2018 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 2018 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 (WVU-ES); and West Virginia State University (WVSU) Gus R. Douglass Land Grant Institute (WVSU-GRDI),which includes both the Agricultural and Environmental Research Station (WVSU-AERS) and the Extension Service (WVSU-ES. This report reflects the joint plan of work for the period 2017 - 2021 and includes ten goal areas. The previous reporting period (2017) was the third year the three entities submitted a joint annual report of accomplishments. This approach will continue until the 2021 reporting year (as approved by NIFA) at which time WVU-AFES and WVUES will submit a joint report and WVSU-GRDI will submit a separate report.

The WVU-AFES supports approximately 46 FTE research faculty positions distributed across the 104 faculty positions. The Station also supports approximately 20 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-director's 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 include 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 427 includes county agents (102), state specialists (54), administrators (12) and staff (259) and is augmented by an additional 659 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 WVUES through our educational programs. Some of the most recognized programs are 4-H clubs and camps, afterschool programming, Dining with Diabetes, Extension Master Gardeners, firefighter training, Community Educational Outreach Service (CEOS), the Family Nutrition Program, Healthy Children Program, Energy Express, STEM initiatives, soil testing, pesticide applicator recertification training, beef quality assurance, farm management, forest stewardship, labor education, workplace safety and health, 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 expands the outreach efforts of WVU by implementing relevant programs linked to NIFA's priority areas. Newly reorganized from 2017-2018, WVUES now works within three administrative units.

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, WVUES 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 and environmental quality; and production/sustainable forestry. In 2018, WVUES agriculture and natural resource programs tallied 64,974 direct contacts.

4-H Youth Development: Positive youth development is achieved by weaving the essential elements of youth development into 4-H programs that promote independence, generosity, and mastery of new skills. The four primary educational areas of emphasis are healthy lifestyles; science, technology, engineering, and math (STEM); literacy and citizenship. In 2018, 4-H youth development programs at WVUES tallied 342,346 direct contacts.

Family and Community Development: A year ago, two WVUES units, Families and Health and Community Economic and Workforce Development, combined into one unit. Although individual disciplinary areas and activities remain, an effort is being made to have a more holistic approach to meeting individual and group needs at the community level. Extension faculty and paraprofessionals help families thrive by providing research-based knowledge, skills, and resources for healthier lifestyle choices. Family programs include resource management, relationship education, parenting, and early childhood development. Nutrition and health education programs teach individuals and families ways to improve their diets and to engage in regular physical activity. Within communities, faculty members work with adults to build leadership and interpersonal skills and promote collaborative community projects. In addition to community development programs, the Fire Institute, the Institute for Labor Studies and Research, and Safety, and Health Extension are also housed within the Family and Community Development unit. These programs build the leadership capacities of local businesses, governments, and unions to 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 2018, WVUES Family and Community Development programs tallied 212,835 direct contacts.

WVUES and its educational programs tallied 620,155 direct contacts in 2018, including both youths and adults. Please note that there has been a reduction of about 40 positions at WVUES over the past two years due to resignations and retirements. Not all of these positions have been filled due to budget constraints or programming needs. This reduction accounts for the lower number of direct contacts as compared to last year.

WVSU's Gus R. Douglass Land Grant Institute currently supports 38 FTE positions across research and extension. Research and extension programming efforts continue to successfully expand and integrate. As the University's infrastructure and capacity expand along with its programing funding, its existing research and extension endeavors are further strengthened and new ones developed to better serve the needs of stakeholders.

The alignment of WVSU research and extension programs within NIFA's priority areas, combined with the mutual coordination of this plan of work with WVU, has proven effective in terms of designing research and extension programing which is highly responsive to the state and national needs. It has also provided a more robust platform for building new integrated and collaborative efforts. Moreover, as a result of the University's further development of its Food and Agriculture research, academic programs such as its Master of Science in Biotechnology are also fortified. New faculty along with split appointments of graduate research faculty, within GRDI, have significantly increased participation of undergraduate and graduate students in agricultural and environmental research.

WVSU will continue to undergo organizational restructuring in response of changes in University administration, programming needs, and federal and state funding derived from appropriations and other sources. The mission of the WVSU-GRDI however remains unchanged and 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 important agricultural crops such as 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, develop novel techniques for soil remediation on reclaimed mine lands; and developing high-fiber and biomass crops which are suitable for mined land surfaces and other specific soils and climate conditions in West Virginia.

West Virginia University and West Virginia State University entered into a voluntary agreement in 1997 to create the West Virginia Association of Land Grant Institutions; a collaboration of the state's two land grant institutions committed to providing education that would help the citizens of West Virginia improve their

lives and communities. In 2005, triggered by an USDA CSREES mandate, the two Universities developed a Comprehensive Plan for the State which superseded the former agreement. This plan assures appropriate coordination between the two institutions to avoid duplication of efforts, as it relates to their research and extension programming, and thus an efficient investment of human and financial resources within the State.

The combined extension efforts of both Universities are addressing the most common problems facing families and communities in West Virginia which includes, a decreasing and aging population; a largely rural population with limited access to health and nutritional information and a consequent tendency towards poorly balanced, calorie dense diets; and an extreme need for environmentally friendly and sustainable economic development which will provide jobs to replace the many which have been lost in coal and timber harvesting industries.

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

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

Progress for 2018 in each of these goal areas is summarized in the Planned Programs section.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	160.0	25.0	44.0	12.5
Actual	130.0	21.8	46.0	18.5

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
- Expert Peer Review

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

2. Brief Explanation

Internal merit review

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

1. Each Extension faculty member developed an individual plan of work. These plans are approved by the unit directors (agriculture and natural resources, 4-H youth development, family and community development). Faculty based their plans on objectives designed to meet the goals of WVU's priority 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 WVUES 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. The Dean of Extension, Steve Bonanno, was reviewed in 2018. Extension administrators are reviewed by their supervisors annually.
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 as they 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 2018:

From the National Association of County Agricultural Agents

- Distinguished Service Award: Brian Sparks
- Achievement Award: J. J. Barrett
- National Finalist Applied Research Posters: Control f corn Earworm Larvae in Sweet Corn - J. J. Barret, John David, and Daniel Frank
- National Horticulture Presentation: Personal Size Watermelon Variety Trial - J. J. Barrett and John David
- Personal Column: Regional Finalist - The Backyard Gardener - J. J. Barrett

- Video Recordings: Joshua Peplowski
- Individual Newsletter: Emily Wells Morrow

From the National Association of Extension of 4-H Agents

- National Communication Award - Educational Package - Team
- National Communication Award - Educational Piece - Team
- National Communication Award - Media Presentation - Autumn Starcher and Sherry Swint
- National Communication Award - Periodical Publication - Team
- National Specialty Award - Excellence in Camping - Team
- National Award - Excellence in Global Citizenship Programming -- Team
- Regional Award - Excellence in Science, Technology, Engineering and Mathematics -- Team
- Susan Barkman Research and Evaluation Scholarship - Tina Cowger

From the National Extension Association of Family and Consumer Sciences

- First Place Eastern Region Award Early Childhood Childcare Training - Apprenticeship for Child Development Specialist - Brenda Porter and Kerri Wade

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. Prior to submission 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 critically review 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 if 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:

Evans-Allen projects undergo a rigorous peer review by an external panel. The panel's reviewers are selected nationally and include prominent scientists in the relevant field of study. Reviewers provide valuable feedback on the projects and suggestions for improvement which must be incorporated prior to program submission to NIFA. The research and associate directors conduct a final review of the project proposals before submitted 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. 1890 Extension programs are also reviewed by extension director before they become active. 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 tried 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. 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.

Our WVUES 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 2018.

<u>WVU-AFES</u>
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 most 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 and inclusive 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 programs. 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. Other stakeholders providing valuable feedback to research and extension programming include institutional governing bodies (WVSURDC Board of Directors and WVSU Board of Governors); as well as WVSU alumni. Furthermore, WVSU Extension professionals work very closely with local stakeholders to ensure impactful relevant program is being delivered to the communities of WV. In fact some programs, supported through partnerships with local governments (city and county) receive direct input from these stakeholders.

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

WVUES
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.

The administration of the WVU Extension Service conducted four "Listening Session" with faculty and staff in 2018. 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.

In 2018, WVUES faculty and staff participated in a University-wide culture survey. The data was analyzed separately for each academic college or unit at the University. A summary of WVUES data was presented at the annual meeting at Jackson's Mill Conference Center in September 2018.

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 helps bridge the gap with other WVU colleges and departments. She also works 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 contemporaneous 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 sincerely 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 (i.e. the land-grant mission). Based on the initial strategies identified in 2010 to improve the Service and Outreach agenda, we have had excellent 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
- Federal, state and local government and non-government agency representatives

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

WVUES
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 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 of the coordinators of WVUES 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 the University is effectively addressing the needs of the state through relevant research and extension programs. Through formally established as well as informal partnerships with State and Local agencies (WV Department of Agriculture, WV Department of Environmental Protection, etc.) input is collected and infused into research and extension programing. 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. 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

WVUES 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. A Substance Misuse Summit was held last fall at Jackson's Mill Conference Center. All WVUES faculty and staff were encouraged to attend. A detailed summary of the event was produced which contains action steps to address the issue in WV.
3. 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. A team of 4-H faculty was selected by Google to produce new curriculum in coding. This year the traveled to NYC to advice Google on packaging he product for distribution.
4. 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 create 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.
5. We are placing an emphasis on our health living programs in both our family and health programs and 4-H programs. WVUES Specialist, Emily Murphy, obtained a multi-million dollar grant from the CDC to promote healthy eating and physical activity in Clay County, WV.
6. We hired an Entrepreneurial and Coalition-Building specialist to create entrepreneurial opportunities for WV youth

In the Action Plans and To Set Priorities

Each of the three WVUES units: Agriculture and Natural Resources, 4-H and Youth Development, and Family and Community Development is 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 highly prioritizes ongoing work with stakeholders and partnerships within the State and value their continued input to improve and make more relevant these relationships in the future. This is important to 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 was moved in to 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 improve morale of faculty, staff and students, enhance our image and afford enhanced opportunities for our service, outreach and engagement agendas. We are continuing to plan 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 in these priority areas (and other emergent areas). 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. There are substantial opportunities to expand tourism in West Virginia. To accomplish this we must work closely 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. WVU has partnered with WVSU to support non-parent relatives who are providing care for children.
3. Local foods systems must help drive local to regional economic development, but producers need education to manage risk, increase productivity, identify new markets, and develop value-added products.
4. 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.
5. West Virginia youth and adults need high-quality life-long learning opportunities that increase their exposure to cultural and ethnic diversity and increase awareness of global issues, and master life skills.
6. Water resource science-based findings need to be disseminated to the public and youth and land managers to mitigate extreme events (floods) and prepare agriculture for a changing climatic future.

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	1310563	3408737	1559478
Actual Matching	5589966	597989	6067220	1005769
Actual All Other	0	1508135	5692716	2089329
Total Actual Expended	9847938	3416687	15168673	4654576

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	0	280889	3053250	489276

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%	10%	10%	0%
102	Soil, Plant, Water, Nutrient Relationships	10%	10%	10%	10%
111	Conservation and Efficient Use of Water	0%	10%	0%	0%
201	Plant Genome, Genetics, and Genetic Mechanisms	0%	0%	0%	30%
202	Plant Genetic Resources	0%	0%	5%	15%
205	Plant Management Systems	10%	10%	10%	10%
211	Insects, Mites, and Other Arthropods Affecting Plants	0%	5%	10%	15%
212	Pathogens and Nematodes Affecting Plants	0%	0%	10%	15%
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%	5%
308	Improved Animal Products (Before Harvest)	10%	0%	0%	0%
313	Internal Parasites in Animals	0%	0%	5%	0%
405	Drainage and Irrigation Systems and Facilities	10%	10%	0%	0%
503	Quality Maintenance in Storing and Marketing Food Products	10%	20%	0%	0%
604	Marketing and Distribution Practices	10%	10%	0%	0%
607	Consumer Economics	0%	5%	0%	0%
806	Youth Development	5%	5%	0%	0%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	17.0	4.0	8.0	6.5
Actual Paid	14.0	3.0	7.0	10.0
Actual Volunteer	1300.0	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	180353	703195	948028
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
346130	82168	1174216	537449
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	277535	1230912	1439261

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 to both food security and alleviation of world hunger.

WVU-AFES
The over-arching program one goal is to mitigate obstacles to local and global food security and hunger brought about by impediments in agricultural production. Individual research tasks in this program range from studying specific parasites in farm animals to various pests and diseases impacting crop yield and health. Research progress includes improving long-term sustainability of small farms producing organic vegetables in the Northeast and developing spatially-targeted pest management systems using geospatial and aerospace technologies for efficient detection of pests and precise delivery of control measures. Other progress includes developing and integrating management for control of plant-parasitic nematodes, and determining the ecological interactions between nematode populations, nematode communities, ecosystems and soil health. Researchers are innovating protocols to properly sample poultry feed during manufacture for nutrient, feed additive, and mycotoxin and salmonella content. Diseases and parasites also inflict many farm animals, resulting in significant costs to producers. For example, mastitis is an endemic and costly disease of dairy cattle that can occur as an acute or chronic condition. Researchers are using sheep injected with lipopolysaccharide after mating to mimic the effect of mastitis on pregnancy loss in dairy cattle. Researchers have discovered that Texel sheep have an enhanced resistance to helminth parasitism, thus allowing potential for genetic selection within the Texel breed to improve parasite resistance in the eastern US. This program continues to embrace all aspects of scientific research within the sphere of what is one of the most important components of society: global food security and elimination of hunger.

Research program highlights for 2018 include:

- Publication of nematicide recommendations in Commercial Tree Fruit production guides.
- Outreach: the WVU Organic Research Farm Field Day (Aug. 2018) was attended by approximately 120 individuals, and included workshops discussing parasitic nematodes, and highlights of current and past research in vegetable production.
- Identified and quantified the ergot alkaloid ergovaline in a previously unstudied Elymus species that harbors a symbiotic fungus from the genus Epichloe.
- Development of a sheep center focused on Texel sheep. Also, found that Texel sired lambs brought on average $0.30/lb more than Suffolk sired lambs.
- Development of a sports nutrition bar by repurposing sarcoplasmic protein from fish.

WVUES

In 2018, WVUES implemented conferences and educational series such as the Small Farms Conference, the Women in Agriculture Conference, Appalachian Grazing Conference, Agriculture Educational Dinner Meetings, and Farm Visits. Programs are offered in four major areas:

Livestock programs include Beef Quality Assurance, Cattle Marketing, Forage Testing and ID, Grazing Management, Pasture Walks, Producer Consultations, the Artificial Insemination Program, and Bull Testing.

Horticulture programs include: Master Gardeners, Fruit Pruning Trainings and Demonstrations, IPM, Tree Fruits, Small Trees, Soil Testing, High Tunnels, Vegetable Gardening for Homeowners, and Beekeeping.
Farm Management programs include: WV Market Ready Program, Annie's Project, Farmers Market Training, Farmers Market Voucher Certification Training, Pop-Up Farmers Markets, Ag-Beats, and Backyard Poultry.

Youth Agriculture programs include: Agriculture in the Classroom, Animal Judging, Beef Expos, Skillathons, and Land Judging

WVUES also offers many individually designed 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 continued development of alternative agricultural endeavors to assist farmers increasing their revenues. Our work focused on utilization of best practices in the field of cultivation, selection, and maintenance, post-harvest handling and cold storage. We worked to increase knowledge levels in alternative enterprises in order to expand profits for small farm operators. In 2018 WVSU Extension worked with commercial growers of greenhouse and nursery management, and fruit and vegetable production. Additionally, our work focused on development of green spaces in urban centers and municipalities in WV.

This is one of the main planned programs on which WVSU research concentrates a great portion of its efforts. Salient research areas include aquaculture genomics, plant genetic mapping & genomics; breeding of selected vegetables and fruits; trialing of vegetables including developing value-added pumpkin and pepper varieties, and soil and water studies affecting agriculture. Salient research programs addressing this planned area include: (a) Development of pest resistant fresh market tomato varieties with superior organoleptic traits for protected culture production. Molecular markers for pest resistant traits are being verified prior to transfer these traits into advanced breeding lines and vintage varieties. New methods to assess phenotypic traits are being incorporated into the breeding program to develop new

open pollinated lines and hybrids are being evaluated with growers. Insect resistance mediated by acylsugars or sesquiterpenes are also being evaluated for potential deployment to verify any interference with the use of beneficial insects in production. (b) WVSU aquaculture researchers conduct 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. (c) Genomic driven improvement of fruit quality in watermelon continues to be an important research focus. WVSU researchers are using biotechnology techniques to produce watermelon plants which do not normally grow well in acidic soils of West Virginia. They are transferring genes from other watermelon plants which can grow well in acidic soils and are also tolerant to Fusarium Wilt and drought. (d) Scientists are also concentrating efforts on improving organoleptic and nutraceutical properties of high commercial value crops such as peppers and cucurbits.

On the Extension side, agents in agriculture and natural resources continue their efforts on implementing educational programs designed to improve growers' profitability. Some of these programming include the introduction of post-harvest technology and management techniques, distribution and marketing. Finally, through other programs such as urban agriculture and junior master garden, WVSU is able to educate urban and youth clientele as it relates to food and agricultural areas.

Highlights for 2018 include:

- High tunnel demonstration units contributed to a moderately increase in the number of agricultural producers diversifying to include hydroponic and aquaponics systems in Southern West Virginia.
- Three advanced breeding lines of tomatoes were evaluated, exhibiting better early production traits than other lines.
- Cutin and wax related genes were identified and evaluated in habanero peppers which were responsible for enhancing storage life and contributed to drought resistance.
- Mutant studies on gene candidates from fly GWAS, confirmed the beneficial effects of nutraceutical enriched pepper lines on the potential to reduce cancers, obesity, and type II diabetes.
- Through evaluation of GWAS on 185 diverse accessions of watermelons, scientists identified genes and SNPs which affected variation in citrulline content.
- Aquaculture scientists demonstrated that temperature and diet are strongly associated growth performance characteristics and mitochondrial function in rainbow trout.

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

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	31928	370226	17863	27702

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	21	21

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Events including conferences, demonstration, field days, symposia, workshops and trainings

Year	Actual
2018	933

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	Number of women trained in farm management and agribusiness skills
15	Number of youth and small producers who gained skill in aquaponics and irrigation technology
16	Number of producers who use new technology to increase profitability and viability
17	Poultry meat production and consumption

18	Forest pests, pathogens and economics
19	Breeding animal resistance to pathogens and parasites
20	Organic vegetable production, soils, yield, economics

Outcome #1

1. Outcome Measures

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

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	119

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Eighty percent of WV farms and producer enterprises are under 100 acres in size, are focused in urban areas, and generate income between $10,000 and $25,000. Profit margins are narrow. Risk management solutions based on improved efficiencies and product safety enhance revenues and increase the quality and quantity of locally raised foodstuffs in the market place.

What has been done
WVSUES delivers technical assistance and training to small acreage producers targeting disadvantaged, underrepresented and isolated populations in urban and rural areas where fresh food products are in limited supply due to the economics of supply and demand. As these regions are abandoned by the larger economic systems, our training and technical, support provides a safety net for communities with limited resources to produce their own foods or acquire them locally at a competitive value. WVSUES also provides cold storage facilities to producers and youth to maintain access to safe food sources.

Results
90% of respondents indicated that they would integrate skills presented into their production operations with an intent on improving quality and quantity of product and enhance food safety.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
205	Plant Management Systems
216	Integrated Pest Management Systems
503	Quality Maintenance in Storing and Marketing Food Products
607	Consumer Economics

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
2018	400

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
With the cost price squeeze that livestock producers are under it is essential that they adopt management practices that decrease costs or increase net returns. One way they can do this is through improved practices such as forage testing. In today's volatile feed market it is essential that each agricultural producer understand the basic principles of forage testing and supplemental feeding on pasture for backgrounded cattle or on hay for any animal age group.

What has been done
The goal of this ongoing forage sampling and feed management program is to teach producers how to optimize supplemental feeding by using forage testing to tailor feed supplements to the nutritional needs and economic response of livestock. They learn how to minimize feed purchases yet maintain animal health and performance. In years with poor hay production weather we encourage all county faculty to promote forage testing.

Results
The potential economic impact on each farm developing a forage testing program is great. Based on findings from the Low-cost Cow-calf project producers saved $10 in feed cost for each $1

invested in forage testing when that information is used in formulating a feeding program for their livestock. When legumes are added to backgrounding pasture, calves on average have an average daily gain of 0.5 lbs. greater than calves on a similar grass pasture without legumes. This adds 23 lbs. to the sale weight of the calves in a 46 day backgrounding period valued at $23-$35/head. Proper supplementation on pasture (high energy on high protein pasture) can add another 0.25 lbs./day as opposes to feeding a moderate protein supplement on that pasture possibly at a lower feed cost.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
205	Plant Management Systems
212	Pathogens and Nematodes Affecting Plants
302	Nutrient Utilization in Animals

Outcome #3

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	610

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Plants in commodity growers' field, home owners' landscapes and lawns were infected with disease causing pathogens and plant health was compromised.

What has been done
WVUES specialists diagnosed the problem through laboratory investigations. Results and recommendations for remedial measures were sent to the clienteles. Many clients followed recommendations and some accepted it as a preventative measure in their next crop.

Results

Crops were saved from ruin, especially fruits and vegetables. Landscape trees and ornamental plants retained aesthetic values. Homeowners saved money that would otherwise be spent for replacing those trees.

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	500

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In WV farmers need to feed hay to livestock in the winter. When well-managed, hay feeding returns plant nutrients to fields where they can be used to grow forage. When fed in permanent feeding areas, plant nutrients need to be harvested in growing crops to prevent them from entering the surface water and becoming pollutants. Winter feeding can damage grass sod that protects the soil from erosion. Establishing quick growing cover in the spring is essential to prevent soil erosion and movement of sediment and nutrients into surface waters.

What has been done
Field demonstrations were conducted in 2015-2018 on 5 sites. Revegetated sites were evaluated for forage growth, ground cover, weeds versus planted crop, forage yield, and animal unit grazing days produced when grazed. Individual case studies were written for each site to quantify the cost of re-vegetation and the value in terms of ground cover and forage production. A video was produced using three of the sites in 2016 showing the benefits of re-vegetating winter feeding

areas.

Results

Farmers stated that they were happy with the growth and yield of BMR Sudan Grass from July-Sept especially with the droughty conditions in later summer. The swine forage site estimated a savings of $582 utilizing the BMR Sudan Grass. Environmental stewardship and weed management are additional important outcomes. It was observed that cattle will graze weed species at certain times especially when young and vegetative, but not later when they are going to seed. 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. This provides a dual benefit to the farmer and local citizens who use the surface water for recreation and drinking.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
302	Nutrient Utilization in Animals
308	Improved Animal Products (Before Harvest)
806	Youth Development

Outcome #5

1. Outcome Measures

Number of producers indicating adoption of recommended or best practices.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

WV farmers have returned to small ruminant production which has helped revitalize this industry in WV. Farmers need help increasing the economic efficiency and overall profitability of their small ruminant enterprises through sound research in production and marketing practices.

What has been done
The WV Small Ruminant Project (WVSRP) helps farmers realize a greater return to small ruminant production and thus revitalize this industry in WV through improved production and marketing practices. This year, the WVSRP's website was updated. The WVSRP offered out-of-season breeding and lambing programs. Through collaborations (Davis College, Animal Science, and Extension), 5 research projects are being funded through grants of totaling $900,000 (Hatch, NESARE). For all projects, we continue to develop resource materials that we disseminate through teaching activities, written articles, and the WVSRP's website.

Results
To date, these projects have resulted in 8 referred publications, 6 national presentations, 6 state conference presentations, 11 technical reports, 5 additional regional presentations, and significant outreach through the WV Small Ruminant Project's website. This project continues to show impact throughout the state and the Northeast region. The research efforts help farmers realize a greater return to small ruminant production which will revitalize this industry in WV. In addition, the work has had international implications with related several projects in the Caribbean. Overall, these projects have helped halt and have potentially started reversing the decline in the WV small ruminant industry.

4. Associated Knowledge Areas

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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	300

3c. Qualitative Outcome or Impact Statement

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

What has been done
The 2018 Pesticide Re-certification Program Video was created and distributed to all county Extension offices to provide approved pesticide re-certification training to pesticide applicators.

Results
300 participants obtained continuing education units toward pesticide re-certification by attending the training and viewing the video.

4. Associated Knowledge Areas

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

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
2018	120

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Agritourism is a vehicle for increased farm income, increased visitor spending, local revitalization, job creation, and farmland preservation. WV is uniquely positioned to capitalize on this opportunity having the highest family farms/capita in the nation and >20,000 small/part-time operations. Post-evaluations from Extension programs, combined with WV tourism data on total visitor spending ($5.1 billion-2012) and trending tourism niches, indicate that new/additional agritourism/farm-based educational enterprises are in demand.

What has been done

The WV Agritourism Initiative, a program, designed to encourage and develop agritourism and farm-based education enterprises in WV began in 2014. It is conducted by a multi-agency team consisting of personnel from WVUES, WVU Law School, WV Department of Agriculture, WV Division of Tourism, and Local CVBs and insurance agencies. Over $30,000 in grant funding was secured for this program. Since 2014, 178 graduates successfully completed one of 4 rigorous short-courses; 75 in 2018. To date, 5 regional clusters have been started, designed to help build regional destination viability. In addition, 128 new agritourism stakeholders attended other agritourism meetings.

Results

Post-project evaluations (75) in 2018 show:
75 said they have implemented at least 2 risk management tools/practices in their current or planned agritourism operations.
70 have made significant improvements to their current/planned operations.
35 have launched a new/improved agritourism/farm-based educational enterprise.
42 reported improved farm viability/ profitability based on workshop and technical assistance.
27 reported an increase in quality of life indicators.
75 indicated an intent to expand or maintain the size of their current operation.
75 agreed they improve their knowledge, skills and confidence to continue/expand/start their agritourism operations.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
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

- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	19

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Arable land is scarce in the Mountain State. Narrow ridges, steep valleys and flood plains prone to sever flash flooding limit capacity for most producers in the state. Coupled with issues of soil contamination and industrial sprawl, the issues is even more critical. Climate change is leaving the region wetter, hotter and less stable for marketable vegetable production. Alternative agriculture circumvents these restrictions through the use of high tunnels, raised beds, soil less growing. These methods offer sound, scientifically based technology that provides resources to home growers and commercial producers.

What has been done
WVSUES continues to deliver alternative agriculture practices as a means to serve the small acreage farmers and producers in the state. Sounds practices, developed specifically for the unique situations facing growers are researched and delivered to ensure a positive result and generate increase participation in alternative methods of production.

Results
19 new growers were recruited to grow several varieties of the same vegetables which were sold to specialty restaurants in the region.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
216	Integrated Pest Management Systems
604	Marketing and Distribution Practices
607	Consumer Economics
806	Youth Development

Outcome #9

1. Outcome Measures

Development of a new diet formulation for rainbow trout.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
A great portion of the production costs of commercial fish are attributed to dietary supplements. Therefore finding ways to produce fish lines with more efficient diet conversation rates is highly desirable.

What has been done
WVSU aquaculture researchers conducted 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.

Results
Aquaculture scientists demonstrated that temperature and diet are strongly associated growth performance characteristics and mitochondrial function in rainbow trout.

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

- 1862 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The production of apples has had a significant economic impact in the Appalachian region. However, the total apple production in WV, primarily fresh market apples, has declined in the last decade. In contrast, the hard cider industry market is showing rapid growth with an average annual increase of 56% between 2007 and 2015 (Alcohol and Tobacco Tax and Trade Bureau). In the US, there has been a 250% increase in cider makers and 36% increase in cider production since 2014. Entrepreneurs in WV are joining this movement, with two cideries opening within the last few years. Genomic driven improvement of fruit quality in watermelon continues to be an important research focus.

What has been done
WVUES has developed 1) the educational components of a proposed Fruit School and a proposed Cider Making School and 2) targeted research to include a screening of different cider apple varieties for overall performance in WV and their relative susceptibility to diseases, an evaluation of their important sensory characteristics for cider making, and a market analysis to determine the full potential of the hard cider industry in WV and neighboring states. WVUES has submitted a grant application to SARE for the $198,220 that is pending. Scientists at WVSU are concentrating efforts on improving organoleptic and nutraceutical properties of high commercial value crops such as peppers, watermelons, and cucurbits.

Results
We are expecting to make solid recommendations about which varieties and rootstocks will perform best in our growing conditions and which varieties will be best suited for cider making based on their sensory characteristics that constitute the taste. That will give us an advantage in producing high quality cider recognizable as unique for the Appalachian Region. In the meantime, we have received $24,522 from the WVDA through their Specialty Block Grant Program that will

help us establish a new cider apple orchard at the WVU Kearneysville Farm.
WVSU-AERS scientists identified pre-breeding pepper and watermelon genotypes with increased levels of phytochemicals and nutraceuticals.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
205	Plant Management Systems
604	Marketing and Distribution Practices
607	Consumer Economics

Outcome #11

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	604

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In WV, there is a demand for locally grown, fresh produce. Increasing the number of producers is needed as are strategies to mitigate the effects of high rainfall, control environment structures, and produce heritage varieties which have elastic phenotypes and local demand. Practices are needed which reduce harvest labor such as modified trellises, year-round markets, and local, value added processing. Increasing the number of food producers without providing links to storage, shipping, and buyers fails to provide the needed economic impact to move the system forward.

What has been done
WVUES expanded a training program related to high tunnel specialty crop production by starting a regular, seasonal in-service training programs for WVU Extension Personnel and USDA-NRCS staff. It showcased successful farms which are adapting to changing climate and markets and included new technology. 575 attendees received training at the Small Farm Conference.

WVUES plans to develop a catalog of successful case studies for other specialty crop farms. No-till vegetable production was demonstrated on a commercial farm in WV. WVSU established two new urban orchards. In addition, mobile cold storage units enabled producers to reach target markets, expand their sales region and deliver to a wider CSA audience.

Results

If each WVU Extension and USDA-NRC trainee has contact with 15 growers using high tunnels, they will assist over 500 specialty crop growers. If each high tunnel produces a minimum of one ton of local food per crop cycle, 500 high tunnels can produce 1,000,000 lbs. of food. The cultivar trials resulted in suitable varieties of cabbage, bak choy, eggplant, bean, lettuce and tomato. Demand and interest in WVSU cold storage capacity has increased. All mobile units were in service this season. The development of urban orchards provide demonstration areas for new fruit tree producers to gain hands on experience with site selection, tree trimming and maintenance, and long term care of established orchards.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
503	Quality Maintenance in Storing and Marketing Food Products
604	Marketing and Distribution Practices

Outcome #12

1. Outcome Measures

Growth in state sales of beef- % increase.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	13

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Beef cattle and sheep production are important sectors of the WV agricultural economy, given the relative abundance of high-quality pasture land and the relative shortage of prime farmland for intensive agricultural product production.

What has been done
We have a long-term integrated pasture-based beef program that has examined ways to increase the production quantity and quality of pasture grass and to enhance the market opportunities for pasture raised beef, the primary method of raising beef cattle in West Virginia.

Results
Stocks of cattle were down somewhat in 2017 but higher prices more than made up for the volume loss. Income from sales of cattle and calves was up 13% compared with 2016.

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.

Not Reporting on this Outcome Measure

Outcome #14

1. Outcome Measures

Number of women trained in farm management and agribusiness skills

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	1000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Women farmers are crucial in preserving small farms, improving local food system, and enhancing rural development. From 2002 to 2007, WV female farm-owners/operators increased by 31%, compared to 11% nationally. However, female-operated farms tend to be small-scale, limited-resource operations, selling under $25,000, have negative net incomes, be more financially at-risk, and more dependent on off-farm incomes (WVUES Focus Group Needs Assessment, 2011). Profitable agribusinesses require a holistic approach to farm planning to successfully prepare women farmers to identify and mitigate their risks.

What has been done

The WV WIA Project team, comprised of 12 Extension colleagues and 2 state collaborators founded the WV WIA Risk Management Program, a multi-prong approach to helping farm women develop skills to become better business owners/farm-partners, and help build profitable, viable and sustainable women-led agribusinesses (http://anr.ext.wvu.edu/ag-women). In 2018, 15 participants attended one online short-course. More than 100 participants complete the 6-weeks WV Annie's Project Curriculum at one of 5 sites. Over $25,000 secured through fund-raising and the support of partner agencies. More than 120 participants have attended the WIA conference in 2018.

Results

Post-evaluations from the online short-course showed: 100% of post-survey respondents have implemented at least 2 risk management strategies; 91% either intend to or have already started determining their cost-of-production; 92% indicated some positive benefit to their enterprises, including, higher returns, lower costs, new markets, new products, new partners or alliances, or access to resources or programs form other agencies. Post evaluations of the participants in the Annie Project Curriculum showed that 100% of post-survey respondents have implemented at least 2 risk management strategies; 91% either intend to or have already started determining their cost-of-production to make better production, pricing and marketing decisions; 92% indicated some positive benefit to their enterprises.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
604	Marketing and Distribution Practices
607	Consumer Economics

Outcome #15

1. Outcome Measures

Number of youth and small producers who gained skill in aquaponics and irrigation technology

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	35

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Alternative agriculture systems require precise nutrient management for success. Combining the raising of fish and plants through aquaponics results in the ability for small producers, families, and isolated populations to develop both a resource for protein and fresh vegetables. These systems can be applied in urban and highly dissected areas of the state where agricultural land for field agriculture is not available.

What has been done
Small demonstration aquaponics systems are installed at Buffalo High School and Welch Armory. Students at Buffalo High School were trained to successfully operate an aquaponics system. They receive both technological, economic and theoretical training to maintain system functionality and fish and plant health. Integrated pest management (IPM) is required with aquaponics to ensure the health and livelihood of the fish. Irrigation technology for small growers was presented to growers using raised beds to enhance production, understand water management techniques and the delivery of macro-nutrients through such systems.

Results
High school students gained skill in operating an aquaponics system. Small growers learned to implement irrigation technology.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

Outcome #16

1. Outcome Measures

Number of producers who use new technology to increase profitability and viability

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	60

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Understanding farm numbers is the crucial underpinning to a sound risk management program. However, most growers produce a variety of specialty crops or value-added products and sell in several market channels which makes it difficult for producers to gather accurate crop/product- and market-specific cost information. Producers need a comprehensive whole-farm planning and risk-management educational program, to help them begin with the end in mind by providing financial viability information for the farm as a whole taking into account production, financial, risk management and marketing aspects. This will help build profitable and viable agribusinesses in WV.

What has been done
WVUES developed an initiative to address the long-term financial success of diversified specialty crops and value-added products. The goals were to 1) increase the capacity producers to understand and apply financial management tools; 2) improve the ability of producers to manage a range of risks; 3) increase the expertise of agricultural service providers so they can continue programs for new farmers after funding ended, and 4) make available online decision support tools that can be utilized by all producers involved in similar industries in the Northeast and across the U.S.

Results
This project is still continuing but has: 1) developed and provided a user friendly farm financial spreadsheet for growers and value-added producers to determine their crop/product costs, market specific costs, and profitability in order to facilitate improved whole farm profit management (based on the national Veggie Compass Model); 2) documented a 30% increase in number of producers using tools and strategies to increase profitability and viability; and 3) documented a 30% increase in % of producers report enterprise improvements (revenue, profits, cost management, markets, losses).

4. Associated Knowledge Areas

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

Outcome #17

1. Outcome Measures

Poultry meat production and consumption

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Currently poultry meat consumption is the primary animal protein consumed in the US. Feed and feed manufacture comprise over 70% of the cost of poultry production, with most US broiler and turkey feed being pelleted. The thermal process involved in manufacturing pellets may have a negative effect on nutrient availability. Coupled with this, it has been consistently demonstrated that corn and soybean based diets (predominant US feed formulation) have a reduced nutrient availability due to pelleting. Finally, feed additives such as enzymes are common in today's feed formulation and susceptible to denaturation during feed processing. Thus, it is important to develop a protocol to properly sample feed during manufacture for nutrient, feed additive, and mycotoxin content.

What has been done
Although initially looking at mycotoxin, the project switched focus from mycotoxin to Salmonella. This change was due to the greater importance of salmonella contamination in poultry products. This concern has paralleled the poultry industries practice of removing sub-therapeutic use of antibiotics in feed.

Results
The project has identified proper sampling protocols and published that work in 2017. Results have also been presented at national meetings, and scientific conferences.

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 #18

1. Outcome Measures

Forest pests, pathogens and economics

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
United States agriculture and forestry faces a major threat by many pests (e.g. insects, weeds, and plant diseases) distributed over large geographic areas. Specifically, noxious invasive species have caused considerable economic loss and environmental damage to agriculture and forestry in the United States. The result of damage and loss caused by such pests is sometimes irreversible without accurate management of the threat in a timely manner. Hence, there is a need to develop spatially-targeted pest management systems using geospatial and aerospace technologies for efficient detection of pests and precise delivery of control measures against major pests in agriculture and forestry.

What has been done
An Unmanned aerial system (UAS) was used to detect various pests including an insect (saddleback moth), plant diseases (fire blight and apple scab), and a weed (morning glory). Both fixed-wing UAS and rotary-wing UAS were used and flown at various altitudes.

Results
The results of our study showed that saddleback moth pupae could be detected during the winter from the aerial imagery taken with rotary-wing UAS 1 m above the canopy of poplar trees. Fire blight and apple scab detections were performed, but the results did not show any promising detectability due to a very low incidence of the plant diseases in the research sites.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
201	Plant Genome, Genetics, and Genetic Mechanisms
205	Plant Management Systems
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems

Outcome #19

1. Outcome Measures

Breeding animal resistance to pathogens and parasites

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Finding and breeding animals with inherent resistance to parasites is also an import aspect of generating sustainable management practices for animal farms. In the last decade, researchers have discovered that Texel sheep have an enhanced resistance to helminth parasitism. By generating estimated breeding values for a variety of traits including fecal egg count in Texel sheep, one can provide a superior breeding stock to producers, and as such, genetic selection within the Texel breed to improve parasite resistance which has the potential to make a long-lasting impact on sheep production in the eastern US.

What has been done
Three producers in the US submitted fecal samples for evaluation by WVU and data was returned to producers. At least one producer submitted fecal egg count data, in addition to data submitted from the WVU Texel flock. This year WVU sold four rams at the two NSIP sales to producers in IA, MN and OH.

Results
Found that Texel sired lambs brought on average $0.30/lb more than Suffolk sired lambs. Data

have been reported to producers at regional producer workshops and scientific meetings.

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
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)
313	Internal Parasites in Animals

Outcome #20

1. Outcome Measures

Organic vegetable production, soils, yield, economics

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The project Long Term Organic Management of Vegetables and Its Effects on Soils, Yield, Weed and Pest Pressure, and Economic Returns has as its main goal to improve the long-term sustainability of small farms producing organic vegetables in the northeast. Minimizing the use of off-farm inputs, reducing tillage, and the use of organic mulches will be tested in order to make recommendation to current and future organic vegetable producers about best management practices that will maintain economically viable yields while improving long-term sustainability of vegetable production systems.

What has been done

A WVU organic farm field day, hosting field trips for WVU students, guest lectures on previous research carried out in the market garden section of the organic farm.

Results

The project as structured cannot be maintained with the resources provided. It is our intention to submit a final report in 2019 and resubmit a more manageable project in organic weed control and alternatives to plastics in horticulture production.

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

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 several projects. With increasing workloads, addition of 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.

WVUES evaluations

The WV WIA Risk Management Program
Post-evaluations from the online short-course showed: 100% of post-survey respondents have implemented at least 2 risk management strategies; 91% either intend to or have already started determining their cost-of-production; 92% indicated some positive benefit to their enterprises, including, higher returns, lower costs, new markets, new products, new partners or alliances, or access to resources or programs form other agencies. Post evaluations of the participants in the Annie Project Curriculum showed that 100% of post-survey respondents have implemented at least 2 risk management strategies; 91% either intend to or have already started determining their cost-of-production to make better production, pricing and marketing decisions; 92% indicated some positive benefit to their enterprises.

Long-Term Financial Success Program
This project is still continuing but has: 1) developed and provided a user friendly farm financial spreadsheet for growers and value-added producers to determine their crop/product costs, market specific costs, and profitability in order to facilitate improved

whole farm profit management (based on the national Veggie Compass Model); 2) documented a 30% increase in number of producers using tools and strategies to increase profitability and viability; and 3) documented a 30% increase in % of producers report enterprise improvements (revenue, profits, cost management, markets, losses).

The WV Agritourism Initiative

Post-project evaluations (75) in 2018 show:
75 said they have implemented at least 2 risk management tools/practices in their current or planned agritourism operations.
70 have made significant improvements to their current/planned operations.
35 have launched a new/improved agritourism/farm-based educational enterprise.
42 reported improved farm viability/ profitability based on workshop and technical assistance.
27 reported an increase in quality of life indicators.
75 indicated an intent to expand or maintain the size of their current operation.
75 agreed they improve their knowledge, skills and confidence to continue/expand/start their agritourism operations.

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%	5%	20%
102	Soil, Plant, Water, Nutrient Relationships	25%	10%	15%	25%
111	Conservation and Efficient Use of Water	0%	10%	0%	20%
112	Watershed Protection and Management	10%	0%	20%	20%
124	Urban Forestry	0%	40%	0%	5%
131	Alternative Uses of Land	5%	10%	0%	0%
132	Weather and Climate	0%	0%	15%	0%
133	Pollution Prevention and Mitigation	10%	0%	15%	0%
135	Aquatic and Terrestrial Wildlife	0%	10%	15%	0%
136	Conservation of Biological Diversity	10%	10%	0%	0%
211	Insects, Mites, and Other Arthropods Affecting Plants	0%	0%	5%	0%
403	Waste Disposal, Recycling, and Reuse	15%	0%	0%	10%
605	Natural Resource and Environmental Economics	10%	0%	10%	0%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	3.0	1.0	7.0	2.0
Actual Paid	3.0	1.0	12.2	4.0
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**
220000	60118	313985	137436
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
7950	27389	1469775	199596
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	150771	1496546	350250

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 two goal is to improve management and stewardship of West Virginia's natural resources considering expected climatic changes to minimize detrimental habitat impacts and ensure a high-quality environment for future generations. Individual research programs are improving understanding of wildlife populations that are endangered or threatened by either habitat loss, climate change, or both including salamanders, turtles, brook trout, grassland birds, and black duck. This includes assessment of historic and future freshwater resources and the sensitivity of aquatic ecosystems, including seasonal pond wetlands (i.e. vernal pools), by using watershed models that enable prediction of future aquatic conditions. Integrated watershed research programs are improving understanding of pollutant loading and transport associated with nutrient cycling and are enhancing understanding of water quality issues and more socially functional and ecologically sustainable green spaces. Biogeochemical cycling and ecosystem water availability of West Virginia's forested ecosystems are of interest, including effects associated with the re-introduction of the American chestnut. Recent soil survey efforts have resulted 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 investigate the best management practices for abundant wildlife such as white-tailed deer, black bears, and coyotes through the development of predictive habitat use and multi-species occupancy modelling techniques. Protecting West Virginia's rich water, soil, and wildlife resources through extensive data collection efforts and modeling exercises will balance sustainable economic growth, environmental quality, and the conservation of natural resources. Research program highlights for 2018 include:

- Utilization 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.

• A total of 96 presentations were made at local, regional, national, and international conferences, widely disseminating the results of climate change, environmental quality and stewardship research projects.

• Thirty-eight graduate students received valuable training and education related to monitoring, modelling, and managing West Virginia's abundant natural resources.

•

WVUES

In 2018, WVUES program activities in climate change and environmental quality included:

Conservation: WVUES educators work with the Greenbrier Valley Conservation District, the Eastern Panhandle Conservation District, and the Little Kanawaha Conservation District and work with the Mine Drainage Taskforce,. A youth program in Watershed Agriculture in the Classroom was offered in 2018.

Integrated Pest Management programs include: Commercial Pesticide Applicator Recertification, Gaining Familiarity with the Degree Day Model, Habitat Planning for Beneficial Insects, Herbicide Resistance and Management, Weed Control, the Pollinator Habitat Establishment Workshops, and Invasive Weed Management workshops. The theme of the WV Master Gardener Association Conference this year was Habitat Planning for Beneficial Insects/Plants for Conservation.

Recycling: Agents worked with local recycling groups in their counties including the Agriculture Plastic Recycling Committee.

WVSU-GRDI

WVSU Extension continues to explore the potential of growing in high tunnels on reclaimed mine land, off grid construction and utilization of high tunnels. Enhancing urban environmental quality is achieved through the development of urban forestry programming.

Scientists at the Agricultural and Environmental Research Station conducted research relevant to climate change, environmental quality and stewardship. They reported results in scientific manuscripts, technical and popular presentations; and also trained undergraduate and graduate students. These researchers continued generating 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 useful to WV farmers and agribusinesses. Research efforts continued to be 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. Other associated research also focused on environmentally responsible and efficient ways to treat agricultural waste through environmental microbiology (e.g. anaerobic digestion techniques). Finally, researchers also continued research efforts related to increasing awareness of soil remediation technology among mining operators and agencies.

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 2018 include:

• Ornamental flower lines (Chrysanthemum, Gladiolus, Gaura, Linum) tested on WVSU's trials did not survive the winter as they had in previous years.

• Pyrethrum flower lines, on the other hand, performed well and may be suitable for future production in the WV climate; which is good news for the American farmer and pyrethrum industry.

• Redox potential of reclaimed mined soils proved to be a dominant factor affecting soil and water composition and other soil parameters; while temporal changes in soil and water composition were also observed.

• Poultry waste and glycerol co-digestions proved an effective way to treat these agricultural waste byproducts while also increasing biogas (methane) production.

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

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	8702	12021	727	0

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	52	52

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Events including conferences, demonstration, field days, symposia, workshops and trainings

Year	Actual
2018	202

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	Number of participants who gained skills related to restoring forests on disturbed lands.
7	Number of producers who learned about preventing rot through proper pruning and culling procedures
8	Number of producers and gardeners who put practices in place to protect solitary bees and other native pollinators
9	Evaluation of reclamation practices on soil water quality for proper reclamation & revitalization of ecosystem services of mined areas.
10	Measured effects of human impact on riverine and watershed microbial ecosystem services (water quality)
11	Advancing watershed management in the Chesapeake Bay and Mississippi River Watersheds
12	Advancing watershed models and land-use-land-practice and climate change impacts

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
2018	300

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Acid mine drainage and other water quality problems continue to plague our state's water resources. Citizens do not always have access to clean water for drinking and recreation.

What has been done
An annual symposium, sponsored by the Mine Drainage Task Force and WVU, is held each spring to discuss current problems and solutions to water quality problems in the region. These symposia have been held since 1980. The Mine Drainage Task Force Symposium is attended by more than 300 people and the proceedings and presentations are placed on a web site for anyone to view and learn.

Results
Participants gained knowledge about current problems and solutions to water quality problems in mid-Atlantic region.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
403	Waste Disposal, Recycling, and Reuse

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
2018	120

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Applying pesticides in public places could lead to serious problems. Alternative product delivery methods of nutritional and pest management in woody ornamentals are needed.

What has been done
WVUES maintains close collaboration with the "Green Industry" by providing technical support and outreach about produce delivery methods of nutritional and pest management methods at industry-sponsored events like WVNLA Winter Symposium.

Results
Surprisingly none of the attendees used microinjection system as method of product delivery in their operations. Only 10 people knew something about it, but the rest heard about it for the very first time. Just a quick survey afterwards indicated that 20 % would look more into it and incorporate this system into their landscape care and maintenance operation.

4. Associated Knowledge Areas

KA Code	Knowledge Area
136	Conservation of Biological Diversity
211	Insects, Mites, and Other Arthropods Affecting Plants

Outcome #3

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	8

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Agriculture is the sector that has been defined as the greatest source of nutrient and sediment pollution that enters the Chesapeake Bay. The 8-county Eastern Panhandle region of WV is the only portion of the state included in the Chesapeake Bay's watershed. Of the 6 states with watersheds that drain into the Bay, WV is the only state that does not have any legislation that mandates farmers to have a nutrient management plan. No record keeping system of inputs is defined. WV only uses what is written on paper to quantify the impact their producers have on water quality, and not what is actually being done in the field.

What has been done
As a means to better capture the positive effect WV producers have on water quality, a research study that will utilize a cell phone application, the Ohio Nutrient Management Record Keeper (ONMRK), to capture nutrient management application data in real time from producers within the Eastern Panhandle that have a nutrient management plan was implemented. It will determine if ONMRK is a suitable record keeping tool for West Virginia farmers with nutrient management plans. WVU Extension is implementing record keeping and trainings for farmers.

Results
The results from this study will determine to what extent farmers in 8 counties are following the recommendations set forth in their nutrient management plans.

4. Associated Knowledge Areas

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

605 Natural Resource and Environmental Economics

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
2018	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. The resulting co-product biochar can be used as a low-cost bulk sorbent for removal of pollutants from storm water and runoff management practices in urban and rural areas.

What has been done
Biochars from different feedstock and pyrolysis processing conditions and/or steam activation were evaluate as a sorbent for heavy metals.

Results
Selected conditions and feedstocks were identified and biochar production process and handling was fine-tuned for the development of biochar bulk sorbent source of enhanced capacity for removal of heavy metals.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
133	Pollution Prevention and Mitigation
403	Waste Disposal, Recycling, and Reuse

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

Number of participants who gained skills related to restoring forests on disturbed lands.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	2000

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. The Appalachian Regional Reforestation Initiative continues to provide information and knowledge for reforestation practices. See https://www.osmre.gov/.

Results
Reforestation practices on mined lands have increased 3 times since 2000. Re-vegetation strategies after highway construction emphasizes native plants for stability.

4. Associated Knowledge Areas

KA Code	Knowledge Area

131	Alternative Uses of Land
136	Conservation of Biological Diversity
605	Natural Resource and Environmental Economics

Outcome #7

1. Outcome Measures

Number of producers who learned about preventing rot through proper pruning and culling procedures

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	29

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Late season freeze events have caused a decrease in production of early blooming varieties of peaches and other stone fruits. Loss of orchard viability results in loss of income and increased importation of fruits to meet market demand. While later blooming varieties will survive late season low temperatures, increasing precipitation during the early season period of growth is causing a subsequent increase in molds and fungi that are further encouraged by increased temperatures later in the season.

What has been done
WVSUES delivers workshops that have integrated climate change issues for producers with other topics. Discussions include shifting to later blooming varieties of peaches as well as behavioral methods to prevent brow rot through proper pruning and culling procedures. Site selection focuses on utilization of microclimates and topography to control temperature variability.

Results
Assessment of the success of transitioning to later blooming varieties, site selection and canopy management and culling have not yet been evaluated. These data are ongoing and will take several seasons to assess efficacy.

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate

136	Conservation of Biological Diversity
605	Natural Resource and Environmental Economics

Outcome #8

1. Outcome Measures

Number of producers and gardeners who put practices in place to protect solitary bees and other native pollinators

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Climate change combined with habitat loss has increased pressure on native pollinator species. Of particular interest are solitary bees. Pollinators are directly responsible for 35% of the world's food production. Decreases in populations of wild native pollinators have a direct negative impact on agricultural production. Native bees have been added to the endangered species list i.e. Rusty Patch Bumble Bee.

What has been done
WVSU delivers workshops targeting producers and gardeners to lead them in a direction to modify their planted landscape to include forage, water and nesting capacity for solitary bees and other native pollinators.

Results
12 individuals constructed Mason bee houses and placed them in a backyard habitat.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity

Outcome #9

1. Outcome Measures

Evaluation of reclamation practices on soil water quality for proper reclamation & revitalization of ecosystem services of mined areas.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

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. Evaluation of reclamation practices based on soil water property are needed to assure proper reclamation and revitalization of ecosystem services of mined soils in WV.

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 growing season.

Results
Data is collected for the 2nd growing season since site was instrumented in early 2017. Reclamation affected soil water quality and processes therein. Temporal changes (within the growing season and annual) in soil water chemical composition fluctuate. Redox potential seemed to be a dominant parameter affecting soil water composition and characteristics. Still, and while varied widely within year and from year to year, most 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
102	Soil, Plant, Water, Nutrient Relationships
133	Pollution Prevention and Mitigation

403 Waste Disposal, Recycling, and Reuse

Outcome #10

1. Outcome Measures

Measured effects of human impact on riverine and watershed microbial ecosystem services (water quality)

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Watersheds are critical for many essential and often conflicting uses including the provision of drinking water and support for industrial manufacturing. Therefore, managing watersheds for long-term viability requires understanding how to manage the microbial ecosystem processes that provide natural biogeochemical cycles as well as bioremediation services. Studies are being conducted in the Kanawha-New River drainage basin which encompass more than 12,000 square miles of Appalachian Mountains, primarily in West Virginia. This river passes through the industrial center of West Virginia which is the Charleston metropolitan area. This region has been nicknamed Chemical Valley because of the large number of chemical manufacturing plants that are located along the river. These facilities use the water during manufacturing and product transportation. These industries have caused substantial pollution to the river since World War I. The lower Kanawha River was even considered to be one of the most polluted rivers in the US prior to 1980.

What has been done
We are studying the microbial diversity and microbial ecosystem processes found in the sediment of the Kanawha River. Microbial functional diversity in sediment was sampled using metagenomics. Chemical diversity of the sediment was also sampled using ICP (Inductively Coupled Plasma)-OES (spectroscopy) and ion chromatography. The dynamics of standard water variables were measured using automated multi-probe sondes deployed at three locations. This research was funded through the NSF EPSCoR RII Appalachian Freshwater Initiative (AFI) grant awarded to WVSU, WVU and Marshall University.

Results
Coordinated sampling of microbial diversity and chemical variability was done at eight locations in the Kanawha River watershed during 2018. River sediment and water were sampled.

Metagenomes were obtained using Illumina sequencing of eight samples from four locations. Spatial variation in sediment chemical diversity was found to be similar to the preceding year but not identical, indicating that local variation in sediment geochemistry is present but yearly variation is also present. The automated sondes provided hourly measurements of river water chemistry with regard to several standard freshwater variables (oxygen, salt, conductivity, nitrogen, etc). Water chemistry was found to be greatly affected by changes in discharge. Six presentations were made at professional conferences during 2018 by Huber Lab personnel.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation

Outcome #11

1. Outcome Measures

Advancing watershed management in the Chesapeake Bay and Mississippi River Watersheds

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	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 there is increasing awareness in the Chesapeake Bay Program, USDA NIFA, US Geological Survey, and affirmation of importance of this massive undertaking among leadership of those agencies.

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
403	Waste Disposal, Recycling, and Reuse
605	Natural Resource and Environmental Economics

Outcome #12

1. Outcome Measures

Advancing watershed models and land-use-land-practice and climate change impacts

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	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
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
132	Weather and Climate
133	Pollution Prevention and Mitigation
135	Aquatic and Terrestrial Wildlife

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.

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.

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%	5%
102	Soil, Plant, Water, Nutrient Relationships	0%	0%	0%	25%
131	Alternative Uses of Land	25%	0%	10%	15%
133	Pollution Prevention and Mitigation	25%	0%	10%	10%
201	Plant Genome, Genetics, and Genetic Mechanisms	0%	0%	0%	40%
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%	0%	0%	5%
403	Waste Disposal, Recycling, and Reuse	50%	0%	20%	0%
511	New and Improved Non-Food Products and Processes	0%	0%	35%	0%
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: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	9.0	0.0	3.0	4.5
Actual Paid	8.0	0.0	2.3	5.0
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**
340000	0	34036	474014
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
324500	0	286167	268724
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	315250	299818

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 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

The importance of expanding and improving West Virginia and the nation's sustainable energy supplies cannot be understated. Hence, a multifaceted approach of targeting and extracting under-used resources and exploring potentially "new" sources of energy--while mitigating environmental impacts--are some areas that this program is devoted to. One project is investigating a less researched, more attractive alternative CO_2 capture technique: using "solid sorbents" functionalized with CO_2 absorbing groups. Results demonstrate that such solid adsorbents are effective in sequestering gaseous CO_2. Other investigators are advancing research into many facets of bioenergy production systems, including thermochemical conversion technology and sustainable technologies to convert biomass resources into chemicals, energy, materials and other value-added products. One project is looking at the potential for providing an alternate solution to transforming available biomass, grown on reclaimed mine-lands in West Virginia, into bio-char intermediate through pyrolysis and hydrothermal processes and then transforming bio-chars into activated carbons to be used as a commercial adsorbent or other electrochemical applications. A related project is broadly investigating thermochemically treated wood to gain a better fundamental understanding of how the thermal treatment process on wood influences the mechanical and electrical conductivity properties of the resulting bio-carbon particles. Investigations pertaining to the impact of unconventional oil and gas development (UOG) on forest operations and forest products markets in the region is being conducted to understand current trends and opportunities for future shale gas development. With these and allied data, the understood relationships between UOG development and surface disturbance, the forest products industry, and forest economies are being greatly advanced. Research program highlights for 2018 include:

- Activated carbonaceous material (CM) produced from technical lignin, a waste-stream, and functionalized with a nitrogen containing polymer successfully sequestered carbon dioxide.
- Successfully developed Electrical double-layer capacitors (EDLCs) using yellow-poplar, red oak, and short-rotation willow.
- UOG well database developed for PA, WV, and OH (~19,000 locations analyzed), and all actively developed/producing wells determined through image analyses.
- Harvest and logistics optimization for multiple biomass feedstocks were carried out using

mathematical programming and sensitivity analysis with different case scenarios.
• Techno-economic and life cycle analyses were integrated for biomass utilization for value-added bioproducts.

WVUES

This year, WVUES educators reported very little activity related to sustainable energy. One agent held wind generator training for 68 youths. Another agent worked with WVU faculty and graduate students to give support to research on natural gas.

WVSU-GRDI

In terms of this planned program related to Sustainable Energy, research efforts at WVSU Agricultural and Environmental Research Station remained focused on improving thermophilic digestion of poultry waste and developing anaerobic microbial energy conversion. Additionally, researchers also continued research related to genomics of fiber and biomass crops. WVSU scientists 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 2018

• WVSU scientists improved the energy content of two bioenergy crops by genetically engineering them to accumulate less carbohydrate and more oil in its tissues. These crops are also being engineered to perform efficiently under WV climate and mined soil conditions.
• Using glycol as a co-substrate resulted in increased biogas production in a thermophilic anaerobic digestion; which is promising for both, the treatment of agricultural wastes and effective production of biogas.

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

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	65	40	84	22

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	9	9

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Events including conferences, demonstration, field days, symposia, workshops and trainings

Year	Actual
2018	26

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	New knowledge concerning how microbial functional diversity gives rise to anaerobic microbial energy conversion processes and carboxylate production from diverse organic wastes.
8	Commercial value for biorefinery products
9	Improving fundamental understanding of thermal wood treatment processes and outcomes
10	Advances in wood processing energy consumption
11	Advances to value-added bioproducts

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
2018	12000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Soil testing is a fundamental process to improve the management of agricultural lands. The old adage still holds true, don't guess, test. The WVU Soil Testing Lab had remained unchanged for decades. The same soil extraction method Mehlich-1, had been used for many years. This method provided limited data to make agronomic decisions. Most Public and Private soil testing labs in the Mid-Atlantic Region have transitioned to Mehlich-3 extraction method, offering additional information to growers. The recommendation system had been in place so long no one could be found that knew the origins of the recommendations. This free service provided to the citizens of WV, needed a dramatic rethinking and improvement.

What has been done
WVU Extension service and WVU Davis College Faculty established a Soil Testing Lab Committee to explore changes to the extraction method and a revision of the recommendation system. WVU Extension faculty and information technology staff developed a completely new software system. This software provides a new soil sample submission method, new customer data management system, a new crop recommendation system and an email delivery process that links the customer to their county extension agent. The lab changed their soil extraction from M-1 to M-3. This allows farmers to track phosphorus saturation in soils and provides results that are like private labs in surrounding states

Results
The WVU Soil Testing Lab has a customer list of over 12,000 names. Having a new extraction method that can provide additional soil nutrient information along with a revised crop recommendation system provides WV farmers and homeowners with better information to improve the productivity of their soils. Better plant growth both in gardens and in agricultural fields is an economic benefit to all. This new soil testing method also provides an environmental signal to customers if their soils are excessive in certain nutrients that potentially can be lost to

the environment.

4. Associated Knowledge Areas

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

Outcome #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
2018	0

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. Research at WVSU 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. Co-digestion where more than one organic waste is used simultaneously can improve digester economics but sometimes leads to instability. This requires further study for better management.

What has been done

Two projects addressed the issues of improving operational controls. First, we constructed a new pilot-scale (2 cubic meter) thermophilic bioreactor that will be used for anaerobic digestion research, as well as bioenergy, and other biomass-to-bioproduct process engineering. This project was funded by a USDA 1890 Research Capacity Building Grant to David Huber (PI) that ended August 31, 2018. The second project involved measuring the stability, resilience and adaptability of a thermophilic digester microbiome during co-digestion with a potentially high energy yielding, but stress-inducing, substrate (crude glycerol).

Results

The set-up of the physical plant and operating system of a two cubic meter bioprocessing reactor was completed. For the second project, digester stability was measured during an experiment with five replicate thermophilic digesters that were run for more than 600 days. The digesters were stabilized on poultry litter substrate and were subjected to co-digestion stress by using crude glycerol as co-substrate. An ecological engineering approach was evaluated for adapting the digesters to stressful levels of crude glycerol. Digesters first received pulses of crude glycerol to evaluate stress responses and resilience. Following short-term exposure to crude glycerol, the digesters were able to process higher concentrations of this substrate and methane production increased about ten-fold.

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

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

Not Reporting on this Outcome Measure

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
2018	0

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 have established the particle bombardment method for switchgrass transformation using the Helios gene gun, which uses DNA-coated gold particles on the inner wall of a plastic tube and accelerated by pressured helium. It is a versatile technique that can be used for creating stable transgenic switchgrass plants as an alternative to Agrobacterium-mediated transformation.

Results
WVSU scientists used the embryonic switchgrass callus for gene gun-mediated transformation according to manufactures instructions and previous work. DNA gene-gun experiments were performed using 100-150 ng of plasmid DNA (reporter gene Intron-GUS) per bombardment. Callus cultures incubated for 6-8 h pre- and 18 h post-bombardment on medium had significant effect on the regeneration. We used three replicate per bombardment experiments, and each replicate consisted of 50 bombarded calli. Putatively transformed callus cultures were selected on medium containing 20 mg/L hygromycin. We compared the transformation efficiency among the two different transformation methods such as Agrobacterium and gene gun-mediated and observed higher transformation efficiency in the gene-gun mediated transformation method.

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
2018	450

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Resource extraction has and continues to damage land and water resources. Acid mine drainage and other water quality problems continue to plague our state's water resources. Citizens do not always have access to clean water for drinking and recreation. Reclaimed mine lands are a resource that have potential to improve food and housing needs in West Virginia. Not enough knowledge is available on how these lands can be used.

What has been done
Visits to encourage the use of these lands have been conducted. A 1/2-day seminar was hosted on "Income Opportunities on Reclaimed Land in West Virginia." An annual symposium, sponsored by the Mine Drainage Task Force and WVU, is held to discuss current problems and solutions to water quality in the region. The Mine Drainage Task Force Symposium is attended by more than 300 people. WVUES has provided information to practitioners, land owners, coal operators, regulators and scientists on better methods and technologies to reduce pollution and improve restoration efforts. Through WVUES Land Reclamation and Acid Mine Drainage programs research and demonstrations projects have been conducted to improve techniques before, during and after mining and to establish vegetation to a designated post-mining land use.

Results
Participants gained knowledge of ways they might use reclaimed lands in WV to bring revenue to themselves and to the state of WV while enhancing the environment. The goal is 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
131	Alternative Uses of Land

Outcome #7

1. Outcome Measures

New knowledge concerning how microbial functional diversity gives rise to anaerobic microbial energy conversion processes and carboxylate production from diverse organic wastes.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

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 control and 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. Biodiesel manufacturing is growing in the US and worldwide. The economics of the process could be improved if the waste product, crude glycerol, could be used for bioenergy production via anaerobic digestion. This research will benefit industries that produce large quantities of organic wastes and seek to convert wastes into useable energy or other bioproducts.

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. An experiment using batch reactor vessels was also conducted to test the stability of metabolic pathways following adaptation to glycerol and increased methane production. We continued a long-term experiment using six-fold replicate laboratory-scale CSTR digesters to evaluate the stability of microbial community structure and function in a

hydrogenotrophic microbiome. All of these experiments were done with a microbiome derived from a pilot-scale digester at WVSU that had been operating with poultry litter as sole substrate for 10 years.

Results

The first experiment evaluated microbial diversity in thermophilic bioreactors (digesters) that had adapted to increased levels of crude glycerol. We hypothesized that an ecological engineering approach could be used to modify microbial community structure and function so that higher levels of this stressful substrate could be handled. If the performance of the bioreactors became modified through changes in the microbiome, this would indicate that the ecological engineering approach was successful. We sampled microbiome diversity using Illumina sequencing of 16S rRNA genes from several time points prior to and after crude glycerol co-digestion. We found that microbial community changes did occur when the digesters exhibited increased performance with the new substrate. We also obtained metagenomic DNA from the digesters following the period of adaptation to the new substrate. Analysis of this data set is being done now. The adapted digesters also contained higher levels of short-chain carboxylates which demonstrated that the adapted microbiome was also stable when theoretically stressful levels of fatty acids were present.

4. Associated Knowledge Areas

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

Outcome #8

1. Outcome Measures

Commercial value for biorefinery products

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A major challenge and opportunity facing the new emerging Biorefinery industry is finding commercial value for its two major byproducts: hydrolyzed hemicellulose and lignin. Depending upon biomass type, the two biorefinery by-products represent approximately fifty percent by weight of the starting material. To-date, very limited economic applications have been found for these by-products.

What has been done
Converted hydrolyzed hemicellulose and lignin by Hydrothermal Carbonization to engineered and surface functionalized carbonaceous materials, and used classical high temperature treatment (HTT) of low-value hardwoods to produce crack-free carbon monoliths followed by surface functionalization and activation to produce materials that can be used as electrodes in electrochemical energy storage systems.

Results
The project demonstrated the valorization of a major Pulp and Paper Industry waste-stream, and converted technical lignin to functionalized activated carbonaceous products. Finally, this project successfully demonstrated the sequestration of carbon dioxide using functionalized activated carbonaceous products.

4. Associated Knowledge Areas

KA Code	Knowledge Area
605	Natural Resource and Environmental Economics

Outcome #9

1. Outcome Measures

Improving fundamental understanding of thermal wood treatment processes and outcomes

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There is a need to take a broader look at thermochemically treated wood to try and gain a better fundamental understanding of how the thermal treatment process on wood influences the

mechanical and electrical conductivity properties of the resulting bio-carbon particles. The hope is that this will lead to the successful use of these materials in composites and sensor applications.

What has been done
Performed some research on using carbonized particles as electrode materials for Electrical double-layer capacitors (EDLCs). Successfully developed EDLCs using yellow-poplar, red oak, and short-rotation willow. The short rotation shrub willow showed the highest capacitance among the biomass types.

Results
The project will end earlier than anticipated as the PI (DeVallance) left WVU on January 15, 2019. However, all the objectives have already been met for the project, so the remaining time will be devoted to dissemination.

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes
605	Natural Resource and Environmental Economics

Outcome #10

1. Outcome Measures

Advances in wood processing energy consumption

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Wood drying accounts for approximately 40% to 70% of the total energy consumed in wood processing operations. For this reason, research efforts have been focused on fast drying methods with high drying quality while maintaining physical properties of dried wood. In addition to improvement of the drying process itself, numerous studies have been devoted to treating wood prior to drying.

What has been done

In this research, influences of reaction media (steam and hot-compressed water) and temperature (100°C and 140°C) during thermal treatment on physical properties and drying behavior of yellow-poplar heartwood were compared.

Results

From a practical standpoint, hydrothermal treatment (in either medium) did not diminish the properties of the final product as no reduction was observed in dimensional stability and compression strength. In addition, increased porosity and water uptake can be helpful in case wood needs to be saturated by liquid preservatives. On the whole, prior to any recommendation for industrial wood drying, further research work is needed to reveal any possible effect of hydrothermal treatments (in either medium) on warpage, checks, and splits in lumber.

4. Associated Knowledge Areas

KA Code	Knowledge Area
403	Waste Disposal, Recycling, and Reuse
511	New and Improved Non-Food Products and Processes
605	Natural Resource and Environmental Economics

Outcome #11

1. Outcome Measures

Advances to value-added bioproducts

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Biomass or underutilized wood for value-added bioproducts can be sourced from forests, agricultural crops, and various residue streams. Woody biomass feedstocks have several advantages over agricultural sources, especially in areas where forests make up a large portion of the total land area and where agricultural production is in decline. Hence, it is necessary to conduct an optimal biomass supply chain study considering multi-feedstocks and comprehensive concerns in economic and environmental aspects. Furthermore, the government and prospective adopters are in urgent need of multi-aspects information including economic feasibility and

environmental impacts of biomass utilization for value-added bioproducts.

What has been done

A modeling process was developed to examine the environmental and economic benefits of utilizing cellulosic biomass as feedstock for value-added carbon products. A life cycle analysis (LCA) model was also developed in to assess the environmental and health effect of this proposed technology. The LCA study was a cradle to grave analysis which studied the GHG emissions, emission to water bodies, water consumption and energy input in the technology.

Results

Of the 18 impact indicators that were analyzed with a 100-year simulation, significant results were found in greenhouse gas emission (changed from 90.33% to 112.03%), freshwater ecotoxicity (ranging from 69.45% to 159.41%), and human toxicity (between 78.48% and 168.45%).

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
511	New and Improved Non-Food Products and Processes

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing 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%
702	Requirements and Function of Nutrients and Other Food Components	10%	0%	20%	0%
703	Nutrition Education and Behavior	30%	20%	30%	0%
724	Healthy Lifestyle	30%	0%	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%	80%	0%	0%
	Total	100%	100%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	14.0	4.0	6.0	0.0
Actual Paid	12.0	2.0	4.4	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
375000	120235	484765	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
561072	54779	666519	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	150852	630687	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
West Virginia University research under Program four includes multiple projects that focus on various aspects of Obesity, Human Nutrition and Health, including the examination of multi-faceted nutritional interventions to improve diet quality and reduce chronic disease risk in midlife and older adults in rural WV, assessing existing dietary intake and identifying key areas of concern. Developing and pilot-testing intervention components; and testing the impact of intervention on improvements in diet quality, disease risk factors, and health-related quality of life. Other investigations generated evidence in support of developing feasible diet therapies that will effectively slow polycystic kidney disease (PKD) progression to renal failure and reduce disease complications while producing the fewest side effects. Investigators established a model for human insulin resistance and type II diabetes by determining the mechanisms by which dietary conjugated linoleic acid (CLA) reduces body fat in pigs and rodents and enhances the intramuscular fat (IMF) in pigs, and how this impacts insulin sensitivity. Other work included utilizing a socio-ecological model to impact policies, systems and environments that will help improve health and well-being among young adults on college campuses and in low-income communities, as well as to understand, develop, create and tailor interventions; and work to improve health promoting compounds in edible parts of horticultural crops for human consumption and utilizing by-products of fruits and vegetables for agricultural uses (e.g., weed control and foodborne pathogen control).

Research program highlights for 2018 include:

- Developed and tested a multi-faceted, targeted nutrition intervention to improve diet quality and reduce chronic disease risk factors in midlife and older rural WV adults.
- Dissemination model (eB4CAST) was tested and refined in a five-state collaborative and again in the national dissemination of 75 institutions from the RCT and Get Fruved projects.
- Refinement and validation of the Healthy Campus Environment Audit (HCEA) and Behavior Environment Perceptions Survey (BEPS).
- Investigated variation of mineral nutrients of various brassica crops by genetic and environments effects using samples from two years of field study.

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, Fun with Fruits and Vegetables, Health Rocks, Health Ambassadors, Healthy Start, Love Your Heart, Rethink Your Drink, Summer Food Training, Take Charge of Your Health and Safety, Yoga, Healthy Children Project, Choosy Kids, Health Motivator, Farmer's Market Voucher Program, Health Science Technology and Key 2 Healthy Start Physical Activity, Physical Activity Technical Assistance, and CEOS health curricula. WVUES also offers individual training programs to improve skills in nutrition, chronic disease management, wellness, and general health behaviors.

WVSU-GRDI
The WVSU Extension Service targeted the aspects of personal behavior and environmental barriers that hinder personal healthy lifestyles. Youth were educated on proper serving sizes, healthy food selection and preparation, and monitoring intake.

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 2018 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

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	23515	9778211	150415	2405

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	4	34	38

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Events including conferences, demonstration, field days, symposia, workshops and trainings

Year	Actual
2018	615

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	Advancing understanding of dietary intake and skeletal muscle mass change after weight loss among middle-aged men with obesity
10	Advances in kidney disease
11	Advances in understanding of mental health disorders
12	Brassica crop production

Outcome #1

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	18000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
WV ranks 4th in the nation in the number of adults that eat less than 1 fruit or vegetable daily. This is a major risk factor for citizens of West Virginia, who already suffer from high rates of obesity, diabetes and heart disease. Children develop food preferences by observing parents and other adult role models consume healthy foods. They also rely on adults to purchase and make those items available in the home. Children in West Virginia are at a disadvantage when it comes to establishing preferences for and accessing fruits and vegetables due to the lack of consumption by adults in the state.

What has been done
The Kids Farmers Market program seeks to give limited income children in West Virginia the opportunity to not only learn about and taste fruits and vegetables, but also gives them buying power they generally lack by providing them with "Kids Koupons" to use at school-based farmers markets. With support from the Eye Foundation of America, The WV Family Nutrition Program expanded the "Kids Coupon" project statewide. Children and families participate in nutrition education and food sampling and receive recipes, shopping bags and small kitchen items as part of their participation. The program targets limited income schools, childcare centers and communities for participation, increasing accessibility for those who need it most.

Results
From June-November, 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 markets and supplemented their income. In addition to the $20,000 in "Kids Coupons" it has provided local farmers with over $70,000 in sales. The Mountaineer Foodbank has adopted the Kids Markets Model to distribute food to needy children in a way which engages them in the choice, increasing the likelihood they will eat the foods provided. The program has crossed state lines and is currently being piloted by an

agriculture agent at Ohio State University in Washington County, OH.

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

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	39000

3c. Qualitative Outcome or Impact Statement

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

What has been done
A Rethink Your Drink (RYD) campaign which includes both educational and media outreach integrate messages about drinking more water and less sugar sweetened beverages into all Family Nutrition Program classes. A RYD@Camp and RYD@School program has been developed to promote messages through week long educational and promotional activities for youth. A media campaign using a combination of radio, TV and digital marketing has promoted and reinforced messages. Last year, over 2 million impressions were achieved with the media campaign and around 39,000 West Virginians were exposed to the messages.

Results

This program informs and educates people of all ages on the sugar content of beverages and healthier options. Excess sugar intake is a key contributor to poor health and chronic disease. Supporting people in making a better choice has the potential to improve health, lower healthcare cost and improve quality of life.

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 #3

1. Outcome Measures

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

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	325

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In addition to increasing the consumption of fruits and vegetables and reducing the intake of sugary drinks, WV youth need to increase the minutes they participate in physical activity in order to reduce health risks and become healthy productive adults.

What has been done
The Choose Health: Food, Fun, Fitness curriculum was delivered by WVSU to 150 middle school youth free and reduced eligible students in Kanawha County and 175 high school students in Cabell County.

Results
In the Choose Health program 43% of 6th-8th grade students increased their consumption of fruits and vegetables and 36% reduced the amount of sugary drinks. Physical activity practice improved by 36% increasing their activity to at least 1 hour/day. Students in grades 9-12 improve

vegetable consumption by 41% and fruits by 33%. Physical activity was increase to 1 hour/day by 23% of the participants.

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 #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
2018	25125

3c. Qualitative Outcome or Impact Statement

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

What has been done
Since 2008, the West Virginia University Extension Service (WVUES) has partnered with the West Virginia 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 curriculum created around a new health theme includes engaging health activities which groups use during meetings. Statewide training is offered every fall and some counties have local training sessions to prepare Health Motivators. A study was conducted to determine the effectiveness and impacts of the initiative. The WVSU EFNEP program initiated a

physical activity program with addiction recovery program participants, some of whom were women. It included walking, muscle development, aerobics, and training for a 5K.

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. 100% of participants in the addiction recovery program developed a structured physical activity routine that helps them exchange strengthen the mind, body, and spirit to refocus on health and wellness.

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	294

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
People who participate in Drug Court and recovery programs throughout the state often lack basic skills in food preparation, food safety, meal planning, grocery shopping and food resource management.

What has been done

Eleven Adult Nutrition Outreach Instructors and Health Educators in thirteen counties throughout the state partnered with Drug Court and Recovery programs to bring Eating Smart, Being Active (a nine-week course focusing on shopping and cooking healthy meals on a budget) to program participants and residents.

Results
Participants showed improvements in all core areas of the program; diet quality, physical activity, food safety and food resource management.

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 #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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	660

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Preventing obesity in early childhood is considered a key public health priority because childhood obesity tracks across the lifespan and is challenging to reverse. Numerous barriers to both healthy eating and physical activity in rural, low-income communities, including social norms, access, and other barriers related to the built environment. 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, Keys for Healthy Kids, and the WV Prevention Research Center, implemented the WV Healthy Children Project (WVHCP) and Key 2 a Healthy Start to promote proper nutrition and physical activity within early childcare. These programs implemented strategies for these best practices to be extended into the children's home and community settings as well. NAP SACC (Nutrition and Physical Activity Self-Assessment for Child Care Centers) and IMIL (I am Moving; I am Learning) served as the cornerstones of the ECE portion. Each ECE provider completed a NAP SACC self-assessment prior to intervention, which included nutrition, physical activity, outdoor play and learning, and screen time and developed an improvement plan.

Results

-Over 60 early childcare providers serving over 900 children within childcare centers, Pre-K/Headstart classrooms, and in-home facilities gained skills in implementing best practices for nutrition and physical activity;
-600 family members gained knowledge of how to be more physical active and eat healthier by being exposed to healthy family messages
-Through the use of key informant interviews, 71.9% of ECE facilities saw an increase in physical activity including indoor and outdoor active play.
-According to the physical activity portion of the NAP SACC self-assessments, centers significantly increased ($p<.05$) meetings best practices for physical activity by over 20% from pre- to post-assessment.

4. Associated Knowledge Areas

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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	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.

Results
Organizational partners are equipped to serve as heart health advocates; 2. 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
802	Human Development and Family Well-Being

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
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Physical activity and eating a nutrient-rich diet are the cornerstones of a healthy lifestyle. Although most individuals know the importance of these behaviors, too few individuals follow recommendations (Merrill, Friedrichs, & Larsen, 2002; Johnson, Sharkey, & Dean, 2010). Certain subsets of the general population, including women, those living in rural areas, and older adults, do not practice a healthy lifestyle (Cleland, Ball, King, & Crawford, 2012; Johnson, Sharkey, & Dean, 2010; Kruger, Carlson, & Buchner, 2007; Merrill, Friedrichs, & Larsen, 47462002).

What has been done
The Health Motivator program was created in 2008 by WVUES because of the poor health outcomes in WV and the research supporting peer-led health education. The WV Community Educational Outreach Service (CEOS) requested the program. The purpose of the Health Motivator program is to promote healthy lifestyles to club members by providing monthly educational materials on specific health-related topics (e.g., walking, brain health, healthy celebrations) from the club's trained Health Motivator. This translates to networks of friends and family and social support for group members to try new and maintain existing.

Results
The study results targeted three qualities of the Health Motivator Program that may be valuable and transferable for other states to consider. These include; 1) peer-led, train-the-trainer systems to provide research-based health information to community groups; 2) new curriculum content developed around a current health theme; 3) and brief, flexible, and easily accomplished activities for volunteers. Simple health education messages disseminated through trained volunteers may help address persistent chronic diseases, such as heart disease and diabetes. Extension's vast relationships with workplaces, churches, civic organizations and local governments provide an ideal opportunity.

4. Associated Knowledge Areas

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

Outcome #9

1. Outcome Measures

Advancing understanding of dietary intake and skeletal muscle mass change after weight loss among middle-aged men with obesity

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Adults over age 64 comprise the fastest growing segment of the U.S. population. Today, about one in eight Americans is over age 64. By 2030, one in five Americans, and one in four West Virginians, will be of this age. This rapid increase in the number of older people is expected to have critical implications on the healthcare system in terms of provision and availability of services, as well as costs. Preserving the health and functionality of older Americans is an urgent public health matter. Diet and physical activity patterns are major modifiable determinants of many age and obesity-related chronic diseases.

What has been done
A pilot study was designed to assess the feasibility and effectiveness of a telenutrition weight loss intervention compared to an enhanced usual care (EUC) control group in 40- to 70-year-old men with multiple risk factors for cardiovascular disease. A statistically significant weight loss from baseline to week 12 was detected in both groups but a larger proportion of participants in the intervention group than the EUC group lost at least 5% of their baseline weight (70% vs. 41%, $p = 0.035$). Based on the feasibility and effectiveness data, it was determined that a larger longer-term trial would be feasible and warranted in this at-risk population.

Results
This work is resulting in publications and conference presentations that help illustrate the association between dietary intake and skeletal muscle mass change after weight loss among middle-aged men with obesity.

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 #10

1. Outcome Measures

Advances in kidney disease

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Polycystic kidney disease (PKD) is an incurable genetic disease characterized by cyst accumulation resulting in massive kidney enlargement and structural damage. PKD is the leading genetic cause of end stage renal failure. Cysts can also spread to extra-renal organs, particularly the liver. Additionally, renal dysfunction has been associated with higher bone fractures. Given these various health complications, PKD is a major health issue with detrimental outcomes.

What has been done
The long-term goal of the study is to generate evidence in support of developing feasible diet therapies that will effectively slow PKD progression to renal failure and reduce disease complications while producing the fewest side effects. Specific aims are to: (I) evaluate the efficacy of dietary n-3 PUFA and/or soy protein isolate on renal cyst pathogenesis and kidney function and to determine potential molecular mechanisms of action, (II) determine whether dietary n-3 PUFA and/or soy protein isolate improves PKD-related complications by investigating liver cysts, hepatic function, and molecular mechanisms of action, and (III) assess whether dietary n-3 PUFA can enhance bone mass and attenuate bone loss associated with PKD progression. All three aims were achieved; however, Aim II showed feeding young female PCK rats soy protein and n-3 PUFA failed to attenuate liver cyst progression. Furthermore, feeding soy protein and n-3 PUFA as fish oil resulted in complications of hepatic steatosis.

Results
All three project aims were achieved. Results of the study have been presented at local research symposiums, national, and international conferences and have been published in nutrition

journals as original research as well as a review article.

4. Associated Knowledge Areas

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

Outcome #11

1. Outcome Measures

Advances in understanding of mental health disorders

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Mental health disorders affect 22.1% of the U.S. young adult population (ages 18?25), which is the highest prevalence of any age group [1]. Two common disorders in young adults are major depression and anxiety, occurring at 10.9% and 22.3%, respectively. These disorders are often attributed to a serotonin deficiency and are treated with medications such as Selective Serotonin Reuptake Inhibitors. Historically, nutrition has been overlooked as a contributor to poor mental health, but there is an increasing focus on this relationship, largely due to the central nervous system's need for key nutrients to maintain optimal function.

What has been done
When looking at determinants of mental health symptoms, there were differences between sexes. For males, the significant predictors of depression were fruit and vegetable intake and food insecurity, and for anxiety, the significant predictors were added sugars intake and food insecurity. For females, the significant predictor of depression was food insecurity, and for anxiety, the significant predictors were added sugars intake and food insecurity. These findings are consistent with previous studies showing differences in dietary patterns of males and females with mental health disorders [26?28]. These are also consistent with studies showing links between mental health and both dietary intake [26?30] and food insecurity [5?10], with lower intakes of healthy foods and higher rates of food insecurity showing an increase in prevalence of

mental health symptoms.

Results
The results of this study illustrate the importance of providing access to affordable healthy foods can improve the rates of mental health disorder symptoms in the university environment. Access to healthy foods and dietary quality are associated with mental health, and these factors are modifiable. Improving these factors can improve the mental health of students, and thus may enhance their academic success. Results of the study have been published in multiple journals and have been presented at national conferences.

4. Associated Knowledge Areas

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

Outcome #12

1. Outcome Measures

Brassica crop production

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Brassica crops are important vegetables worldwide. According to the Food and Agriculture Organization (FAO, 2016), the total production of Brassica vegetables was ranked at 5th, following tomatoes, watermelons, onions, and cucumber. In the US, consumption of Brassica vegetables also ranks high among vegetable crops, after tomatoes and lettuce. The Brassica crops are considered nutritious, in part due to glucosinolates, which are known for their anticarcinogenic activity. In addition, Brassica vegetables provide phenolic compounds, carotenoids, vitamins, and minerals. Considering the importance of Brassica crops in human diets, the mineral composition of Brassica vegetables needs to be more carefully investigated.

What has been done
A total of 8 minerals were analyzed from the edible tissues of the 13 Brassica crops grown. Pak

choi, mustard green, and komatsuna were found to be generally high in minerals compared to other crops, but we also found a significant difference in mineral composition among the 13 Brassica crops. Additionally, a significant effect of crop and growing year, as well as their interaction on mineral concentration, was found. Minerals Fe, Zn, P, and Mn were significantly affected by both main effects (growing year and genetic difference) and their interaction, but K was only affected by crop. In contrast, only growing season was significant for Na.

Results

Study results indicate that both genetic difference (crop) and environment have significant influence on uptake and accumulation of most minerals analyzed in this study. However, crop effect was significant for all minerals except for Na, suggesting that crop selection is very important for better mineral-based nutritional value of Brassica vegetables.

4. Associated Knowledge Areas

KA Code	Knowledge Area
502	New and Improved Food Products
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior

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

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.

Kids Farmers Markets

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 markets and supplemented their income. In addition to the $20,000 in kids coupons it has provided local farmers with over $70,000 in sales. The Mountaineer Foodbank has adopted the Kids Markets Model to distribute food to needy children in a way which engages them in the choice, increasing the likelihood they will eat the foods provided. The program has crossed state lines and is currently being piloted by an agriculture agent at Ohio State University in Washington County, OH.

Choose Health Program

In the Choose Health program 43% of 6th-8th grade students increased their consumption of fruits and vegetables and 36% reduced the amount of sugary drinks. Physical activity practice improved by 36% increasing their activity to at least 1 hour/day. Students in grades

9-12 improve vegetable consumption by 41% and fruits by 33%. Physical activity was increase to 1 hour/day by 23% of the participants.

Health Motivator

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. 100% of participants in the addiction recovery program developed a structured physical activity routine that helps them exchange strengthen the mind, body, and spirit to refocus on health and wellness.

Love Your Heart Partnership

Organizational partners are equipped to serve as heart health advocates; 2. 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).

WV Healthy Children Project and Key 2 a Healthy Start

-Over 60 early childcare providers serving over 900 children within childcare centers, Pre-K/Headstart classrooms, and in-home facilities gained skills in implementing best practices for nutrition and physical activity;

-600 family members gained knowledge of how to be more physical active and eat healthier by being exposed to healthy family messages

-Through the use of key informant interviews, 71.9% of ECE facilities saw an increase in physical activity including indoor and outdoor active play.

-According to the physical activity portion of the NAP SACC self-assessments, centers significantly increased ($p<.05$) meetings best practices for physical activity by over 20% from pre- to post-assessment.

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	40%	0%	0%	0%
703	Nutrition Education and Behavior	10%	0%	25%	0%
724	Healthy Lifestyle	10%	0%	0%	0%
802	Human Development and Family Well-Being	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: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	20.0	1.0	1.0	0.0
Actual Paid	14.0	0.0	1.8	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	240478	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
573590	0	312024	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	273052	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
Among many ongoing studies in program five, investigators sprayed antimicrobials using electrostatic versus conventional sprayers to deactivate Salmonella on eggs. Methods of deactivation were compared to test for Listeria monocytogenes and Campylobacter jejuni on eggs and their subsequent economic feasibility. The efficacy of commercial antimicrobials was evaluated to compare the efficacy towards deactivating unstressed and various stress-adapted Campylobacter jejuni on broiler (chicken) wings using immersion and electrostatic spray methods. Ongoing work included Ceca and carcass samples that 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 was shown to reduce Salmonella and Campylobacter on processes broiler carcasses. Microbiological quality and efficacy of antimicrobials were evaluated in terms of ability to inactivate unstressed or cold-stress adapted Salmonella and Enterococcus on broiler carcasses. Ongoing studies (validations) support that the reduction of Salmonella and Enterococcus on carcasses and wings increased. Applying post-chilling antimicrobial dipping treatments is still indicated as an intervention to control Salmonella. This ongoing work is of critical economic and human health importance in the chicken industry.

Research program highlights for 2018 include:

- Electrostatic spraying of commercial antimicrobials is an effective and economical approach to enhance microbial safety of eggs, particularly for small poultry processors.
- Applying post-chilling antimicrobial treatments particularly PAA and LA could effectively reduce Campylobacter on broilers.
- Enterococcus faecium may serve as a Salmonella surrogate for in-plant validation studies.
- Applying post-chilling antimicrobial dipping treatments is a viable intervention to control Salmonella.
- The WVU-AFES recently added a joint faculty position with WVUES in the food safety area.

WVUES

The food safety 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.
In 2018, WVUES faculty were involved in local and regional efforts to train producers, adults, youth, and other Extension faculty and staff. Programs help participants gain skills in home food preservation, commercial food preservation, implementing food businesses, electric pressure cooker and slow cooker safety, fruits and vegetables drying, gardening and food safety, and hand washing. Specific activities include: food preservation and canning workshops, Venison 101, Food Handler training, Produce Safety Alliance Grower Training, Farmers Market Safety Training, Writing Your Farm Food Safety Plan, and the Germ Stops Here Program. EFNEP and SNAP programs also teach food safety.
WVSU-GRDI

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

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	2685	141000	2507	0

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	1	1

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Events including conferences, demonstration, field days, symposia, workshops and trainings

Year	Actual
2018	104

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	Chicken production and post-chilling antimicrobial advancements
9	Salmonella control techniques
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.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	1081

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The increased number of produce related foodborne illness outbreaks in the US has raised concerns with the safety of fresh produce and have increased the importance of communicating to consumers that locally-produced agricultural products have followed government-mandated safety protocols. WV producers need a better understanding of local, state, and federal food safety regulations, as well as the ability to comply in a cost effective manner. Failure to be proactive in food safety education and compliance will result in local producers being vulnerable to food safety liability and loss of lucrative markets. Maintenance of a cold chain for perishable food items provides an increase in food quality and can extent distribution and market area.

What has been done
WVUES is building infrastructure to support a state-wide culture of food. It developed a multidisciplinary effort to deliver continuous, comprehensive food safety education and a technical assistance program aimed at reducing the risk of contamination of fresh and fresh cut fruits and vegetables. There are two levels of training: Level 1: Train the Trainer (Agricultural Service Providers - ASPs): and Level 2: Train the Producer. WVSUES delivers workshops and technical support to raise the consciousness of producers toward risk management through proper pre- and post-harvest handling techniques, cold chain implementation and proper packaging.

Results
25 members of the WV Food Safety Training Team gained knowledge of FSMA regulations and GAPs recommendations and learned to implement food safety plans.
232 producers gained knowledge of food safety risks, recommended GAPs/GHPs, on-farm food safety assessment, economics of food safety, food safety planning, record-keeping, voluntary certification, and communicating food safety compliance.
100% of producers at training reported their intent to implement at least two food safety

recommendations,
76% agreed to develop a food safety plan and 56% will apply for GAPs audit.
87 producers gained knowledge of food safety risks, recommended GAPs/GHPs, and writing food safety plans. 34% implemented a food safety plan and 10 have passed their GAPs.
70% of WVSUES respondents have demonstrated through experiential activities best management activities in the production of small fruits and vegetables.

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 #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
2018	116

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There is a need for food safety trainers in West Virginia as shown by the large number of requests for these classes and the large number of food safety questions received by the State Food

Safety Specialist.

What has been done

Food safety training in WV is offered in combination with various workshops such as Food For Profit, Food Preservation, ServSafe®, Hazard Analysis Critical Control Points (HACCP), Good Manufacturing Practices (GMPs) etc. These programs train educators as well as producers, processors, and home food preservers. Ten agricultural professionals in WV (36 in total for WV, PA, TN, and OR) were trained to deliver food safety programs and one-to-one consults on how to set up and manage a food venture. As a part of this work, between 2013 and 2017, 13 workshops were held in WV by WVU Extension Service field faculty who facilitated and made presentations about food safety and food business development.

Results

An on-line survey of a representative sample of participants from the workshops (6 to 12 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

Outcome #4

1. Outcome Measures

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

Not Reporting on this Outcome Measure

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
2018	2544

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 2018, the Energy Express program, a six-week summer literacy program, served 120,936 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 2000 children ate balanced nutritional, well-prepared, safe meals during the summer of 2018, 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
802	Human Development and Family Well-Being

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

Chicken production and post-chilling antimicrobial advancements

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	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
724	Healthy Lifestyle

Outcome #9

1. Outcome Measures

Salmonella control techniques

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	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
703	Nutrition Education and Behavior
724	Healthy Lifestyle

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
2018	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
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

Food Safety Training
25 members of the WV Food Safety Training Team gained knowledge of FSMA regulations and GAPs recommendations and learned to implement food safety plans.
232 producers gained knowledge of food safety risks, recommended GAPs/GHPs, on-farm food safety assessment, economics of food safety, food safety planning, record-keeping, voluntary certification, and communicating food safety compliance.
100% of producers at training reported their intent to implement at least two food safety recommendations,
76% agreed to develop a food safety plan and 56% will apply for GAPs audit.
87 producers gained knowledge of food safety risks, recommended GAPs/GHPs, and writing food safety plans. 34% implemented a food safety plan and 10 have passed their GAPs.
70% of WVSUES respondents have demonstrated through experiential activities best management activities in the production of small fruits and vegetables.

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

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	19.0	6.0	7.0	0.0
Actual Paid	11.0	5.0	9.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
500000	300588	735237	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
368179	136947	783353	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	345596	449058	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 six have generated a multitude of benefits for the citizens of West Virginia, Central Appalachia 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 Appalachians' quality of life. For example, ongoing research is characterizing sector-specific market dynamics, to more accurately predict market changes, more effectively develop West Virginia economic resources (e.g. agriculture, energy, knowledge), and improve the livelihoods of citizens across the state. Other efforts are also underway to demonstrate and expand the evidence for the role of parks and outdoor recreation in promoting physical activity and associated preventative health benefits. Additional progress is advancing 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 six are helping the people of West Virginia and Central Appalachia balance the often competing and confounding factors that influence economics at the community-level.

Research program highlights for 2018 include:

- Advancing understanding of agricultural and energy commodity markets, to improve price forecasting and risk management, and to characterize the influence of commodity market volatility on economic development and environmental protection.
- Creating and developing a county knowledge-based economic index, building on existing research and extending it to fit regional (county) scales.

- Demonstrating the potential development opportunities for sustainable fashion through case studies analyzed.
- Developing a methodology and using advance geospatial technologies to assess inclusive wealth in economically-repressed regions.

WVUES

At WVUES program activities were carried out within the following units: the Fire Institute, the Institute for Labor Studies and Research, Safety and Health Extension which includes the OSHA Training Institute, and Community Development initiatives. Activities and educational events in this planned program include:

Fire Institute: WV State Fire Marshal Academy, National Junior Firefighter Camp, WV State Fire School.

Institute for Labor Studies and Research: Appalachian Construction Users Council, Steward Training, United Mine Workers Summer School, US Labor and Building Trades history classes.

Safety and Health Extension: OSHA classes and Timber-Safe Software Training.

Community Development: Tourism, Government Planning and Public Policy, Business Retention and Expansion, Community Leadership Academy, Extension Service Committees, Quilt Trail, Primary/Real Colors, Histories at the Museum, Languages of Appreciation in the Workplace, leadership training, festivals and fairs coordination, Recruitable Communities Program, Road Scholar Program Tour, strategic planning training, community collaboration training, the WV Agritourism Initiative, the Histories at the Museum program, and USDA Small Business Innovation Research Grant Program.

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 2018:

- 85 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

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	23896	39510	4440	1825

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	1	18	19

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Events including conferences, demonstration, field days, symposia, workshops and trainings

Year	Actual
2018	566

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 persons with disability who are helped to find solutions to work-related barriers to agriculture employment.
12	Implementation of a new course to help union members better understand the past experience of workers in order to benefit the future group of workers.
13	Population decline of rural communities
14	public resistance of renewable energy facilities
15	The collaborative landscape of architecture and community development
16	Facility related benefits in urban care

Outcome #1

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	1992

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
A destination competitiveness study in partnership with the RPTR Program revealed hospitality as WV's top competitive strength in each of the regions in which the study was conducted. Hospitality training is vital to maintaining a competitive advantage. Community leaders revealed a lack of training and support for front line hospitality employees.

What has been done
WVUES partnered with the WVDE Hospitality Education and Training committee to improve hospitality training curriculum. The goals are to improve the quality of service to guests, build guest loyalty, improve impacts to WV businesses, and bring in investors. This year WVUES partnered with Hollywood Casinos in Charlestown to test a different approach to in-person hospitality. We also offered a separate training utilizing ARC GIS asset maps. Online asset maps were posted on destination tourism websites.

Results
In 2018, 1,992 participants enrolled in and completed the online WV Welcome hospitality training and 150 frontline tourism employees participated in in-person hospitality trainings at tourism summits in Tucker and Jefferson counties. A pre/post evaluation demonstrated an increase in knowledge in each of the major components of the course. The highest mean differences between pre- and post-test indicated that participants learned how to deal with different types of visitor needs and how to deal with upset guests, as well as an increase in knowledge of attractions in surrounding areas. Since there was a larger increase in knowledge for classroom trainees as compared to online trainees, we will be focusing on classroom delivery. We will also be developing a separate training focused on increasing knowledge of attractions in the surrounding area.

4. Associated Knowledge Areas

KA Code	Knowledge Area
134	Outdoor Recreation
608	Community Resource Planning and Development
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services
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
2018	50

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Some towns in WV, such as Bethany, have comprehensive plans that are nearing the end of their functional lives set by law and need to be revised. Changing circumstances such as a slowing of development in some counties, such as Boone, have been negatively impacted by the decline of coal and the opioid crisis. Other county groups such as the Ritchie County Regional Health Center are having difficulty recruiting professionals.

What has been done
A WVUES community development specialist worked with town officials in Boone County officials to develop recommendations for focusing development activities and in Hampshire County to develop and update plans. He also worked with the planning commission and the county planner in Tucker County to finalize a subdivision ordinance. The Recruitable Communities Program worked with community stakeholders in Harrisville to determine projects that could be done to improve the community. He worked with the Westover Planning Commission to amend zoning regulations. County planners received grant-writing training to help secure more funding.

Results
Bethany is expected to have its plan completed in early 2019 and has corrected errors on its

zoning map. Boone is moving forward with development ideas as part of a comprehensive plan for the county in 2019. Hampshire County's draft plan is ready for the formal approval process. Communities that worked with the RCP improved signage and recreation facilities. In Ritchie County, connections were made between the educational and the medical communities. The planning commission in Tucker County has a solid subdivision ordinance proposal with rules to protect property owners from uncontrolled development. In Westover, the city amended its zoning regulations to include a "planned unit development" category and eliminated the review of Conditional Use Permit applications by the Planning Commission and giving it to the Code Enforcement Officer which will allow for more orderly development activities in the city.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
608	Community Resource Planning and Development
805	Community Institutions, Health, and Social Services

Outcome #3

1. Outcome Measures

Number of volunteers who increase or improve skills.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	1300

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Extension Master Gardener Program offers an outlet for people interested in gardening to learn more about horticulture. That fits well with the observed trends in the last decade of people wanting to know where the food comes from and a movement "grow local-buy local." Locally produced fruits and vegetables are left to ripe on the tree and/or vine as nature intended. They are sold to the consumers within hours of being harvested ensuring the freshest and best-tasting food. Besides, local food helps community overcome "food desert" designation, helps community grow and aids to farm sustainability. This gardening renaissance is rapidly moving food gardening towards the top of the nation's pastime.

What has been done

Extension Master Gardener Program offers an outlet for people interested in gardening to learn more about horticulture. That fits well with the observed trends in the last decade of people wanting to know where the food comes from and a movement "grow local-buy local." Locally produced fruits and vegetables are left to ripe on the tree and/or vine as nature intended. They are sold to the consumers within hours of being harvested ensuring the freshest and best-tasting food. Besides, local food helps community overcome "food desert" designation, helps community grow and aids to farm sustainability. This gardening renaissance is rapidly moving food gardening towards the top of the nation's pastime.

Results

Trained volunteers in 46 counties through the West Virginia Extension Master Gardeners Association (WVEMGA) in coordination with the WVU Extension Service, help people better understand horticultural and environmental issues by community engagement through gardening and beautification projects at schools, parks, public institutions, community organizations, etc. The state-wide membership has increased for estimated 200 new members statewide bringing the total number of active Extension Master Gardener members to about 1,400. It is important to mention that when it comes to reporting volunteer engagements, we are always one year behind. In the 2017/18, thirteen counties reported their volunteer efforts. They have logged 13,252 volunteer hours on 88 projects. At the national rate of $24.69/hour for the value of volunteer work, Extension Master Gardeners contributed to their local and state economy with $327,192. In 2018 we added 186 new EMG Trainees; they have completed the training and have 2018 and 2019 to complete their volunteer requirements to become certified Extension Master Gardeners.

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	500

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Ensuring that youth involved in the West Virginia University Extension Service 4-H program are protected in a safe and nurturing environment is a critical component of a positive youth development experience. In order for this to occur we must ensure that our 4-H adult volunteers are trained and knowledgeable about required West Virginia University policies and practices.

What has been done
The West Virginia University Extension Service works with the West Virginia University Office of Diversity Equity and Inclusion to have an established and consistent vetting policy for our 4-H volunteers. This includes volunteer application, background check, completed references, interview, annual National Sex Offender Public Website check, signed Code of Conduct, and Protecting Our Children training. The Protecting Our Children training is required annually and includes training on all items related to WVU BOG Rule 1.7

Results
All West Virginia 4-H volunteers complete annual Protecting Our Children training. This resulted in increased knowledge and practices on identifying and reporting requirements for child abuse or neglect, and appropriate supervision of children involved in programs sponsored by the University or on University premises. Consequently, as a result of this annual training, our volunteers are better equipped to complete their volunteer role and youth are engaged in a safe and supportive positive youth development experience.

4. Associated Knowledge Areas

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

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

2018 200

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A problem found across industries is that the supervisor often lacks basic leadership knowledge and skills to effectively manage. Some companies have implemented leadership training with limited impact to employees belonging to those groups. Many newly promoted supervisors are required to take the OSHA-30-hour course in which they learn about how to recognize workplace hazards and communicate compliance issues. However, the OSHA 30 hour does not currently have a formal elective on Leadership principles.

What has been done

The Foundations for Safety Leadership (FSL) program is designed to improve safety climate on construction work sites across the US. WVUES designed a curriculum and training program that was approved by OSHA as an elective topic in the OSHA 30-hour training program.

Results

Data from 20 companies across 3 geographic areas are still being collected. Preliminary analysis indicates that 1) leadership skills and safety climate improve 2 and 4 weeks after the training; 2) leaders understanding of safety leadership skills improved; 3) leaders actively participate in the safety program to a greater degree, however, the impact did not appear to trickle down to the workers; 4) leaders perceived an increase in their crew's safety reporting practices; 5) workers perceptions of their leaders' safety leadership behaviors improved after the training; 6) workers improved relationship with leader; and 7) workers self-reported 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

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
2018	92972

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The OSHA Training Institute (OTI) Education Center program was initiated as an extension of the OSHA Training Institute, which is the primary training provider of the Occupational Safety and Health Administration. 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, West Virginia University Safety and Health Extension was selected by OSHA to become an OSHA Training Institute Education Center (OTIEC). The National Resource Center (NRC), an OTIEC in OSHA's Region III, covers the District of Columbia, Delaware, Maryland, Pennsylvania, Virginia, and West Virginia. One of the most important objectives of all OTIECs is to train and authorize those with safety education job-related responsibilities to deliver the OSHA 10 & 30 hour hazard awareness courses.

Results
The above numbers yielded a ranking of 3rd out of the Nation's 27 education centers. The average post test score was 94.8% (n=326). Minimum passing score is 80%. The average performance assessment was 94.1% (n=326). Minimum passing score is 66.6%. A 6 month follow up survey reported (n=185) that 93% of respondents used the training techniques learned in WVU courses when delivering training and 58% made changes to company safety and health programs as a result of new information gained at a WVU course. It should also be noted that 89,882 students received OSHA 10 or 30 hour training in 2017 from those authorized through our OTIEC.

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

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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The Westside of Fairmont has a predominantly African American population (40% vs. a state average of 3%). While the unemployment rate is low, poverty rates are very high and the median household incomes are approximately 42% below the state average. The neighborhoods have lost many basic goods and services. Residents expressed a desire to increase minority-owned local businesses, entrepreneurship opportunities, and the fulfillment of basic needs and services (Stout, et al., 2016).

What has been done
A WVUES specialist has worked with The Windmill Entrepreneurship Support Clinic that provides a plan to revive community entrepreneurship by leveraging and connecting local assets, residents' ideas and talents, and the resources of local service providers. The resulting Neighborhood Action Plan contains strategies designed to achieve objectives and goals for social, economic, and physical development. The Fostering Fairmont Initiative: Windmill Entrepreneurship Support Clinic was selected for immediate action by members of the Westside Action Coalition.

Results
The project linked community initiatives and university based entrepreneurship programs, including the WVU Law School's Entrepreneurship and Innovation Clinic, and the WVU Women's Business Center. Three community members pledged $5,000 each ($15,000 total) in investment to support a local entrepreneur who is expanding his handy-man business to address construction/rehabilitation and demolition of vacant and dilapidated housing in the neighborhoods.

4. Associated Knowledge Areas

KA Code	Knowledge Area

602	Business Management, Finance, and Taxation
605	Natural Resource and Environmental Economics
608	Community Resource Planning and Development
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures
805	Community Institutions, Health, and Social Services

Outcome #8

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	17

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Resources for quality of life, recreation, healthy living and physical activity are often lacking in WV communities. Many community groups need assistance in identifying needs, designing solutions, and applying for funds to carry out community development projects.

What has been done
In 2017, WVUEs partnered with landscape architecture faculty to provide design and planning services,. The projects include: Camp Pioneer- Randolph County, New River Gorge Learning Center, Fayette Community Center, Marlinton Opera House Empty Lot Design, Pocahontas, Community Center, Upshur County Youth Camp-EPA Tarpit Mitigation, Upshur, Community Center, Westside Fairmont Neighborhood Design, Elkins Railroad Avenue Design, Randolph, Community Center, Lost Creek Design, Marion Community Center. In 2018, reviews of plans were conducted.

Results
Some community groups have made physical changes to their living environments to improve their quality of life. Others now have plans for which they will pursue funding and implementation. Camp Pioneer adopted the plan for rehabilitating the vespers. New River Gorge Learning Center is working on landscape development tied to a Montessori curriculum development and the AGEE program at WVU. Marlinton Opera House is now called "Discovery Junction." Excavation and

construction of the park has begun with local funding and a state soil and water conservation grant.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
608	Community Resource Planning and Development
805	Community Institutions, Health, and Social Services

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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Economic development has moved beyond cost cutting and incentive programs. Rather, communities and regions are selling the place, the people, and the unique local assets that provide a competitive advantage. Leaders must evaluate assets and obstacles, recognize business and industrial structures, analyze their economic base, and appreciate the characteristics of their population and workforce. Communities often have difficulty knowing what data exist, where to find them, how to analyze them, and how to interpret them in the context of their daily lives.

What has been done
In 2018, a synthesis and interpretation of marketing data was done for Princeton, WV and was submitted to the Princeton Renaissance Project. An economic impact analysis to support tourism planning efforts was done for Tucker County and submitted to the Tucker County Cultural District Authority and the Mill Town Community & Economic Development Corporation. Community housing reports were submitted to the Weston, WV Better Buildings Committee.

Results

The data from work in Tucker County is providing a baseline to track the county's tourism economy and evaluate the impact of interventions. Leadership from the Princeton Renaissance Project are building on report recommendations and increasing their dialogue with locally owned, downtown businesses. The team has requested follow-up survey work to better understand the creative economy businesses that are currently located in the community, what attracts/retains them in the community, the regions strengths and barriers to growth, missing skills and assets, and how the Princeton Renaissance Project could more effectively facilitate and leverage relationships between businesses to more effectively market the community.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
608	Community Resource Planning and Development
805	Community Institutions, Health, and Social Services

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

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The OSHA Training Institute (OTI) Education Center program was initiated as an extension of the OSHA Training Institute, which is the primary training provider of the Occupational Safety and Health Administration. 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

What has been done
In 1994, WV University Safety and Health Extension was selected to become an OSHA Training Institute Education Center (OTIEC). The National Resource Center (NRC), an OTIEC in OSHA's Region III which covers the District of Columbia, Delaware, Maryland, Pennsylvania, Virginia, and

West Virginia. The Center held 269 courses in 2018, a 15.9% increase from 2017. A total of 3,457 students were trained in 2018, an 11.9% increase from 2017. Our Authorizing OSHA Trainer Courses outreach instructors trained 109,719 students, an 8.2% increase from 2017.

Results
The NRC ranked first in the number of outreach cards distributed (109,719). The gross revenue associated with the center for 2018 was $1,013,954.13 (Public courses $478,486.13, Contractual 257,190.00 and Fees for cards $278,278.00). It should be noted, that in 2011 the gross revenue was 636,906.08. Over the past 7 years, there has been a 60 % increase in gross revenue. Since much of the Oil & Gas activity is within the state of WV, many of those who attend our education center courses live in WV and work for oil & gas companies.

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures

Outcome #11

1. Outcome Measures

Number of persons with disability who are helped to find solutions to work-related barriers to agriculture employment.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	875

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
West Virginia AgrAbility (WVA) increases the likelihood that individuals with disabilities and their families engaged in production agriculture (AgrAbility customers) become more successful. The vision of AgrAbility is to enable a high quality of life for farmers, ranchers, and other agricultural workers with disabilities. While the term "disability" often brings to mind conditions such as spinal cord injuries and amputations, AgrAbility addresses not only these but also many other conditions, such as arthritis, back impairments, and behavioral health issues.

What has been done

WVA is a collaboration between WVU Extension Service -Safety and Health, West Virginia State University and the partnership of ARCMOV and WVATS. It provides education to farming communities on agriculture, disability accommodations, and secondary injury prevention. It networks with stakeholders to enhance financial, rehabilitative and educational opportunities, direct assistance to farmers with disabilities through farm site assessments and peer support. In 2018, 875 farmers, rehabilitation professionals, veterans and other providers of services to persons with disabilities who engage in farming or farm related occupations received training and/or services from WVA.

Results

WVA conducted farm assessments and agricultural workers self-completed the McGill Quality of Life Survey. The MQOL is comprised of items measuring physical well-being and four subscales: physical symptoms, psychological symptoms, existential well-being, and support. A 10 point Likert scale used for consumers to score themselves on ten items including the area of 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

Outcome #12

1. Outcome Measures

Implementation of a new course to help union members better understand the past experience of workers in order to benefit the future group of workers.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	2000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Several years ago, the United Association International Training Fund (UAITF) discontinued the history and heritage program that they had used to orient new members and apprentices. In the years since then, leaders and apprentice instructors have noticed that knowledge of the organization's past, the context of contemporary decision making, and social, economic, and political cohesion among their members have declined. Therefore, the UAITF solicited proposals to create a new credit course to be taught in multiple formats to apprentices and members.

What has been done

After accessing the existing course materials, a specialist at WVUES submitted a proposal to design a new course in both live teaching, face-to-face, and fully online formats. The curricula will cover the history of work, labor, and the various crafts that comprise the United Association's jurisdiction from colonial times to present in Canada and the United States. This labor history curriculum will address the history of North America through the lens of the United Association's past.

Results

The UA operates six local training programs within West Virginia including over 2,000 members and apprentices who will have access to the course. In addition, the program will be made available to the over 360,000 members of the UA in the United States and Canada. A well-crafted history program for UA members will help the community of UA members better understand the present in ways that orient the group to the future. The course will ask questions and provide answers that are relevant to the UA community at large rather than just responding to the scholarly community of inquiry.

4. Associated Knowledge Areas

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

Outcome #13

1. Outcome Measures

Population decline of rural communities

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Rural communities are experiencing increased population decline, as young people and the highly-skilled move to urban areas to take advantage of urban opportunities. Rural areas with large natural resource endowments (coal, oil, natural gas) are also susceptible to the boom and bust cycles of economic highs and lows. A potential risk for communities that are heavily reliant on natural resource endowments is that resource production booms can crowd out other economic activity, thus leading to lower long-term growth. An additional challenge is that many rural areas have recently seen a dramatic increase in opioid abuse and the related impacts on people and communities. For regions with a history of economic distress, like the Appalachian region, economic distress may be contributing to opioid use. At the same time, the increasing health epidemic risks making economic recovery in these regions more difficult as a healthy workforce is a necessary component for economic success.

What has been done

This project will examine several potential drivers of growth or decline and their impact on rural communities. This project will use disaggregated micro-level data on businesses, energy development, properties, and people, and statistical techniques to examine various factors and their relationship to U.S. rural community-level growth.

Results

The presentation of this research at national conference and pending publication will help us better understand how economic activity at the local level can be impacted by energy development and whether long-term growth may be affected. It can also help communities target resources to prevent negative economic outcomes and promote long-term economic vitality.

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 #14

1. Outcome Measures

public resistance of renewable energy facilities

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Although proposals for renewable energy (RE) facilities encounter less public resistance if sited in already compromised landscapes, this could increase environmental and social injustice. The purposes of the project are to recognize former mine sites where the development of RE is feasible, to determine the possible negative impacts on landscape and communities, and to identify design strategies to avoid, reduce, or mitigate the impacts. Design guidelines have been created for RE facilities installation in rural and natural contexts; whereas design guidelines applicable to compromised landscapes - as former mine sites are - have never been developed. This is the gap in knowledge the project will help address.

What has been done
The research should result in novel knowledge of design principles and recommendations for RE development in former mine lands that can be extended to spoiled landscapes. Design recommendations will be elaborated for the use by government officials, policymakers, stakeholders, and local residents for informed future planning, design and development.

Results
The project will develop a design toolkit for the transformation of former mine sites into renewable energy (RE) facilities that would consider landscape characteristics and community preferences in order to avoid, reduce, or mitigate further landscape negative impacts.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures
805	Community Institutions, Health, and Social Services

Outcome #15

1. Outcome Measures

The collaborative landscape of architecture and community development

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
As a profession and discipline, the fields of landscape architecture and community development are necessarily collaborative. Cultivating relationships between practitioners, academics, community members, local officials, non-government organizations, etc. builds capacity to make progress towards identified goals and objectives. This project brings together a diverse array of disciplines and expertise to establish a robust approach to community development and planning with a focus on recreation and heritage resources in rural West Virginia.

What has been done
Community plans have been developed and delivered to stakeholder groups in rural West Virginia Communities.

Results
This community planning and design support contributed to the community of Marlinton, WV, successfully obtaining external funding (approximately $200,000) to build a community park, Discovery Junction, which will enhance recreational opportunities and improve environmental literacy through the use of native plants.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
608	Community Resource Planning and Development

Outcome #16

1. Outcome Measures

Facility related benefits in urban care

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There is a growing body of knowledge that points to tangible and measurable facility related benefits in the urban care setting, namely well-funded hospitals and clinics that can avail themselves of cutting-edge health care design expertise. However, nearly 20% of health care is delivered in the rural setting where there are limited dollars for capital improvements. When there is funding for facility upgrades, those capital improvements should be maximized in order to help those facilities deliver the best care possible.

What has been done
This project will assess the potential of evidence-based design to improve the delivery of health care in rural settings, as well as to determine how and if better design of rural health care facilities can lead to improved patient and provider outcomes in the rural setting. Survey data has been collected for my project looking at healthcare access barriers for persons on the autism spectrum.

Results
Published manuscript, "Impact of Design on Patient Participation in Healthcare in a Rural Health Clinic in Appalachia," highlighted a connection between the design of the physical facility and the participation of elderly patients in their own healthcare. A follow up study used similar methodology and found additional connections on facility and participation in those who identified as having a disability.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land
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

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

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

WVDE Hospitality Education

In 2018, 1,992 participants enrolled in and completed the online WV Welcome hospitality training and 150 frontline tourism employees participated in in-person hospitality trainings at tourism summits in Tucker and Jefferson counties. A pre/post evaluation demonstrated an increase in knowledge in each of the major components of the course. The highest mean differences between pre- and post-test indicated that participants learned how to deal with different types of visitor needs and how to deal with upset guests, as well as an increase in knowledge of attractions in surrounding areas. Since there was a larger increase in knowledge for classroom trainees as compared to online trainees, we will be focusing on classroom delivery. We will also be developing a separate training focused on increasing knowledge of attractions in the surrounding area.

The Foundations for Safety Leadership Program

Data from 20 companies across 3 geographic areas are still being collected. Preliminary analysis indicates that 1) leadership skills and safety climate improve 2 and 4 weeks after the training; 2) leaders understanding of safety leadership skills improved; 3) leaders actively participate in the safety program to a greater degree, however, the impact did not appear to trickle down to the workers; 4) leaders perceived an increase in their crew's safety reporting practices; 5) workers perceptions of their leaders' safety leadership behaviors improved after the training; 6) workers improved relationship with leader; and 7) workers self-reported increased compliance with safety procedures.

OSHA Hazard Awareness Courses

The average post test score was 94.8% (n=326). Minimum passing score is 80%. The average performance assessment was 94.1% (n=326). Minimum passing score is 66.6%. A 6 month follow up survey reported (n=185) that 93% of respondents used the training techniques learned in WVU courses when delivering training and 58% made changes to company safety and health programs as a result of new information gained at a WVU course. It should also be noted that 89,882 students received OSHA 10 or 30 hour training

in 2017 from those authorized through our OTIEC.

West Virginia AgrAbility

WVA conducted farm assessments and agricultural workers self-completed the McGill Quality of Life Survey. The MQOL is comprised of items measuring physical well-being and four subscales: physical symptoms, psychological symptoms, existential well-being, and support. A 10 point Likert scale used for consumers to score themselves on ten items including the area of 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.

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

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	2.0	1.0	4.0	0.0
Actual Paid	2.0	1.5	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	90176	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
34329	41984	231475	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	150582	432966	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
The over-arching program goal is to advance the technology and understanding of contemporary forestry science and management. Individual research programs are focused on development of the scientific and technological foundations for the use of lignocellulose as a potential biomedical nanomaterial. Additional forest products research includes quantitative characterization of the alternative energy potential of woody and vegetative biomass species, which could increase and diversify the energy market in the state. Regarding the intersection between forestry and energy development, efforts are currently underway to advance understanding of the effects of natural gas extraction, an increasingly widespread practice in West Virginia, on the forest products industry and forest management by private landowners. Various research activities are directed toward serving private landowners and stakeholders, including improving profitability and productivity of naturally regenerated eastern forests via the development of adaptive management approaches to help individuals achieve economic and intrinsic goals. Scientists are utilizing digital image correlation to improve understanding of strain in urban trees, to improve risk management in urban forestry and optimize the safety of public, community spaces. Given the impacts of climate change and land conversion on the health and viability of ecosystems, it is necessary to understand the complex interactions between resource management and ecology. Therefore, to improve long-term sustainability of forest management, the non-market value of forest biodiversity is being estimated and used to integrate biological conservation and forest management. Additionally, ecological assessments are being conducted for beech bark disease and a recently discovered fungal pathogen responsible for red oak decline, and disease management practices are being developed. Collectively, research activities within the program area are benefiting West Virginia communities via improved management of the state's vast forest resources and enhancement of the forest products economy.
Research program highlights for 2018 include:

- Development of new technologies to advance urban forestry and improve risk management in greenspaces.
- Advancement of adaptive management strategies for private landowners and stakeholders.
- Initial characterization of newly discovered fungal pathogen responsible for red oak decline.

- A total of 20 presentations were made at local, regional, national, and international conferences, widely disseminating the results of climate change, environmental quality and stewardship research projects.

WVUES
In 2018, WVUES Extension offered programs in production/sustainable forestry which target youths, landowners, and commercial enterprises. Programs and activities in 2018 included:

Forestry: Consulting Forester Forum, CPR and First Aid for Loggers, Enhancing Woodland Productivity, Industrial Hemp, Loggers Hazards, Harvest Unit Planning and Layout Design, Meet Your Forester, Mon National Forest Recreation Economy, Syrup Symposium, Walk in the Woods, Winter Tree ID, Woody Ornamentals, and WV Tree Farm Regional meetings

Wildlife: Apiary visits, Bats of WV and Beyond, Deer Damage, Compass and Orienteering, Deer Disease Control and Habitat, Dendrology, Beekeeping, Fencing, Wildlife Habitat Improvement, Naturalist Class on Mammals, Natural Learning Environmental Training, Black Vulture and Fisher training, Woods and Wildlife, and the WV Monarch Summit.

WVSU-GRDI
WVSUES promotes urban and community forestry through projects targeting disadvantaged, underrepresented and economically depressed areas where green space can be made available through the transformation of empty lots into small fruit production zones and/or park areas. 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 2018 include:

- Workshops and training participants indicated an increase in their knowledge of tree care including disease prevention, pest management, and seasonal pruning

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.

WVSU target audience includes limited resource producers, veterans, disadvantaged farmers, recovery groups and NGOs working with displaced workers and addiction recovery centers.

3. How was eXtension used?

Extension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	5503	231455	1904	400

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	3	3

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Events including conferences, demonstration, field days, symposia, workshops and trainings

Year	Actual
2018	169

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	Number of loggers and logger owner operators trained to reducing worksite hazards and injuries for loggers
5	Preventative measure taken by homeowners to save popular tree species
6	Selective harvest benefits to production and wildlife
7	Advances in understanding of valuation of biodiversity
8	Advancements in shale gad industry models
9	Increased 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
2018	2000

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. The Appalachian Regional Reforestation Initiative continues to provide information and knowledge for reforestation practices. See https://www.osmre.gov/.

Results
Reforestation practices on mined lands have increased 3 times since 2000. Revegetation strategies after highway construction emphasizes native plants for stability and beauty along roadsides.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
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
2018	56

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Proper tree maintenance in urban environments is critical to the health and wellness of the tree as well as to improve production of fruit and nut trees. Training specific to small urban orchards and forests is in increasing demand as cities, towns, and institutions of higher learning are interested in reducing their carbon footprint, providing visually pleasing landscapes and increasing food production in areas that are otherwise devoid of fresh food potential.

What has been done
WVSUES continues to provide hand-on workshops on site selection, tree maintenance through proper pruning, care, disease prevention and treatment.

Results
70% of participants reported and demonstrated basic skills and knowledge of tree care including site selection, disease prevention and proper seasonal pruning and pest management.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources
124	Urban Forestry
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants

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

Number of loggers and logger owner operators trained to reducing worksite hazards and injuries for loggers

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	245

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Loggers have a fatality rate more than 20 times higher than the national average for all workers (BLS.gov, 2015). In 2014, the logging fatality rate in WV was more than two times higher than the national rate while the nonfatal injury rate is nearly double (Mujuru, Singla, Helmkamp, Bell & Hu, 2006). WV logging companies use traditional chain saw felling and cable felling (Milauskas, 2006). WV loggers use manual felling with 75% using this technique exclusively (Fullen, Rauscher, Lundstrom & Myers). WV logging companies that use manual felling as opposed to feller-bunchers had a higher rate of worker compensation claims Bell (2002).

What has been done
WVUES conducted 5-year Timber-Safe Pilot study: The cross-sectional study surveyed and interviewed loggers and logger owner operators in WV to assess their hazard awareness and injury risk perceptions. The 5-year study produced a logger safety and health management program/curriculum called Timber Safe which was implemented in WV. A series of field and management audits prior to and after implementation will be conducted. Data will be analyzed to determine if the intervention was effective at reducing work site hazards and injuries over time. A mobile application to collect WV logging site hazard data was produced.

Results
The preliminary results show evidence of a work culture that has not been educated or informed and has little to no experience in implementing an effective safety and health management system. These findings demonstrate the need for a new approach. The results had a direct impact on WVUES being invited to submit a proposal for a long-term study, which was funded. The WVUES proposal, within the South East Center proposal was one of only two projects that scored high enough initially to be funded as part of the center. The Timber-Safe project is the only research project in all Ag Safety Centers that is focusing on loggers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources
511	New and Improved Non-Food Products and Processes
605	Natural Resource and Environmental Economics

Outcome #5

1. Outcome Measures

Preventative measure taken by homeowners to save popular tree species

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	125

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Colorado blue spruce (Picea pungens) also known simply as blue spruce is a popular tree used by many homeowners in their residential landscapes throughout the State of WV. Rhizosphaera needle cast is caused by the fungal pathogen Rhizosphaera kalkhoffi, and as it causes the needles to turn purplish-brown and drop off, it seriously affects the aesthetic value and health of these valuable trees. Repeated needle loss can result in branch death after 3 to 4 years and, in some cases, eventually cause tree death. This disease is very widespread in the state of WV.

What has been done
A community based approach called the Blue Spruce Network was created to control disease more effectively by eliminating the chance of disease spreading from one site to another.

Results
Preventative measures taken by home owners saved money, time and effort to replace diseased spruce trees that would cost thousands of dollars to home owners.

4. Associated Knowledge Areas

KA Code	Knowledge Area
124	Urban Forestry

Outcome #6

1. Outcome Measures

Selective harvest benefits to production and wildlife

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	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
125	Agroforestry
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants

Outcome #7

1. Outcome Measures

Advances in understanding of valuation of biodiversity

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	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
605	Natural Resource and Environmental Economics

Outcome #8

1. Outcome Measures

Advancements in shale gad industry models

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	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
125	Agroforestry
511	New and Improved Non-Food Products and Processes
604	Marketing and Distribution Practices

605 Natural Resource and Environmental Economics

Outcome #9

1. Outcome Measures

Increased landowner outreach efforts

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	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 2018 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
604	Marketing and Distribution Practices

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

None 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.

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.

Timber Safe Pilot Study

The preliminary results show evidence of a work culture that has not been educated or informed and has little to no experience in implementing an effective safety and health management system. These findings demonstrate the need for a new approach. The results had a direct impact on WVU being invited to submit a proposal for a long-term study, which was funded. The WVU proposal, within the South East Center proposal was one of only two projects that scored high enough initially to be funded as part of the center. The Timber-Safe project is the only research project in all Ag Safety Centers that is focusing on loggers.

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%	25%	0%
304	Animal Genome	0%	0%	15%	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: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	8.0	0.0
Actual Paid	2.0	0.0	7.2	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**
130000	0	897041	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
30057	0	1143691	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	864245	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. Faculty conduct research that will ultimately lead to improved efficiency and competitiveness in the production of agricultural products; publish/present results in refereed journals/professional meetings; train graduate students.

WVU-AFES
Investigators in this program area are advancing scientific understanding of the complicated interactions between plants, animals, humans, and the environment. Several field experiments are under way that examine the utility of employing the phenomenon of hypovirulence as a biological control for chestnut blight. Studies were extended to a new group of fungi, the Metarhizium species, in which the accumulation of ergot alkaloids were recently discovered. These fungi are significant in agriculture because they colonize the plant roots in a nondetrimental manner and kill insects (biocontrol agents). Other current work includes liver panel blood chemistries, quantitative PCR, immunohistochemistry and fluorescence microscopy that are used to analyze and quantify the effects of allupurinol on systemic tissue of the immune system. Genetic transformation experiments are being carried out to assess the impact of gene editing on symbiotic nitrogen fixation. This work sets the stage for effective characterization of microbial diversity to accurately predict the cycling of carbon and nutrient cycling in soil. In other research, four new candidate genes were isolated from one model dung beetle that are associated with objectives, at least one of the genes is related to the size of the beetle horns. Researchers are studying the various factors that contribute to livestock reproductive success. Work is being conducted to understand the functional contribution of newly discovered oocyte-specific genes to early embryonic development. Research is ongoing to increase the quality and productivity of various crop species to benefit grazing animals, agricultural producers, and the public. Collectively, these research activities increase the efficiency and success of agriculture in West Virginia, and help revitalize local economies and more effectively protect the environment.
Highlights for 2018 include:

- Discovery of several Metarhizium (fungi) species that accumulate alkaloids that are important in agriculture and in medicine.
- Discovery that crop rotations that integrate pasture are less vulnerable to nitrogen leaching due to changes in microbial community composition and reduced nitrification.
- Isolated four new candidate genes from the dung beetle associated with beetle horn size.
- Advancements in biological, genetic, and environmental understanding impacting ruminant fertility, to advance scientific understanding and improve WV animal production
- Advancing understanding of the interaction between uric acid, oxidation stress, and inflammation in chickens, to improve poultry production

WVUES
Doesn't participate in this program area. The work of Extension specialist who have joint appointments with the Davis College will be reflected in the WVU-AFES section and outcomes.

WVSU-GRDI
Doesn't participate in this program area

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

2018	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: 2018

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	9	9

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Events including conferences, demonstration, field days, symposia, workshops and trainings

Year	Actual
2018	25

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	Mechanisms that cause insulin resistance in over-conditioned dairy cattle
5	Improved understanding of the interaction between uric acid, oxidation stress, and inflammation in chickens, in order to improve poultry production
6	Improved understanding of the interactions between microbial community structure, soil biogeochemistry, and microbial activity
7	Improved understanding of biochemical characterization of fungi associated with turf and forage grasses, in order to reduce toxicity to grazing animals

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
2018	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
302	Nutrient Utilization in Animals
304	Animal Genome
305	Animal Physiological Processes

Outcome #4

1. Outcome Measures

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
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Over conditioned 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

Improved 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
2018	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

Improved understanding of 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
2018	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

Outcome #7

1. Outcome Measures

Improved understanding of 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
2018	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

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 recently lost 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	30%	0%	0%	0%
801	Individual and Family Resource Management	10%	0%	0%	0%
802	Human Development and Family Well-Being	50%	100%	0%	0%
806	Youth Development	10%	0%	0%	0%
	Total	100%	100%	0%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	22.0	2.0	0.0	0.0
Actual Paid	19.0	2.0	0.0	0.0
Actual Volunteer	4000.0	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	120235	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
936322	54779	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	150582	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

In 2018, WVUES helped West Virginia's families become more stable and self-sufficient by improving skills in financial management, family relationships, stress reduction, and childcare. . 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.

2018 activities can be categorized in four areas:

Financial Education: Reality Store, Couponing Tips to Help You Save Money, Family Finance, Farm Succession and Estate Planning, and Money Habitudes

Adult Relationships: The Five Love Languages, Five Love Languages of Children, Love Languages at Work, How Not to Fall for a Jerk, Relationship Smarts, Scream Free Relationships, Stewards of Children Darkness to Light, and Marriage Preparation.

Stress Reduction: WVUES programs that strengthen skills in stress reduction include: Stress Less with Mindfulness.

Childcare/Parenting: WVUES collaborates with community and state organizations to enhance childcare services and provide parenting training including: Apprenticeship for Child Development Specialist, iRESPECT--Parent Night Program, Parenting Apart, Children's Miracle Network Hospitals, Darkness to Light: Preventing Child Sexual Abuse, and WV Healthy Children Project.

Adult Continuing Education: Education Outreach Service organization (CEOS); Healthy Grandfamilies, Cultivating Cultural Competency, Life Skills: Getting Organized, Power Interviewing, True Colors.

This year, WVUES held a Summit on Substance Misuse and Jackson's Mill Conference Center for all WVUES faculty and staff.

At WVSU the "Healthy Grandfamilies" program continued in 2018 serving approximately 110 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 2018 include:

- Grandparents improved knowledge and skills an gained support for raising their grandchildren.

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

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	8344	125074	8417	400

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

Patent Applications Submitted

Year: 2018

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	1	1

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Events including conferences, demonstration, field days, symposia, workshops and trainings

Year	Actual
2018	317

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.

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
2018	148

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
West Virginia has recorded the lowest well-being in the nation for the past 8 years in a row, with a Wellbeing Index score of 58.9 in 2016--lower than the national Well-Being Index score of 62.1 in 2016 (Gallup Wellbeing, 2016). The practice of mindfulness, which has been defined as paying attention, on purpose, to the present moment with a non-judgmental attitude? (Kabat-Zinn, 2011), is a technique which has been embraced by contemporary society and has been shown to have positive impact on health and well-being. Mindfulness programs also strengthen families as they may protect against the emotionally stressful effects of relationship conflict.

What has been done
The Stress Less with Mindfulness program is conducted by WVUES educators throughout the state to a number of different audiences, however, workplace sites are often considered the best place to find adults who are interested in learning mindfulness techniques. An evaluation/research was implemented in 2016-2017. The results have been used included in a journal articles which has been submitted to the Journal of Family and Consumer Science. Another article was written about a collaboration with Extension educators at Michigan State University Extension and has been submitted to the Journal of Human Sciences and Extension.

Results
Evaluation findings suggest that SLM enhances human wellbeing, especially related to psychological needs. The most important reasons people signed up for SLM was that they felt stressed or because they recognized the signs of stress in others and wanted to help. Although participants said they had trouble continuing to use mindfulness skills because they found it difficult to practice awareness of self without judging themselves and because they tended to dwell on the things they cannot control rather than on things they can control, these admissions show that they were learning to recognize healthy mental practices. All in all, participants said that the training improved their daily lives by decreasing anxiety and stress, improving coping

skills, giving them better.

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
2018	660

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Youth need to think about their future at an early age so that they will have the knowledge, skills, and motivation to build financial security. Too many people are not financially capable given poor planning, too much debt and insufficient savings (NIFA, 2017) Staggering figures show that in the last decade the incidents of personal bankruptcy rose by 69%. Furthermore, more than half of Americans report living paycheck-to-paycheck.

What has been done
The Reality Store program is a financial simulation for youth in middle school and high school. It has been offered to middle schools in Wayne County for the past 7 years. The materials were updated to reflect West Virginia taxes, costs, and prices. First, students complete an "Envision Your Life Questionnaire." Then they are given a career with a monthly salary, marital status, and number of children. They randomly select a career that requires a high school to postsecondary education and visit 17 stations (ex. transportation, housing, utilities, etc.) where they make financial decisions based on their income. 94 adults volunteered in the program.

Results
In 2018, 594 students learned the importance of budgeting, saving, and making wise financial decisions via the Reality Store program. They examined their attitudes about their futures and

their career aspirations. The reflected on whether the career they are considering would support the lifestyle they would like as an adult. It is hoped that students will be more motivated to stay in school.

4. Associated Knowledge Areas

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

Outcome #3

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
West Virginia ranks second in the number of children being raised by grandparents. Grandfamilies are families where one or more grandparents serve as the primary caregiver for one or more grandchildren who lives in their home. Grandfamilies have family and social interactions and responsibilities that are more complex than other families and parenting grandparents are often not equipped to parent in the 21st century. Several studies have documented the vulnerability of custodial and co-parenting grandparents to negative health outcomes, social isolation, depression, chronic health conditions and functional limitations. Grandfamilies have become the hidden victims of the opioid crisis across the United States.

What has been done
The WVSU Healthy Grandfamilies Program conducted 8-week discussion groups in the greater Kanawha Valley and a pilot program in Harrison County. This program provided workshops and ongoing social services to support grandparents raising their grandchildren. Partnerships have been developed with boards of education, Family Resource Networks, United Way, Legal Aid of

WV, Bureau of Senior Services, and faith-based communities. The Healthy Grandfamilies Project enrolled and graduated 125 grandparents as participants during the grant period. These participants completed the 6-month intervention. An agent from WVUES is also conducting Healthy Grandparenting classes in Braxton County.

Results

Grandparents reported fewer challenges at 6 months than at baseline related to financial burden, less time for self, less privacy, feeling ?tied down,? lack of sleep, fear of losing custody, dealing with bureaucracies, impact on health, feeling isolated/alone, difficulty getting public assistance, interference with job, legal difficulties, less time for family, and difficulties with school system. After completing their participation in discussion groups, grandparents reported significant improvement in awareness, knowledge, and comfort level related to the topics of navigating the school system, communications, social media, family relationships, healthy lifestyles/managing stress, response to addiction, parenting, legal issues, nutrition, and health literacy/self-care.

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	209

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

Since 2010, WVUES has been delivering the 5 Love Languages program. Extension faculty standardize the delivery of the program, including a PowerPoint presentation, handouts, and an evaluation form. A discussion guide: Connecting with Others Using the Five Love Languages, is available online (Kaczor, Peck, & Riffe, 2012). The program has been implemented in more than 17 counties. Versions of 5 LL have been created for parents of teens and parents of children. Other relationship programs that are offered include How Not to Fall for a Jerk, and Relationship Smarts,

Results

Participants in the 5 Love Languages (5 LL) program gained an understanding of their own LL and the LL of their partner and gained confidence in using the love language of their partner. These two findings confirm earlier research that 5 LL program participants felt that their love language was accurately portrayed by the Chapman's Love Language Survey and that they understood how to communicate better with their partner after learning their love LL (Veale, 2006). Participants in the 5 LL programs also improved in partner empathy.

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

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Number of participants who train others.

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

Amount of money raised by participants to support the program.

Not Reporting on this Outcome Measure

Outcome #8

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	75

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In order for a child care center to maintain their license, child care providers must successfully complete 16 hours of continuing education per year. These training sessions must be approved and accredited by the state. All four semesters of the ACDS program are accredited.

What has been done
It is difficult to recruit and retain ACDS instructors from the private arena because the pay is fairly low and classes are offered in the evenings. A concerted effort was conducted in late 2017 to increase the number of Extension faculty who were trained and offered ACDS classes. In 2018, the number of Extension faculty who taught ACDS increased from three to seven. An additional agent agreed to chair the local council making it eight agents who are actively engaged with the ACDS program. In 2018 there were 54 classes of ACDS provided across the state to approximately 650 students.

Results
It is difficult to recruit and retain ACDS instructors from the private arena because the pay is fairly low and classes are offered in the evenings. A concerted effort was conducted in late 2017 to increase the number of Extension faculty who were trained and offered ACDS classes. In 2018, the number of Extension faculty who taught ACDS increased from three to seven. An additional

agent agreed to chair the local council making it eight agents who are actively engaged with the ACDS program. In 2018 there were 54 classes of ACDS provided across the state to approximately 650 students.

4. Associated Knowledge Areas

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

Outcome #9

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	80

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Wyoming Co. WV is an area that has been economically impacted due to the loss of coal related employment. The population has declined over time and many of the remaining citizens have been characterized as having poverty induced depression. This is a depression that does not result from laziness, but rather hopelessness.

What has been done
Families that participate in a local food bank were given an opportunity to participate in a poultry production workshop. Interested families were trained in poultry production and provided plans to build a mobile poultry house. A grant from obtained from National Council of the United States Society of St. Vincent de Paul was obtained to purchase construction materials, poultry, and feed. Participating families were supervised in construction of the mobile poultry houses and placement of egg-type poultry.

Results
Participating families felt a sense of accomplishment and pride in building their mobile poultry

houses, raising egg-type poultry, and generating food i.e. to supplement their diet and for potential sale. Twelve egg-type poultry were placed per family and average egg production was 10 eggs per day.

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
- Public Policy changes
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Stress Less With Mindfulness

Evaluation findings suggest that SLM enhances human wellbeing, especially related to psychological needs. The most important reasons people signed up for SLM was that they felt stressed or because they recognized the signs of stress in others and wanted to help. Although participants said they had trouble continuing to use mindfulness skills because they found it difficult to practice awareness of self without judging themselves and because they tended to dwell on the things they cannot control rather than on things they can control, these admissions show that they were learning to recognize healthy mental practices. All in all, participants said that the training improved their daily lives by decreasing anxiety and stress, improving coping skills, giving them better.

Grandfamilies Program

Grandparents reported fewer challenges at 6 months than at baseline related to financial burden, less time for self, less privacy, feeling "tied down," lack of sleep, fear of losing custody, dealing with bureaucracies, impact on health, feeling isolated/alone, difficulty getting public assistance, interference with job, legal difficulties, less time for family, and difficulties with school system. After completing their participation in discussion groups, grandparents reported significant improvement in awareness, knowledge, and comfort level related to the topics of navigating the school system, communications, social media, family relationships, healthy lifestyles/managing stress, response to addiction, parenting, legal issues, nutrition, and health literacy/self-care.

Five Love Languages

Participants in the 5 Love Languages (5 LL) program gained an understanding of their own LL and the LL of their partner and gained confidence in using the love language of their

partner. These two findings confirm earlier research that 5 LL program participants felt that their love language was accurately portrayed by the Chapman's Love Language Survey and that they understood how to communicate better with their partner after learning their love LL (Veale, 2006). Participants in the 5 LL programs also improved in partner empathy.

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	30%	10%	0%	0%
806	Youth Development	70%	90%	0%	0%
	Total	100%	100%	0%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	54.0	6.5	0.0	0.0
Actual Paid	45.0	7.3	0.0	0.0
Actual Volunteer	8150.0	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	438858	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
2407837	199943	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	282217	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

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 at the state and local level, 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.

In 2018, WVUES conducted programs in five areas: citizenship, healthy lifestyles, STEM, literacy, and adult leadership.

Citizenship: 4-H Achievement Day, Life Mentoring, 4-H Global Exchange, Global Citizenship, Charting, 4-H Officer School, Build a Budget, Reality Store, Youth Bullying, Cyberbullying, Cultural Competencies, iRESPECT, Get a Life, leadership education and Teen Leader Weekend.

Healthy Lifestyles: CYFAR/PROSPER Project, Health Ambassadors, ATV Safety Awareness, Helmet Safety, Summer Foods, the Youth Family Nutrition Program, Shooting Sports and Safety, Agriculture Safety, Germ Bug, Rock Climbing, Dancing Choosey Kids, I Can ... and Stop Spit Tobacco and RELAX.

STEM: 4-H STEM programming includes Robotics, Rockets to the Rescue, Code a Name, Code Your World, Clover Imagination Zone, CryptoClub, Computer Science First, Incredible Wearables, Leap into Science, Lego educational initiatives, Rockets to the Rescue. It also includes 4-H youth agriculture programs such as livestock round-ups, beef expos, land judging, project tagging, forestry judging, and garden-based learning. Other agriculture programs include Agriculture in the Classroom, Agriculture Literacy & Gardening, Agriculture Club, Agriculture Field Day, and Beef Quiz Bowl.

Literacy: WVUES continues to offer the Energy Express at 70+ sites as well as Reading Partners, Agriculture Literacy, and Reading, Writing, and the Rest of Your Life.

Adult Leadership: In order to offer of the programs listed above, WVUES 4-H educators offere a host of adult leadership programs including: Camp counselor (ECI) training, Title IX training, 4-H volunteer training, Essential Elements training, LifeSkills training, Afterschool Network training. A Substance Misuse Summit was held this year for all staff and faculty and Extension faculty participate in the Advocates for Substance Abuse Coalition.

WVUES

At WVSU Extension, multiple programs support youth development initiatives, including 4-H PLANTERS, 4H Growth of the Go, 4H Mentoring, SCRATCH, NASA/ SEMMA program initiatives and 4-H day camps hosted on campus. 4-H PLANTERS engaged preschoolers in literacy activities bridged with gardening activities using curricula from the Junior Master Gardener curriculum that is altered for the targeted audience. 4-H PLANTERS is a feeder program of 4-H GROWTH, which serves grades k-5. 4-H Mentoring is a leadership and citizenship program engaging youth in various activities that are aimed to increase their knowledge and competence in the above areas with the help of a caring adult. The CASTEM programs will further increase youth participants' interest and knowledge in science through the NASA/SEMAA program initiatives. Day camps offered at WVSU were designed to meet the needs of youth in the community, topics included physics, gardening, chemistry, rocketry, environmental science, and robotics. WVSU 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 2018 include:

• 100% of youth in the 4H Mentoring program demonstrated new skills and confidence in making public presentations.
• The 4H PLANTERS program resulted in significant increases in STEM inquiry and observation among preschool youth participants at two program sites.

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.

WVSU Extension mainly serves underrepresented and underserved youth from preschool to high school.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	73795	2544366	276269	5089089

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Events including conferences, demonstration, field days, symposia, workshops and trainings

Year	Actual
2018	3134

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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

Outcome #1

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	12309

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Numerous indicators suggest the U.S. is falling behind in preparing our next generation STEM workforce in fields vital to the military, government and industry, as well as supplying the great thinkers needed to maintain U.S. leadership in technology and innovation. There is a serious shortage of young people entering into the STEM fields today. Additionally, Early Childhood Educators frequently do not engage in science which deprives students of the impact of STEM education including language acquisition and observation skills.

What has been done
A WVUES 4-H specialist promoted the 2018 Camp Science Experiment: "Code Your World" which reached 5,000 youth and supported the WVU STEM Ambassador Program. STEM training workshops were attended by Extension professionals. A STEM Track was implemented at the WVUES 4-H Teen Leader Weekend and a new 4-H Code Camp was offered. At WVSU, preschool students in 12 classrooms experienced STEM programming including JMG, community events, school STEM days, after-school parent programs, a camp, and Junior Master Gardener training. A JMG based program was initiated in Raleigh County. The WVSU CASTEM program bridges the STEM gap for historically underserved/represented K-12 youth with an evidenced based 5-Core STEM education platform.

Results
WV youth engaged in hands-on science activities while at camp. Extension professionals were trained to work with 4-H volunteers to offer STEM activities in their counties. The CASTEM program has provided youth, their families and formal and informal educators and the community with exposure to hands-on STEM curriculum activities to increase interest in STEM careers for matriculation into STEM degree programs with land grant universities. As a result, there was an increased number of participants who improved in curiosity/aspirations toward science,

engineering, and technology and an increased number of participants who enhanced their knowledge related to science, engineering, and technology. Participants at two Preschool sites had the highest increases in STEM inquiry and observation in their counties. Teachers in these classrooms attributed the gains directly to the PLANTERS program. In Raleigh County youth expressed excitement at the ability to grow and eat vegetables from a garden they designed.

4. Associated Knowledge Areas

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

Outcome #2

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	500

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
One way to enhance public school STEM curriculum is to offer programming to children in after-school settings and community venues as a school enrichment program. This approach empowers educators to offer workshops in community settings like libraries, museums, and after-school and summer learning programs to engage under-served audiences in accessible and familiar settings.

What has been done
The WV Statewide Afterschool Network through WVUES was one of six states selected to participate in the first cohort of Leap Into Science, a nationwide program developed by The Franklin Institute Science Museum that integrates open-ended science activities with children's books, designed for children ages 3-10 and their families. WVUES 4-H agents completed Leap Into Science training and now offer this program across WV. At WVSU, the CASTEM NASA program fostered a STEM non-profit parent organization; Southern West Virginia Robotics Club

(SWVRC) which assisted WVSU NASA SEMAA in preparing youth robotics teams for competition around the state. Thirty coaches mentored over 100 youth and their families in robotic competitions.

Results
New partnerships have been formed including one with college students in the Marshall University Collegiate 4-H Club who implemented the LEAP program in Cabell County, WV. Over 400 youth in Cabell County have indicated in increased interested in STEM. WVUES educators have contributed to strengthening the model for replication at the national level. Several of the SWVRC teams qualified to participate in the FLL State competitions. Participants in the mentoring sessions learned skills in research and making presentations, as well as in design and engineering.

4. Associated Knowledge Areas

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

Outcome #3

1. Outcome Measures

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

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	59

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Youth in low socioeconomic area have limited access to civic engagement programming and opportunities which have been shown to enhance skills and well-being, as well as allow teachers to better understand their students.

What has been done
The WVSU 4-H mentoring programs and summer camps--4-H Film Camp, 4-H Dance Camp and 4-H Culinary Camp--help youth develop life skills, express creativity, and become more

productive members of their society. The WVSU Leader's Academy introduces high school students to local business owners who give them opportunities to contribute to their town and explore career fields. These activities also raise self-esteem.

Results
At the culmination of the camps and the completion of every project, 100% of youth have demonstrated their newly obtained skills and confidence by providing a presentation to the parents, family members, community members, the club members and WVSU staff.

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	159

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Youth in WV don't often have the opportunity to experience other cultures, so a chance to visit China is important to expand their understanding of other cultures. At the same time, Chinese youth from Shanxi are anxious to learn about American culture and education.

What has been done
A delegation of youth and adults from China have visited the WV 4-H Camping program for 5 years. In 2018, a delegation of 9 WV youth went to China to meet youth and adults from a high school, visit historic and cultural sites. They met with 150 Chinese, mostly youth, citizens.

Results
Youth in West Virginia gained understanding of other cultures and improved their cultural IQ. They also learned to share the unique qualities of their own culture. Shanxi students learned

about American culture and how to interact with WV kids. The Chinese kids also learned more about WVU so that they may come to study at WVU.

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
2018	4000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
West Virginia youth face a major disadvantage when it comes to health. Research indicators have consistently shown that West Virginia ranks high in child and adult obesity, pervasive poverty, and concerns in children's well-being. In addition according to the West Virginia Department of Health and Human Resources (2013), nine out of ten adults in West Virginia consume fewer than five servings of fruits and vegetables daily, and almost one-third of West Virginia adults participate in no leisure-time physical activity or exercise.

What has been done
To address concerns of health and nutrition in the rural, economically disadvantaged state, the West Virginia University Extension Service 4-H program continued to build the West Virginia 4-H Healthy Lifestyles Program. West Virginia received a 4-H Healthy Habits grant from the National 4-H Council funded by the WalMart Foundation for the 2017-2018 year. Funding received supported the implementation of educational curriculum designed to support and improve physical activity and promote healthy nutrition habits among youth in school, after school and summer learning programs.

Results

Adults and teen 4-H Health Ambassadors provided healthy living educational curriculum to 4,000 underserved youth in second through twelfth grades. Participants demonstrated increased knowledge gain on the importance of physical activity and making healthy nutrition choices. Resulted in increased partnerships between the West Virginia University Extension Service, school systems, faith based organizations, and health organizations.

4. Associated Knowledge Areas

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

Outcome #6

1. Outcome Measures

Number of youth who increase or improve their literacy skills.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	2317

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 87 sites in 40 WV counties. Last summer, 2,317 children reached 50% attendance with an additional 723 served. Nutritional meals (120,936) were served to the children and 21000 take-home books were distributed. Four hundred and eighty-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-seven percent of children either maintained (5.8%) or increased (61.2%), and the average child gained 1.7 months in broad reading achievement.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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
2018	311

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In order to address the extreme problem of substance abuse, most specifically opioid abuse, in WV, the WVU CYFAR Project has elected to implement the PROSPER Program, an evidenced-based program which has been proven to be effective if implemented with fidelity to reduce the likelihood that youth will become involved in risky behaviors such as substance abuse over time.

What has been done
Youth in this program are enrolled in one or both of two PROSPER activities: strengthening families (family-based, includes parents) and life skill training (school-based). In the 2017/2018 semester, 311 youth between the ages of 10 and 14 (middle schools students) were enrolled. The students and families are from two WV counties: Randolph and Brooke. Two family programs and four life skill programs were held.

Results
Youth in the two PROSPER activities: strengthening families (family-based, includes parents) and life skill training (school-based) showed slight increases on decision making, self-efficacy, and problem solving measures. Youths also increased slightly on post-critical thinking measures; the pre-assessment mean was 2.70 and the post-assessment mean was 2.76. On the Making Decisions in Everyday Life scale, participants also increased slightly from pre- to post-assessment (pre-mean of 2.95 to post-mean of 2.96). On the Strengthening Families questionnaire we did see some improvement on indicators that could be interpreted as social conscience, personal values, and caring. Youth showed improvement on one statement: I show my parent that I appreciate the things they do for me (pre mean = 2.667 and post-mean = 3.000

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

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	500

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In WV, there has been a significant decline in the number of producers (10% decrease 2007-2012) and for each principal operator under 35 years old, there are 7 over 65. At the same time, WV is growing its local food economy. Higher demand for local foods and the shortage in producers has highlighted information and experience gaps that limit entry and business success in WV.

What has been done
In 2018, a WVUES specialist integrated agripreneurship and risk management and continued developing the WV Market Ready curriculum. WVUES and other state agencies submitted a grant proposal for building a Beginning Farmer Program in WV. WVUES collaborated the Davis College to plan the Young Innovators Program, implemented the Youth Entrepreneurship Competition; helped with developing the program for the Governor's School for Entrepreneurship. Our grant writing training has resulted in over 65 grants being funded to date and 10 pending.

Results
WV high school youth, college students, and state producers have developed an ?entrepreneurial mindset,? leading to better overall business planning and risk management.

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
2018	4746

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The need to complete postsecondary training in preparation for success in the modern workforce is greater than ever. A 2010 report by the Georgetown University Center on Education and the Workforce states, "Postsecondary education or training has become the threshold requirement for access to middle-class status and earnings in good times and in bad. It is no longer the preferred pathway to middle-class jobs" it is, increasingly, the only pathway? (Carnevale, Smith, & Strohl, 2010, p. 3).

What has been done
The Post-Secondary Success Team has successfully created lessons that teach the necessary skills youth need to be successful in the workplace. Lessons have been published and passed National 4-H Peer Review. Two lessons were accepted for national publication through NAE4-HA and have been presented at a national conference. The team continues to research gaps in this area to create lessons to teach these important skills to youth.

Results
4,746 youth in West Virginia have increased postsecondary skills which are necessary to succeed in the work place. A research study about 4-H alumni attribution of 21st century workforce skills to their 4-H experience has been completed and submitted to a peer-reviewed journal.

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
2018	5640

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 courses this year at 18 locations. Trainings were located at eighteen (18) different locations. Audiences included 2016 youth in youth programs, 316 adult leaders, 2064 youth and adults in the ASI online E-Course. 821 youth completed the Tread-Sylvania online game. 423 youth participate in a county-wide ATV Safety Poster contests.

Results
Six youth successfully complete the ASI/ATV RiderCourse. Eight youth complete the ATV National 4H PSA Contest. Three hundred and twenty four (324) youth were certified through the Governor's Highway Safety Council DMV Safety Course (Mandated by Law). One hundred percent (100%) of the youth and adults successfully completed the ASI RiderCourse.

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.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	350

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The state of WV will benefit from youth returning to the state and stepping into leadership positions. Through involvement in quality 4-H programs, West Virginia?s youth reach maturity and develop into responsible leaders of their state, the country, and the world.

What has been done
The WV 4-H Charting program is offered to WV youth who are in at least 10th grade. Participants complete a Charting Portfolio and attend county 4-H camp to take Charting class, go to State Charting/Teen Leader Weekend, or make arrangements at the county level to attend three Charting classes. Additionally, all participants must go through an interview. The current Charting Portfolio includes activities that foster self-understanding, communication, leadership, goal setting, critical thinking, and decision making.

Results
Through participation in the WV 4-H Charting program, approximately 350 youth have demonstrated that they are ready for leadership now and later in life and were awarded their 4-H Charting pin as a result of successfully completing the program. Successful completion makes them eligible to receive a WVU Leadership scholarship worth up to $2,000 over the course of four years if they meet the other academic requirements for the scholarship.

4. Associated Knowledge Areas

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

Outcome #12

1. Outcome Measures

Number of youth attending expressive arts programs who demonstrate mastery of their creative art.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	60

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Incorporation of expressive arts has successfully helped children experiencing hyperactivity or social anxiety to control impulsive and aggressive behaviors, expressive art has been used to help individuals explore issues regarding body image, self-esteem, social isolation, and depression.

What has been done
WVSU is committed to supporting at-risk youth through a variety of programming types including activities which provide a needed outlet for emotional and behavioral health. The WVSU 4-H Mentoring program incorporates expressive arts into its curriculum delivered in low socio-economic neighborhoods of Charleston WV. These activities include music, movement, play, dram, sculpture, painting, and drawing.

Results
100% of youth in the program grew in self-awareness and self-confidence and learned new skills and concepts.

4. Associated Knowledge Areas

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

Outcome #13

1. **Outcome Measures**

Number of youth who improve their grade point average or other assessment score related to academic achievement.

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Energy Express
Significant increases in letter-word identification, reading fluency, passage comprehension and broad reading. Sixty-seven percent of children either maintained (5.8%) or increased (61.2%), and the average child gained 1.7 months in broad reading achievement.

PROSPER
Youth in the two PROSPER activities: strengthening families (family-based, includes parents) and life skill training (school-based) showed slight increases on decision making, self-efficacy, and problem solving measures. Youths also increased slightly on post-critical thinking measures; the pre-assessment mean was 2.70 and the post-assessment mean was 2.76. On the Making Decisions in Everyday Life scale, participants also increased slightly from pre- to post-assessment (pre-mean of 2.95 to post-mean of 2.96). On the Strengthening Families questionnaire we did see some improvement on indicators that could be interpreted as social conscience, personal values, and caring. Youth showed improvement on one statement: I show my parent that I appreciate the things they do for me (pre mean = 2.667 and post-mean = 3.000).

ATI/ATV RiderCourse
Six youth successfully complete the ASI/ATV RiderCourse. Eight youth complete the ATV National 4H PSA Contest. Three hundred and twenty four (324) youth were certified through the Governor's Highway Safety Council DMV Safety Course (Mandated by Law). One hundred percent (100%) of the youth and adults successfully completed the ASI RiderCourse.

Key Items of Evaluation

VI. National Outcomes and Indicators

1. NIFA Selected Outcomes and Indicators

Childhood Obesity (Outcome 1, Indicator 1.c)	
19066	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.