547 youth participated in a ATV Safety poster contest.

Results
Youth and adults were certified as safe operators of ATV vehicles. 2099 youth and adults youth completed the American Safety Institute (ASI) on-line E-Course; 752 youth completed the Tread-Sylvania On-line game; 6 youth completed the ASI/ATV RiderCourse; 524 youth certified through the Governors Highway Safety Council DMV Safety Course (Mandated by Law). According to a report of the Governors Highway Safety Council there has been a decrease in deaths on ATV?s in WV from October 2006 (54 deaths) compared to October 2017 (20 deaths) and only one of those under the age of 18. Our ATV Safety Program has contributed to those statistics and has been published on both local and National levels through Associated Press.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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.

Not Reporting on this Outcome Measure

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
2017	60

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
If youth have healthy and nurturing outlets for self-expression, they will experience higher self-worth, have higher achievement in school, and be less likely to engage in risky behavior and criminal acts in the community,

What has been done
WVSUES provides a 5-day long camp at the Roosevelt Neighborhood Center which was attended by 34+ middle school youth. Activities included music production, dance, song writing, recording, and visual arts. These camps were staffed by local artists who provided step-by-step instruction on the youth's chosen track (music production, dance, recording, etc.). WVSU also conducts 4-H Film Camp, 4-H Dance Camp and 4-H Culinary Camp. At the culmination of the camps, youth demonstrated their skills.

Results
At the culmination of the camp and the completion of every project, 100% of youth have demonstrated their newly obtained skills by providing a presentation to the parents, family

members, community members, the club members and WVSU staff. Each youth demonstrated increased knowledge and mastery. Even the youth who began the camp/club with a fear of public speaking/performing, were able to publicly display their new skills.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	535

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Early positive engagement with science is important for early learners because it is how they learn about the world around them and it provides exposure to a robust vocabulary. Science activities start children down a path of positive, engaged STEM learning. Though preschool classrooms are required to have classroom science centers and plants, they are often underutilized.

What has been done
In preschool STEM activities through the PLANTERS program at Buffalo, Hometown, and Poca Elementary schools we ask students questions as often as possible instead of providing them with answers. Students have the opportunity to make observations about the natural world and participate in experiments in which they first develop a prediction and then test it. When students ask questions we seek the answers with them either through experimentation or research in books or by utilizing online resources. We also follow the students? interests. In one case, a winter lesson on penguins led to a discussion about fish which led to a unit on the ocean in January.

Results

Teachers reported an increase in STEM Inquiries outcomes from all three schools, which were the highest in the state. The teacher at Hometown, writes of the 2016-2017 school year: ?By May of this school year alone, every student in my class improved at least one to two progressions on the Early Learning Rating Scale, including a 213.33% overall growth from September 2016. This means in a class of 14 students, six to seven students were at Mastery level or above in all three sections of Scientific Inquiry.? One of our teachers told us that until engaging with PLANTERS programming she was afraid of science.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #14

1. Outcome Measures

Number professionals who improve or increase skills in STEM and transfer them to youth.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	136

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Studies suggest the U.S. is falling behind in preparing our next generation for the 21st century workforce and there is a shortage of youth entering into the STEM fields. Currently, WV youth, grades 3-11, have proficiency scores that are low in math and science. In addition, first time at-risk freshman enrolling in WV STEM degree programs do not graduate at the rate of their counterparts in other states. Female students are even less likely to matriculate into a STEM degree programs. High school girls in WV reported only a 13.3% interest in pursuing STEM as a major or career choice even though proficiency scores in secondary schools are comparable to their male counterpart. (WVDE, 2017).

What has been done
WVSU?s, Center for the Advancement of Science, Technology, Engineering and Mathematics (CASTEM), SEMAA program harnesses the collective resources of NASA to bridge the education gap for historically underserved and underrepresented K-12 youth in STEM. The program provides: 1. Hands- on, Inquiry Based K-12 STEM Curriculum Enhancement; 2. Aerospace

Education Laboratory (AEL); 3. Family Involvement using NASA Explorer Schools Family Involvement Curricula; 4. Outreach activities; and 5. Professional development activities to enhance formal and informal teacher education. 5,154 individuals were trained in STEM skills including youth participants, families, and educators.

Results

136 educators from public schools, private schools, community programs, home school co-ops, and higher education community initiatives in nine counties were trained to train youth in their classrooms and other community settings. Recipients of train-the trainer services included students from 47schools and 33 programs who were supported by 29 partners in 68 facilities. Youth participants increased interest in STEM careers; educators increased the number of STEM activities they offered to their students; families were made aware of STEM activities and educational resource; and communities improved their capacity to incorporate best practices and resources for STEM education into community activities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

At WVUES, shrinking funds at both the state and county level have caused reduction in staff and programmatic priorities have narrowed.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

WVUES

Example of evaluation results from this planned program:

Evaluation for the CYFAR/PROSPER Program

Goal 1: Youth will improve decision making skills, self-efficacy, and problem solving skills.

In the Strengthening Families Program

There were no real differences from the pre- to the post-tests means on items from the core competency assessments related to decision-making, although the mean score was up slightly on the post-test. The scale for this construct want from negative to positive (never = 0; always = 3). The pre-mean score (2.09) was slightly lower than the post-mean score (2.16). The Workforce Preparation Assessment includes the Problem-Solving and Decision-Making sub-scales. The scale runs from positive to negative (completely agree = 0;

completely disagree = 3), therefore we would expect the post scores to be lower. There was no real differences between the pre- and post-scores. The pre-scores on this instrument were slightly lower (1.47) than the post-scores (1.26) showing a slight increase in self-perceived problem solving skills.

In the School-based Life Skills Program

There were no real differences from the pre- to the post-tests means on items from the core competency assessments related to decision-making, although the mean score was down slightly. The scale for this construct went from negative to positive (never = 0; always = 3). The pre-mean score (1.90) was slightly lower than the post-mean score (1.77). In addition, the Workforce Preparation Assessment includes the Problem-Solving and Decision-Making sub-scales. This scale runs from positive to negative (completely agree = 0; completely disagree = 3), therefore we would expect the post scores to be lower. There was no real differences between the pre- and post-scores. The pre-scores on this instrument were slightly lower (1.04) than the post-scores (1.15) showing a slight decrease in problem perceived solving skills.

Goal 2: Youth will be more engaged in school and improve attendance and grades.

We do not plan to measure school attendance of students. Because PROPER is an evidence-based delivery system, which has been researched under long-term research conditions, we know that attendance and grades do improve when students engaged in the full PROSPER model.

Goal 3:

Youth/Parent relationships improve through better communication and nurturing.

Objective A: Parents will increase competency in flexible parenting attitudes and practices as measured through the CYFAR Parenting Assessment Tool and the Adult Participation Level Assessment.

The SFP 10-14 questionnaire was administered to youth and parents at the beginning and end of the program. In 2017, 23 youth and 25 parents completed both assessments. Foryouth, the questions that showed the most improvement were about attitudes toward rule setting/discipline and feeling loved, including: (1) My parents set rules for me to follow; (2) My parents treat me with respect when they discipline me; (3) My parents do and say things to let me know I am loved; and (4) I feel truly loved and respected by my parents. For parents, the questions that showed the most improvement were about knowing how to do rule setting/discipline, communication, and decision making, including: (1) I explain the consequences of not following my rules concerning alcohol, tobacco, and drug use to my youth; (2) I know who my youth is with when s/he is away from home; (3) When my youth misbehaves, I enforce consequences without yelling, blaming, or criticizing; (4) "I show and tell my youth that I love and respect them; (5) Before reacting, I stop and think about my youth's perspective and how my youth might be feeling; (6) I discuss our family's values with my youth; and (7) I find ways to include my youth in family decisions about fun and work activities in a manner appropriate for his/her age.

Objective B: Youths will demonstrate increased social conscience, personal values and caring for others as measured through the Core Competencies Assessment Tool and Youth Participation Level Assessment.

In the Strengthening Families Program

Character: There was no real difference between the pre- and post-scores on the character assessment. Participant perception of character decreased from pre-survey (2.78) to post-

survey (2.66).
Caring: The same was true for scores on the caring assessment. Participants' sense of empathy and sympathy for others decreased slightly. The mean on the pre-survey was 2.13 and the mean on the post survey was 1.88.

In the School-based Life Skills Program
Character: There was no real difference between the pre- and post-scores on the character assessment. Participant perception of character decreased from pre-survey (2.31) to post-survey (2.12).
Caring: The same was true for scores on the caring assessment. Participants' sense of empathy and sympathy for others decreased slightly. The mean on the pre-survey was 1.72 and the mean on the post survey was 1.66.

Goal 4:
Community teams will increase their capacity to implement and sustain evidence-based programs focused on youth and families.
The PROSPER Project has incorporated assessments of community involvement. Each year, the evaluation team at Iowa State University collects data from members of the community teams. That data is summarized and returned to the Extension staff who are leading the teams. The information is shared with team members in an effort to improve team functioning. Summaries include the following: (1) Survey Participation Rates; Motivations and Involvement of Team Members, including: primary reason for team involvement, length and hours of involvement on the team, perceived personal benefits, and perceived balance of personal costs and benefits; (2) Internal Relationships, including team membership, team meetings, team operations; (3) Interpersonal Team Dynamics, including: team leadership skills; (4) External Relationships including school partnership; Cooperative Extension System, and Community Agency Support; (5) Promoting the PROSPER Effort including general promotion of PROSPER across the community and promotion of PROSPER to specific community groups; (6) Team Task Accomplishments and Challenges Encountered by the Team; and (7) Sustainability.
In addition, the PROSPER Project incorporates fidelity observations of programming into their training sessions. These observations are conducted twice on the 2nd or 3rd week and again on the 5th or 6th week. Observers include individuals trained in the SFP 10-14 curriculum. The evaluation team at Iowa State University produces summary information to assure that the curriculum is being implemented with fidelity. Site coordinators also discuss the observations with the individual trainers. The summary reports include the following information: adherence to curriculum, session completion, activity completion, group participation, leader session management, leader interaction, and general room logistics.

Goal 5:
Youths will decrease risky behaviors including reduction in substance use.
This CYFAR Project has elected to implement the PROSPER Program which is an evidenced-based program which has been proven to be effective if implemented with fidelity. We have made every effort to implement the program faithfully, under guidance of the staff of the PROSPER Program at Iowa State University. Under appropriate research protocols, the PROSPER Model Delivery System has been shown to reduce engagement in risky behaviors and substance use over time.

Key Items of Evaluation

VI. National Outcomes and Indicators

1. NIFA Selected Outcomes and Indicators

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