

2014 West Virginia University Research Plan of Work

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I. Plan Overview

1. Brief Summary about Plan Of Work

The West Virginia Agriculture and Forestry Experiment Station is part of the Davis College of Agriculture, Natural Resources and Design. While the West Virginia Cooperative Extension Service is a separate administrative unit and not part of the College, research and extension are integrated through joint appointments (nine of 110 faculty in the Davis College have partial extension appointments), through coordination of activities and planning at the deans, directors and associate-directors levels, through integrated research, extension and education projects and programs funded by Hatch, Smith-Lever and McIntire-Stennis formula funds and through competitive funding from NIFA and other sources.

The Davis College is relatively broad in academic and research discipline areas, including, the Division of Design and Merchandising (includes programs in Interior Design as well as Textiles and Fashion Design and Merchandising); Forestry and Natural Resources (includes Forest Resource Management, Wood Science, Parks and Recreation and Wildlife Management); Division of Animal and Nutritional Sciences (includes Agriculture, Animal and Veterinary Sciences, Biochemistry, and Human Nutrition and Foods); the Division of Plant and Soil Sciences (includes Agronomy, Horticulture, Microbiology); and the Division of Resource Management (Environmental and Natural Resource Economics, Agricultural and Extension Education and Landscape Architecture).

The Experiment Station supports approximately 45 FTE research faculty positions distributed across the 110 individual scientist positions. The Station also supports approximately 25 FTE technical positions, 35 clerical and farm/forest worker positions and 40 professional support positions (mostly graduate students). The West Virginia Experiment Station operates seven farms and two forests which support faculty research. Four of the farms (Animal and Nutritional Sciences farms in Morgantown and Reedsville, Horticultural and Agronomy farms in Morgantown) and the University Forest are sufficiently close to the University campus to be used extensively to support academic programs in addition to research. Outlying farms include the Reymann Memorial Farm (beef, sheep, aquaculture, agronomic crops and bull testing station) and Kearneysville Tree Fruit Research Farm (primarily apples and peaches) in northeastern West Virginia; the Willow Bend Farm in the southeast (pasture raised and finished beef); and the Tygart Valley Forest (mostly oak regeneration and disease control research) in east central West Virginia. All but Tygart Valley Forest serve as extension and research centers.

Cutbacks in Agricultural Research Service (ARS) budgets and the closing of the ARS facility in Beaver, WV, has led to a reduction in the research resources devoted to the pasture finished beef projects. The elimination of congressionally directed spending has also led to reduced activity in the aquaculture and wood utilization areas. These cutbacks increase the relative importance of federal capacity funding and AFRI competitive funding to the success of our research programs.

The most common problems facing families and communities in West Virginia include a state population which is decreasing in size and aging as well due to a disproportionate loss of younger citizens; 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.

The focus of research programs in the West Virginia Station over the planning period 2014-2018 will be on economic development in rural communities, improving human nutrition, health and quality of life in rural communities, and protecting and preserving state natural resources and the environment. Four centers and one organizational unit exist within the College to help focus and direct our efforts on economic development, natural resources and the environment. They also contribute to our ability to leverage Hatch and McIntire-Stennis capacity funding by attracting external competitive grants and other external sources of funding. The four centers are the Natural Resource Analysis Center (NRAC), the Environmental Research Center (ERC), the National Geospatial Development Center (NGDC) and the Appalachian Hardwoods Center (AHC). The organizational unit is the West Virginia Cooperative Fish and Wildlife Unit.

The Natural Resource Analysis Center (NRAC) was formed in the early 1990s as a multi-disciplinary research and teaching facility in the Davis College of Agriculture, Natural Resources and Design at West Virginia University. Geographic Information Systems and Remote Sensing have been integral parts of the research and teaching programs of the Davis College for many years. The wide range of research and teaching activities at the Center have been designed to complement work within the College, and include environmental planning, environmental and natural resource economics, recreation, wildlife management, forest ecology, and land and water reclamation. Areas of expertise at NRAC include economic development and environmental sustainability, remote sensing, land cover mapping, landscape analyses, watershed-based analysis and applications, and GIS-based planning and decision making. Recent projects have included development of water resource GIS datasets for West Virginia and parcel prioritization methodology development for land conservation.

The goal of the Environmental Research Center (ERC) is to provide a center of excellence at West Virginia University that facilitates the integration of environmental research, outreach/education, and practitioner science. The ERC acts as an unbiased intermediary among groups and as a regional and national leader in integrated environmental and social research and outreach. The Center is housed in the Davis College of Agriculture, Natural Resources and Design, and is a collaborative venture involving faculty and staff from numerous programs and colleges throughout WVU as well as external collaborators from both the public and private sectors. The center's goal is to serve as the nucleus tying together various groups who are interested in interdisciplinary environmental research and education. As a college center, the ERC focuses on being a key driver behind large multi- and interdisciplinary research, teaching, and outreach efforts focused on environmental topics.

Funded by the Natural Resources Conservation Service (NRCS) and in partnership with West Virginia University, the National Geospatial Development Center (NGDC) was established to develop geospatial technologies that support the business mission of the NRCS. The Center operates collaboratively with university researchers, other NRCS Centers, as well as private and public partners to advance the integration and utilization of geospatial technologies in NRCS. The mission of the National Geospatial Development Center is to enhance NRCS capacity to produce, utilize, and apply soil and natural resources information through the innovative application of geospatial technologies in partnership with Cooperative Ecosystem Study Units, private industry, and other USDA technology centers.

Forest lands in West Virginia represent an enormous resource in the form of hardwood timber, wildlife habitat, and areas for human recreation and restoration. Station research in timber management and wood utilization seeks enhanced profitability of timber production balanced against protection of wildlife habitats and recreational environments. Both are served by research projects which limit negative impacts of insects, disease and invasive species. Timber management research also is strongly influenced by the fact that a majority of state forest lands are in relatively small tracts, owned by many

different individuals coexisting with several relatively large lumber producing companies. Research and outreach programs to serve both types of producers are supported. The Appalachian Hardwood Center (AHC) at West Virginia University is a jointly supported center of the WVU Extension Service and the WVU Davis College of Agriculture, Forestry, and Consumer Sciences. The center was established in 1987 by the West Virginia Legislature to provide technical and research support for the state's growing wood products industry. The AHC is a center of excellence for outreach; extension and technology transfer; professional development; and applied research. The AHC serves sustainable natural resource-based businesses and communities as well as private forest landowners and natural resource professionals in the Appalachian forest region.

The quantity and variety of wildlife in West Virginia are extremely important to the economy and character of the state. Research in this planned program is designed to better understand habitat requirements for wildlife in West Virginia, and to determine the impacts of human activity on wildlife habitat, particularly habitat for fish and song birds. A large majority of the research in this program represents cooperative research between West Virginia State University faculty and scientists with the West Virginia Division of Natural Resources, USGS, US Fish and Wildlife Service, and the Wildlife Management Institute, a group collectively known as the West Virginia Cooperative Fish and Wildlife Unit. While capacity funding provides infrastructure for this program, the majority of research in wildlife management is supported by external funds, another example of how capacity funds allow us to develop the infrastructure to attract external funding to deal with real-world problems.

As in the past, research programs of the West Virginia Experiment Station are coordinated with and supported by research programs at West Virginia State University and by educational and outreach programs of both West Virginia State and West Virginia University Extension. Supporting research at West Virginia State includes plant genetic work to improve yield, disease resistance and organoleptic properties of pepper, watermelon and greenhouse tomatoes, investigation of procedures to bind water soluble metals and carbon in CO₂, and determining feasibility of utilizing in fish diets, protein recovered from anaerobic digestion of poultry litter.

Supporting outreach programs are conducted by West Virginia University Extension for all Station research programs except Fundamental Plant and Animal Systems. Interactions are extensive and vital to technology transfer and implementation of programs involving production agriculture and forestry, economic development, community design and quality of life in rural communities, human nutrition and health and assuring a safe, high quality food supply.

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. Program Administrative teams and Directors from both institutions meet annually prior to POW submission to plan for collaboration and avoid duplication.

Modifications of the West Virginia plan for 2014-2018 reflect minor changes in our programming and the expected addition of up to seven new faculty positions over the next three years. Faculty in the West Virginia Agricultural and Forestry Experiment Station now conduct research in seven program areas: Economic Development and Quality of Life in Rural Communities; Climate Change, Environmental Quality and Stewardship; Fundamental Plant and Animal Systems; Global Food Security and Hunger; Production/Sustainable Agriculture; Childhood Obesity, Human Nutrition and Health; Production/Sustainable Forestry; and, Sustainable Energy. The Sustainable Energy and Nutrition

areas are ones in which we are investing additional positions in order to build core groups that can compete successfully for competitive external funding. The Food Safety area was moved in 2012 to the Production/Sustainable Agriculture area.

For 2013 we continue to coordinate research and extension work on Marcellus shale, an area of growing economic and environmental importance in our region. We have also developed a memorandum of understanding with Penn State and the University of Maryland to share extension and research resources regionally rather than station by station to support our regional tree and small fruit industry. One new position in plant pathology was filled in 2012 and another will be filled in 2013. We are optimistic that this agreement will lead to further regional cooperation in other areas of concern in the future.

Over the next three years the College expects to hire up to seven new faculty which would translate into an additional 2.8 FTE in research positions. These new hires are intended to build on core strengths in molecular genetics, reproductive physiology, nutritional biochemistry and environmental sciences. A new permanent dean, Dr. Daniel Robison, joined the College on June 1, 2012. We have entered a new strategic planning process under his leadership and will be fully evaluating our research portfolio and five year research plan. The seven new hires have been delayed one year to wait for the outcome of the strategic planning process.

Estimated Number of Professional FTEs/SYs total in the State.

Year	Extension		Research	
	1862	1890	1862	1890
2014	0.0	0.0	42.0	0.0
2015	0.0	0.0	44.0	0.0
2016	0.0	0.0	45.0	0.0
2017	0.0	0.0	45.0	0.0
2018	0.0	0.0	45.0	0.0

II. Merit Review Process

1. The Merit Review Process that will be Employed during the 5-Year POW Cycle

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

2. Brief Explanation

The West Virginia Agricultural and Forestry Experiment Station engages in a scientific merit and peer review process for all research projects. Projects are reviewed internally by individuals with expertise in the fields of science addressed in each proposal are selected by the

Division Director, Experiment Station Director or designee and asked to judge technical merit, likelihood of achieving stated objectives, and potential impacts for each proposed project. A minimum of three peer scientists (i.e., individuals qualified by their status in the same discipline, or a closely related field of science), are asked to read and provide written comments on the proposed activities. The terms of reference for the reviewers focus on questions of the quality of the proposed science, technical feasibility of the research, the validity of the scientific approach, and likelihood for completing the stated objectives. Additional comments may be requested on a project's relevance to the station's priorities, the degree of integration with extension (as appropriate), responsiveness to stakeholder needs, and the accuracy of any claims for multi-disciplinary and multi-state collaboration. Reviewers are asked to present their findings in writing, and records of the reviewers' comments are preserved for the life of the project, or for a period of three years in the event that a project is not initiated. Competitively awarded grants requiring peer review or contract research requiring grantor approval are exempt from this process.

Programs are reviewed annually by the Station visiting committee. In 2013 we will be conducting a College-level strategic planning process initiated after the arrival of our new dean on June 1, 2012. This process will involve evaluating our planned programs and areas of emphasis over a ten-year horizon. The plan will be developed at the College and University levels and will involve review by University and College faculty, students and staff and external constituents.

III. Evaluation of Multis & Joint Activities

1. How will the planned programs address the critical issues of strategic importance, including those identified by the stakeholders?

West Virginia Experiment Station faculty will participate in multistate research projects and partner with specialists from West Virginia University Extension to develop and deliver new knowledge and provide technical support to those industries of agriculture and forestry for which West Virginia enterprises have potential competitive advantage. Additionally, multistate research and outreach efforts will focus on preserving state natural resources, enhancing rural economic development and improving the health, nutrition and lifestyle choices for citizens in rural Appalachian communities.

Resources from multiple universities will be applied through multistate research projects to improve yield and efficiency of production methods for forages and grazing livestock; to increase profitability of organic production; to develop sustainable management systems for, and new products from, Appalachian hardwoods; to minimize negative effects on state natural resources from economic activity; to better understand the impacts of natural resource policy and assessment measures on environmental and economic wellbeing; and to define habitat requirements and management systems required to maintain West Virginia plant and animal wildlife populations.

Station faculty will partner with West Virginia University Extension specialists to assure timely technology transfer and industry adoption of research results as appropriate to the maturity of the technology. Programs initially receiving particular emphasis in educational outreach efforts will include cool water aquaculture, production and optimum use of Appalachian hardwoods, organic production of vegetables and fruits, economic growth through development of outdoor recreation and tourism opportunities, and reducing obesity and osteoporosis in rural West Virginia communities.

Stakeholder input has been and will continue to be of critical importance in determining priority research and outreach programs for the West Virginia Station. Our process for soliciting the input of our stakeholder groups is documented in the next section of the report.

2. How will the planned programs address the needs of under-served and under-represented populations of the State(s)?

West Virginia has a relatively high proportion of limited income, rural and typically under-served citizens for whom issues related to economic opportunity and quality of life tend to be of highest priority. Station faculty will work cooperatively with colleagues in the West Virginia University Extension Service, West Virginia State University Land Grant Programs, and West Virginia University Health Sciences Center Department of Community Medicine to deliver information and technical support most needed by these citizens. Our Community Design Team, a joint effort with WVU Extension, will continue to assist disadvantaged communities to plan for the future and to pursue economic and cultural development opportunities.

Research and outreach programs in production agriculture and forestry will be conducted jointly with West Virginia University Extension and will focus on the often under-served, smaller, family owned operations which are typical in West Virginia. Similarly, programs in food quality, food safety, and human nutrition and health will be directed largely at concerns and situations characteristic of smaller, less affluent, rural communities, again those typically under served. Additionally, Station programs supporting economic development, quality of life and protection of natural environments will be directed toward developing ways in which smaller, rural communities can capitalize on existing resources to enhance economic development and improve quality of life in the community. Station faculty will be supported and strongly encouraged to participate in cooperative, multi state projects with address these issues.

3. How will the planned programs describe the expected outcomes and impacts?

Most joint research and extension programs in West Virginia share a common goal of contributing to economic growth and community wellbeing by helping to develop technologies that utilize resources which are relatively unique to West Virginia and readily accessible to state citizens, in order to produce competitive advantages for state entrepreneurs. Other joint programs focus on development and delivery of methods for understanding, analyzing and solving state wide issues, including human nutrition (osteoporosis, obesity, cardiovascular disease, etc.), environmental quality and natural resource conservation. Expected outcomes and impacts from these programs will be described in terms of economic growth and industry expansion (aquaculture, pasture finished livestock, hardwood utilization, etc.), improved public health demographics for citizens in rural communities in West Virginia (healthier diets, reduced incidence of obesity, diabetes and cardiovascular disease, fewer cases of osteoporosis, etc.), increases in knowledge gained through basic research activities, technology transfer resulting from basic and applied research efforts, enhanced soil and water quality, and improved aquatic and terrestrial wildlife habitat.

4. How will the planned programs result in improved program effectiveness and/or

Multistate research and joint research-extension efforts are critical to the success of programs conducted by the West Virginia Agricultural and Forestry Experiment Station. The

West Virginia Station lacks the critical mass of scientists needed to achieve reasonable progress in the development of technologies to support economic development and improved quality of life for State citizens. Joint research programs involving scientists from other states and from West Virginia State University, are therefore necessary to meet expectations for technology development. We have recently signed a memorandum of understanding with Penn State and the University of Maryland to share extension and research resources regionally rather than station by station to support our regional tree fruit industry. We are optimistic that this agreement will lead to further regional cooperation in other areas of concern in the future. Likewise, Station efforts to enhance state-wide economic development and improve quality of life require joint research-extension programs to develop and deliver outreach programs which will achieve the understanding and adoption of new technology, improved management systems, steps to healthier lifestyles, more informed personal choices, etc.

IV. Stakeholder Input

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

- Targeted invitation to traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Survey of traditional stakeholder groups
- Survey specifically with non-traditional groups

Brief explanation.

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

2(A). A brief statement of the process that will be 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

Brief explanation.

An administrative position for Outreach and Community Affairs was established July 1, 2010 under the Associate Dean and Associate Director of the Agriculture and Forestry Experiment Station to enhance our communication and working relationship with commodity and industry groups, state agencies and community organizations that represent our College disciplines within the State of West Virginia. The major stimulus for this action was to enhance the College's relationship with our stakeholders and make our programs more relevant to needs of the State. We truly believe that our success as a College will be measured by how well we serve the citizens of West Virginia, then the nation and the world. We value our work with the stakeholders and partnerships within our State and need their input to improve and make more relevant this relationship in the future.

The responsibilities identified for this position were:

1. Communicate the position and contact information to the various stakeholder groups offering our assistance and requesting their input.
2. To create an updated data base of stakeholder, community groups and industry partnerships relevant to the College.
3. Evaluate the need for activities to enhance the communication, awareness and image of the College.
 1. Expand our presence and participation to stakeholder groups
 2. Re- create a College Newsletter
 3. Annual open house
 4. Enhance the activities of the College Alumni Association
 5. Research Annual Reports
 6. Re-visit the role of the College Visiting Committee in support of the College

A memo announcing the new position was sent to a partial data base list of stakeholder groups, state agency and industry partners with the position contact information, offering our assistance and asking for their input for improved relations. This position continues to work with extension, state agencies and internally through the divisional directors to develop a more extensive and current data base for commodity and community organizations that encompass a more comprehensive scope for our College programs and activities. This data base is critical for improved communication from the College via all forms of information media. Efforts have been initiated with the communication specialist for the College to assess the need and potential to re-establish a College level newsletter. The College currently has two alumni associations, the College and the Division of Natural Resources and Forestry. Recommendations have been made to the leadership of the College Alumni Association for potential changes in the meeting and banquet venues to link with other activities in the College and improve participation and grow this association in support of the College. In addition, consideration should be given to explore concept to merge the two alumni associations into one.

2(B). A brief statement of the process that will be 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
- Meeting specifically with non-traditional groups

Brief explanation.

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.

In addition to the ongoing service and outreach activities, highly varied requests constantly come to the College. Examples of such request are: to set up a meeting for outreach activities, identify individuals that have the expertise to address a given problem, seeking assistance to set up an business enterprise germane to a discipline within our College, to discuss potential partnership activities or to seek direction for a possible solution to a problem. In addition many of the requests involve academic program issues, graduate and undergraduate applications, potential internship opportunities for family members who are students, employment opportunities and scholarship support opportunities. There has been a particular interest from industry and commodity groups for updated information regarding the now successful search for a new Dean for the College.

3. A statement of how the input will be considered

- In the Budget Process
- To Identify Emerging Issues
- Redirect Research Programs
- In the Staff Hiring Process
- In the Action Plans
- To Set Priorities

Brief explanation.

Stakeholder input as it relates to the College/Station research portfolio is discussed regularly with College advisory groups and within College administrative groups, particularly when work plans are being prepared or when staffing decisions are pending. Such input will be included in our strategic planning processes. We will be developing a 10 year strategic plan in 2012 after the arrival of our new dean on June 1, 2012 and will be reaching out to traditional and new stakeholders to aid our planning process.

V. Planned Program Table of Content

S. No.	PROGRAM NAME
1	Economic Development and Quality of Life in Rural Communities
2	Climate Change, Environmental Quality and Stewardship
3	Fundamental Plant and Animal Systems
4	Global Food Security and Hunger: Production/Sustainable Agriculture
5	Childhood Obesity, Human Nutrition and Health
6	Production/Sustainable Forestry
7	Sustainable Energy

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Economic Development and Quality of Life in Rural Communities

2. Brief summary about Planned Program

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, forests, water and recreational opportunities, unemployment is typically higher than in the rest of the Nation. Accordingly, the West Virginia Agricultural and Forestry Experiment Station has designated economic development and the quality of life in rural communities as one of our primary program areas.

Regional economic opportunities need to be based on the natural and human resources present in the region. A significant part of rural employment growth nationwide has occurred in non-traditional economic activities including those capitalizing on natural resources and climate. A number of possible economic opportunities are being investigated in West Virginia, including pasture finished beef, cool water aquaculture, organic production of vegetables and animal products, and ecotourism. Research will examine factors which affect levels of employment, poverty, welfare, and food assistance in order to characterize patterns of income distribution, land use, and the potential for economic development from recreational and tourism activities. Additional work will examine economic potential to direct market local and niche foods, develop and test techniques to support clonal nursery production, and evaluate public policies that support and nurtures biobased production of energy and materials.

Quality of life issues to be examined focus on rural citizens and communities and include education and leadership development, personal appearance and self esteem as well as suitability of constructed environments at home and in the workplace. We also are evaluating ways to alter national park programs and infrastructure to better attract and appeal to minority and disabled citizens, and to best use our national park system in supporting national goals for environmental education and fitness enhancement.

West Virginia University Extension has an extensive number of related educational outreach programs in community resource and economic development. Those involving business development and retention, community design for sustainable economic growth, and forest heritage tourism are most closely related to College research programs. For example, one successful program conducted jointly between the College and WVU Extension is the WVU Community Design Team. The program is designed to conduct community visits and assist communities, for a fee, to help plan for their future.

3. Program existence : Mature (More than five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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			10%	
134	Outdoor Recreation			15%	
511	New and Improved Non-Food Products and Processes			15%	
604	Marketing and Distribution Practices			15%	
605	Natural Resource and Environmental Economics			10%	
608	Community Resource Planning and Development			20%	
724	Healthy Lifestyle			5%	
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures			5%	
903	Communication, Education, and Information Delivery			5%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Stagnant or declining per-capita income, population outflow primarily for younger working age adults, and chronic structural unemployment, are persistent problems in some areas of West Virginia. Research to develop technologies and management systems which promote economic development consequently are a high priority in the West Virginia Experiment Station. Additionally, research which supports improvements in factors which affect quality of life independent of income may be equally important in stemming outflows of human capital.

The predominantly rural character of West Virginia dictates that Station research will focus on economic development and quality of life issues that occur primarily in rural communities having agricultural or forest based or other land based economies. During the planning period 2014-2018, the West Virginia University Experiment Station will continue to focus on research to determine the keys to successfully increasing direct consumer sales of agricultural products (retail rather than wholesale) with integrated, birth to market production methods for livestock where beneficial; to develop systems of treating water from abandoned mines which allow usage in the production of cool water fish and recreational fisheries; to devise protocols for the efficient propagation of native plant species; to institute programs which assist community based efforts to establish recreation and/or tourism industries which capitalize on local historical, forest or wildlife resources; to construct decision tools which assist in choosing among easement and land use alternatives; to develop methods to evaluate economic feasibility of niche or specialty markets through analysis of risk and profit potential; to formulate and implement procedures which compare alternative courses for economic development in terms of potential profit and degree of risk; to devise models predicting restorative, stress reducing capacity of various nature related

recreational activities and assess relationships between interpretation and level of tourism activity.

2. Scope of the Program

- In-State Research
- Multistate Research
- Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Opportunities exist to offer sustainable economic growth to rural communities in ways which will not destroy the essence and character of the communities involved. If State citizens and policy makers are given information and technical assistance about economic opportunities and ways to improve the quality of life in rural communities they will effectively use that information to develop new businesses, improve existing businesses and improve rural communities.

2. Ultimate goal(s) of this Program

To assist rural West Virginia citizens, communities and policymakers by providing research-based experience and technologies to bear on economic development and quality of life issues. To help communities, citizens and policy makers in developing diverse and robust local economies which provide sufficient opportunities for gainful employment while preserving the natural resources, environment and character of each community.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2014	0.0	0.0	6.5	0.0
2015	0.0	0.0	7.0	0.0
2016	0.0	0.0	7.5	0.0
2017	0.0	0.0	7.5	0.0
2018	0.0	0.0	7.5	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Conduct research; publish results in scientific journals and popular press; make presentations at scientific and professional meetings; train graduate students. Conduct community outreach in partner with WVU Extension through the Community Design Team and other avenues to help foster programs that enhance job opportunities and enhance the quality of life in the region. Consult with policy makers to gain information about the key issues facing the region and to provide technical and educational information to

help address those issues.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension	
Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● Other 1 (extension is a separate unit) 	<ul style="list-style-type: none"> ● Other 1 (extension is a separate unit)

3. Description of targeted audience

The primary audience for our community and economic development activities is community managers, planners, policy makers, consultants and local development committees or groups. For aquacultural and agricultural product development and marketing, the audience includes producers, processors and distributors. Our work on the quality of life is used by local and State planners and policy makers, State citizens and community groups and educators.

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
 - Direct Adult Contacts
 - Indirect Adult Contacts
 - Direct Youth Contacts
 - Indirect Youth Contact
 - Number of patents submitted
 - Number of peer reviewed publications
- Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Presentations on research at professional meetings
 - Team consultations with, and reports to assist, community action groups focused on improving local economic development and quality of life.
 - Completed graduate degree programs
 - Popular press reports.
- Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

O. No	Outcome Name
1	Number of community specific plans developed and adopted in whole or in part to help enhance economic development and quality of life.
2	Number of business plans and successful start-ups in the State developed and implemented with assistance from the WVU Agricultural and Forestry Experiment Station.

Outcome # 1

1. Outcome Target

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

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 131 - Alternative Uses of Land
- 605 - Natural Resource and Environmental Economics
- 608 - Community Resource Planning and Development
- 804 - Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

Number of business plans and successful start-ups in the State developed and implemented with assistance from the WVU Agricultural and Forestry Experiment Station.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 134 - Outdoor Recreation
- 511 - New and Improved Non-Food Products and Processes
- 608 - Community Resource Planning and Development
- 903 - Communication, Education, and Information Delivery

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Economy
- Appropriations changes

Description

Changes in appropriations which reduce or eliminate support for this program could significantly alter the timing of outcomes.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Experiment Station research program evaluation will take 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:

- Referee journal articles and books
- Professional presentations
- 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

In addition, every five years we will have a full portfolio review of our research programs in terms of:

- 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 timing of the first portfolio review will be determined by our new dean, in consultation with our visiting committee at our biannual spring meeting in 2013.

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Climate Change, Environmental Quality and Stewardship

2. Brief summary about Planned Program

Research to assist in the preservation of West Virginia's soil, water, forest and wildlife resources is a high priority in the West Virginia Experiment Station particularly given the extra stresses and uncertainty imposed by a changing climate. The focus of Station research 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. Our primary environmental research areas involve minelands' restoration, ecosystem resiliency to climate change and other environmental stressors, water quality, wetlands, and aquatic and terrestrial wildlife ecology.

Much of the research in this program examines the impact of human activity on soil and/or water quality. Specific emphasis will be on proper handling of animal wastes, environmentally sensitive management of pests (insects, diseases, nematodes, weeds and invasive plants), determining cost and value of programs to prevent and remediate pollution, developing methods to increase the success of created wetlands, setting restoration priorities, minimizing negative environmental impacts from agricultural, forestry and mining activities and developing opportunities for state participation in emerging biobased sectors of the economy. Also examined will be organic production of vegetables, animals and eggs, soil properties best supporting pasture productivity, and the efficacy of current mitigation practices in aiding recovery of lost aquatic ecosystem function as well as productive use of reclaimed mine sites.

West Virginia University Extension conducts related educational outreach programs in sustainable agriculture and forestry, watershed management, pesticide safety and integrated pest management.

3. Program existence : Mature (More than five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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%	
102	Soil, Plant, Water, Nutrient Relationships			10%	
112	Watershed Protection and Management			15%	
132	Weather and Climate			10%	
133	Pollution Prevention and Mitigation			15%	
135	Aquatic and Terrestrial Wildlife			25%	
605	Natural Resource and Environmental Economics			10%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Research supporting preservation of West Virginia's soil, water, forest and wildlife resources has high priority in the West Virginia Agricultural and Forestry Experiment Station. Key research themes over the period 2014-2018 will include anticipating and adapting to changes in climate, developing baseline data to monitor the impacts of climate change on State ecosystems, protecting soil and water quality by developing economically effective and environmentally sustainable management practices for agriculture and forestry and at other points of interaction between man and environment. Contamination of soil and eventually ground water with acid drainage from abandoned mines, and from more recent surface mining, is a persistent State concern. Most acid mine drainage sites involve complex mixtures of contaminants. Efforts to define the nature and scope of the contamination have used both actual mine drainage sites and simulated drainage situations. Examples of the former include comparing wetlands impacted by the release of metal-laden sediments from acid mine drainage and those not so impacted. Research with simulated mine drainage is measuring, under laboratory conditions, impacts of sulfate, neutralizing cation action and endpoint pH on acid mine drainage neutralization with the goal of designing more efficient acid mine drainage treatment systems. We plan to coordinate research and extension work on Marcellus shale, an area of growing economic and environmental importance in our region.

Research to develop environmentally sustainable practices for managing farms and forests is an important component of overall Station goals to position state producers/entrepreneurs to compete more effectively in organic or "green" markets and to preserve West Virginia land, forest, wildlife, and soil and water resources for future generations. Example projects include the development of soft chemical and mating disruption programs to minimize insect damage to tree fruit orchards, efforts to document and correct as necessary, impacts on non-target species from efforts to control gypsy moth defoliation of state forest lands, development of TMDL planning and assessment tools, use of composted poultry litter in turfgrass management, and developing methods to objectively assess economic value of environmentally sustainable practices.

2. Scope of the Program

- In-State Research
- Multistate Research
- Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Activities conducted without concern for the environmental consequences are rarely sustainable. Research can lead to significant improvement in the sustainability of agricultural and forest industries in West Virginia and long-run, cost effective environmental decisions. Climate change will have an impact on the environment of the State, affecting agricultural production, ecosystem health and the well being of the citizens of the State. Research can help mitigate the impacts of climate change and help our citizens respond in a positive way to climate change.

2. Ultimate goal(s) of this Program

Make significant contributions to both the environmental sensitivity and profitability of land-based economic activities in West Virginia. Help inform policy makers and citizens groups by providing scientific, unbiased information about climate change and environmental quality issues.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2014	0.0	0.0	8.0	0.0
2015	0.0	0.0	8.5	0.0
2016	0.0	0.0	9.0	0.0
2017	0.0	0.0	9.0	0.0
2018	0.0	0.0	9.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Conduct research; publish/present results; contribute to educational and outreach programs; train graduate students. Coordinate with WVU Extension to provide relevant outreach programs. Communicate with policy makers, community leaders and citizens groups.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension	
Direct Methods	Indirect Methods

- Other 1 (extension is a separate unit)

- Other 1 (extension is a separate unit)

3. Description of targeted audience

The activities in this area are used to contribute to the body of knowledge in the environmental and natural sciences, and to inform policy makers, planners, regulatory agencies and public interest and citizens groups.

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
 - Direct Adult Contacts
 - Indirect Adult Contacts
 - Direct Youth Contacts
 - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Presentations on research at professional meetings
- Popular press articles on research
- Completed graduate degree programs

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

O. No	Outcome Name
1	Reduce the number of state streams classified as impaired by agricultural and forestry activities.
2	Number of State landowners adopting reclamation and watershed protection practices in consultation with Experiment Station Faculty.

Outcome # 1

1. Outcome Target

Reduce the number of state streams classified as impaired by agricultural and forestry activities.

2. Outcome Type : Change in Condition Outcome Measure

3. Associated Knowledge Area(s)

- 133 - Pollution Prevention and Mitigation
- 605 - Natural Resource and Environmental Economics

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

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

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 101 - Appraisal of Soil Resources
- 102 - Soil, Plant, Water, Nutrient Relationships
- 112 - Watershed Protection and Management
- 132 - Weather and Climate
- 133 - Pollution Prevention and Mitigation
- 135 - Aquatic and Terrestrial Wildlife
- 605 - Natural Resource and Environmental Economics

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Economy
- Appropriations changes

Description

Loss or significant reduction in funding would impact timing of outcomes.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Experiment Station research program evaluation will take 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:

- Referee journal articles and books
- Professional presentations
- 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

In addition, every five years we will have a full portfolio review of our research programs in terms of:

- 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 of a subset of our College Visiting Committee. The timing of the first portfolio review will be determined by our new dean, in consultation with our visiting committee at our biannual spring meeting in 2013.

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Fundamental Plant and Animal Systems

2. Brief summary about Planned Program

Research involving fundamental plant and animal systems is designed to increase our basic scientific understanding of reproductive, nutritional and general physiological systems and processes. On the animal side, practical problems addressed include embryonic mortality in sheep and cattle, performance limiting amino acids in animal rations, and health and disease resistance in poultry. For plants, the program emphasis varies from determining functions of ubiquitin and other polypeptide tags, to understanding basic mechanisms of flower senescence and cold shock adaptation, to combating the impacts of phytophthora and Chestnut blight, to defining and eliminating negative effects on grazing animals of ergot alkaloids produced by fungi symbiotic with pasture grasses.

3. Program existence : Mature (More than five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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			25%	
206	Basic Plant Biology			15%	
301	Reproductive Performance of Animals			25%	
302	Nutrient Utilization in Animals			15%	
304	Animal Genome			10%	
305	Animal Physiological Processes			10%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Efficiency in the production of plant and animal products is enhanced by a thorough understanding of the ways in which biological systems interact with environmental conditions, including conditions which

define habitat for wildlife, natural settings for recreational activities or alternative schemes for the management of domestic plants and animals. A primary goal of research involving fundamental plant and animal systems at the West Virginia Experiment Station will be to support components of production agriculture, forestry and other land-based economic activities which are profitable under West Virginia conditions. Examples of supporting research include basic nutrition and physiology of poultry; nutritional biochemistry; microbiology; genetic mapping and functional genomics for cool water fish species; reproductive physiology; nutrient utilization of pasture raised livestock; basic growth and physiology of forage plant species as well as livestock-forage interactions; physiological processes controlling growth, cold tolerance, flower production, etc. of ornamental plants; mechanisms of disease and pest resistance for organically produced crops; etc.

2. Scope of the Program

- In-State Research
- Multistate Research

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Natural variation exists in the efficiency of numerous physiological processes which characterize plant and animal species. Greater process control and efficiency of production generally result from a more complete understanding of the basic mechanisms which underlie a productive process. Work in the basic biological sciences will ultimately lead to new products and management practices that will benefit farmers, industry and State citizens.

2. Ultimate goal(s) of this Program

To develop greater understanding of usable variations in fundamental physiological processes of plants and animals which lead to increased returns to industries for which State producers/entrepreneurs have competitive advantage or to improved life quality for West Virginia families and communities.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2014	0.0	0.0	5.0	0.0
2015	0.0	0.0	5.5	0.0
2016	0.0	0.0	6.0	0.0
2017	0.0	0.0	6.0	0.0
2018	0.0	0.0	6.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

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.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension	
Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● Other 1 (extension is a separate unit) 	<ul style="list-style-type: none"> ● Other 1 (extension is a separate unit)

3. Description of targeted audience

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

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
 - Direct Adult Contacts
 - Indirect Adult Contacts
 - Direct Youth Contacts
 - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Presentation on research at professional meetings
- Completed graduate degree programs

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

O. No	Outcome Name
1	Gain understanding of the mechanisms that govern flower senescence
2	Develop ergot alkaloid deficient grasses at or near wild-type vigor - # new cultivars
3	Successfully develop and employ strategies using hypovirus as a biological control agent for Chestnut blight - # new strategies employed
4	Identify ovarian-specific gene expression affecting reproductive success - # new genes identified

Outcome # 1

1. Outcome Target

Gain understanding of the mechanisms that govern flower senescence

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms
- 206 - Basic Plant Biology

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

Develop ergot alkaloid deficient grasses at or near wild-type vigor - # new cultivars

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms
- 206 - Basic Plant Biology

4. Associated Institute Type(s)

- 1862 Research

Outcome # 3

1. Outcome Target

Successfully develop and employ strategies using hypovirus as a biological control agent for Chestnut blight - # new strategies employed

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms
- 206 - Basic Plant Biology

4. Associated Institute Type(s)

- 1862 Research

Outcome # 4

1. Outcome Target

Identify ovarian-specific gene expression affecting reproductive success - # new genes identified

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 301 - Reproductive Performance of Animals
- 304 - Animal Genome
- 305 - Animal Physiological Processes

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Appropriations changes
- Competing Public priorities

Description

Reduction in funding for fundamental research could have a significant impact on timing of outcomes

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Experiment Station research program evaluation will take 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:

- Referee journal articles and books

- Professional presentations
- 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

In addition, every five years we will have a full portfolio review of our research programs in terms of:

- 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 timing of the first portfolio review will be determined by our new dean, in consultation with our visiting committee at our biannual spring meeting in 2013.

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Global Food Security and Hunger: Production/Sustainable Agriculture

2. Brief summary about Planned Program

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

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

West Virginia University Extension conducts educational outreach programs to ensure technology transfer to end users in most College research areas in production agriculture. Specific examples include educational programs related to production of cool water fish for food and sport, grasslands management, beef and sheep production and marketing, commercial and individual horticulture and plant pest and pathogen diagnostics. We are looking increasingly at systems approaches to production, for example integrated plant and animal organic farming systems and joint aquaculture/aquaponics production systems that take advantage of West Virginia's relatively abundant supply of water.

3. Program existence : Mature (More than five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
133	Pollution Prevention and Mitigation			10%	
202	Plant Genetic Resources			5%	
205	Plant Management Systems			10%	
211	Insects, Mites, and Other Arthropods Affecting Plants			10%	
212	Pathogens and Nematodes Affecting Plants			10%	
216	Integrated Pest Management Systems			5%	
301	Reproductive Performance of Animals			15%	
302	Nutrient Utilization in Animals			15%	
303	Genetic Improvement of Animals			5%	
307	Animal Management Systems			10%	
313	Internal Parasites in Animals			5%	
	Total			100%	

V(C). Planned Program (Situation and Scope)**1. Situation and priorities**

West Virginia agriculture is dominated by high intensity poultry production and low intensity pasture-fed ruminant production. Much of the land in West Virginia is characterized by steep slopes and high rates of erosion that are suitable to pasture but not to intensive row-crop production. Most intensive crop production, including some fruits and vegetables, is limited to those regions of the state that have relatively flat terrain and favorable soil characteristics. To be competitive, West Virginia producers typically must become competitive either by increasing the value of what they produce or by reducing transportation and production costs by relying on locally-marketed products, by taking advantage of the State's proximity to major urban markets or by developing niche products.

To remain viable, West Virginia producers typically must improve efficiency by increasing the value of what they produce, by producing at lower cost, or both. Specific strategies include avoiding enterprises which require extensive amounts of mechanical tillage or harvest; reducing costs of major inputs such as feed, labor, and facilities; focusing on higher value products including those with ornamental or recreational uses; increasing real or perceived product value in specialty, niche or out-of-season markets; diversifying product offerings; taking advantage of proximity to markets, etc.

The objective of this research program in the West Virginia Agricultural and Forestry Experiment Station is to generate new knowledge with positive impact on economic activities for which state producers have some degree of competitive advantage. Station research will focus on economic activities meeting

one, or more often multiple, circumstances listed above and generally having land as a primary input. Examples include forage production / livestock grazing; poultry production; organically produced vegetables, fruits and/or animal products; production of ornamental plants; and cool water aquaculture for food and sport fishing.

2. Scope of the Program

- In-State Research
- Multistate Research
- Integrated Research and Extension
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

For the foreseeable future, West Virginia will remain a largely rural state with a need for economic activities which thrive in non-urban settings. Land-based enterprises operate naturally and logically in rural settings; many rural West Virginia citizens own land which can be a valuable input, as well as a major input, to such enterprises. Applied agricultural research at the WV Agricultural and Forestry Experiment Station will lead to greater competitiveness and profitability for farmers in the State and region.

2. Ultimate goal(s) of this Program

To generate information which will contribute to a diverse and robust rural economy based on responsible and sustainable use of land, water and air. To enhance the productivity and profitability of farmers and agribusinesses in the State and to provide the citizens of the State with a healthy diet at reasonable cost.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2014	0.0	0.0	9.0	0.0
2015	0.0	0.0	9.5	0.0
2016	0.0	0.0	10.0	0.0
2017	0.0	0.0	10.0	0.0
2018	0.0	0.0	10.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Conduct research; report results in scientific manuscripts, technical and popular presentations; train

graduate students. Generate applied research that is useful to the profession and to producers within the State. Conduct outreach activities in conjunction with WVU Extension to disseminate the results of that applied research in a way that is understandable and useful to State farmers and agribusinesses.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension	
Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● Other 1 (extension is a separate unit) 	<ul style="list-style-type: none"> ● Other 1 (extension is a separate unit)

3. Description of targeted audience

The target audience for this program area includes producers, processors, distributors, extension specialists, agricultural consultants, regulators, policy makers and other researchers.

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
 - Direct Adult Contacts
 - Indirect Adult Contacts
 - Direct Youth Contacts
 - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Presentation on research at professional meetings
- Popular press articles on research
- Completed graduate degree programs

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

O. No	Outcome Name
1	Growth in state sales of beef - % increase
2	Growth in state aquaculture industry - annual % increase in gross revenue
3	Growth in state broiler, egg and turkey sales- annual % increase

Outcome # 1

1. Outcome Target

Growth in state sales of beef - % increase

2. Outcome Type : Change in Condition Outcome Measure

3. Associated Knowledge Area(s)

- 205 - Plant Management Systems
- 301 - Reproductive Performance of Animals
- 302 - Nutrient Utilization in Animals
- 303 - Genetic Improvement of Animals
- 307 - Animal Management Systems

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

Growth in state aquaculture industry - annual % increase in gross revenue

2. Outcome Type : Change in Condition Outcome Measure

3. Associated Knowledge Area(s)

- 133 - Pollution Prevention and Mitigation
- 302 - Nutrient Utilization in Animals
- 303 - Genetic Improvement of Animals
- 307 - Animal Management Systems

4. Associated Institute Type(s)

- 1862 Research

Outcome # 3

1. Outcome Target

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

2. Outcome Type : Change in Condition Outcome Measure

3. Associated Knowledge Area(s)

- 133 - Pollution Prevention and Mitigation
- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 307 - Animal Management Systems

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Economy
- Appropriations changes
- Competing Public priorities

Description

Loss or meaningful reduction in funding and / or a significant downturn in the economy could significantly affect timing of outcomes

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Experiment Station research program evaluation will take 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:

- Referee journal articles and books
- Professional presentations
- 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

In addition, every five years we will have a full portfolio review of our research programs in terms of:

- 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 timing of the first portfolio review will be determined by our new dean, in consultation with our visiting committee at our biannual spring meeting in 2013.

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Childhood Obesity, Human Nutrition and Health

2. Brief summary about Planned Program

West Virginia citizens have the third highest level of obesity in the Nation (Center for Disease Control, 2011). 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. Station research in human nutrition and health is focused on determining the current and potential impacts of diet, nutritional education and dietary intervention on obesity and obesity related conditions (diabetes, elevated cholesterol and plasma lipids, heart attack, stroke and some cancers). The program also is testing the efficacy and safety of bioactive compounds in foods, including krill protein, and is developing omega-3 DHA enhanced diets and educational programs to support their adoption.

Complementary educational programs directed by West Virginia University Extension include food safety education, family nutrition, dietary planning with diabetes, and cardiac nutrition.

3. Program existence : Intermediate (One to five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds :Yes

6. Expending other than formula funds or state-matching funds : Yes

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			15%	
502	New and Improved Food Products			15%	
702	Requirements and Function of Nutrients and Other Food Components			20%	
703	Nutrition Education and Behavior			30%	
724	Healthy Lifestyle			20%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

West Virginia citizens have the third highest level of obesity in the Nation (Center for Disease Control, 2011). 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.

Dietary patterns formed in childhood often persist into adolescence and influence the risk of developing chronic health problems. For example, overweight children and teens are more likely to be obese as adults and have greater chance of developing type 2 diabetes, high blood pressure, abnormal blood lipid profiles, and orthopedic problems.

Knowledge regarding relationships among familial factors, dietary patterns and body mass index of young children, will allow us to better address the serious and growing problem of childhood obesity in West Virginia. Planned research will provide information about these relationships in rural, Appalachian children that will allow us to design culturally sensitive, effective outreach and education programs.

State median population age and occurrence of osteopenia or osteoporosis likewise exceed national averages in West Virginia. In fact, the National Osteoporosis Foundation estimates that by the year 2020, more than 300,000 women in West Virginia will suffer from osteoporosis unless corrective action is taken. Estrogen replacement therapy has been used successfully to prevent bone loss in postmenopausal women but has several undesirable side effects. Ongoing research is examining the efficacy of exercise and treatment with non-steroidal plant estrogens (phytoestrogens) as an alternative to estrogen replacement therapy in preventing bone loss.

Omega-3 polyunsaturated fatty acids, particularly docosahexaenoic acid (DHA) have been shown to reduce cardiovascular disease, inflammatory disorders, autoimmune disorders, Crohn's disease and certain cancers. Additionally, infants that are born from mothers with high plasma DHA exhibit characteristics that are indicative of greater central nervous system maturity at comparable points in time. Research will be undertaken to develop sensory-acceptable methods of fortifying foods with DHA which avoid problems of short chain fatty acid oxidation, and of providing a reliable source of DHA using the heterotrophic marine alga, *Cryptocodinium cohnii*.

Planned research also will address problems related to food quality and efficiency of food processing. Because fish proteins are especially susceptible to freeze and freeze-thaw cycle induced denaturation, one research focus will be on developing superior (measured by product quality and safety) methods of cryopreservation for fish fillet and restructured fish products. Additionally, research is being instituted to evaluate and develop non-thermal electron beam treatment as a critical control point to minimize microbial contamination, particularly in leafy green vegetables and ground meat products. A recently instituted and related area of research involves developing improved methods for protein and lipid recovery from trout processing by-products. This method is being exploited to develop commercial products.

2. Scope of the Program

- In-State Research
- Multistate Research
- Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Good nutrition and optimal food consumption is fundamental to overall health. Dietary modifications can be developed which will significantly improve the health of West Virginia citizens. Research can lead to increased food quality and safety while increasing efficiency of food processing.

2. Ultimate goal(s) of this Program

To provide citizens of West Virginia with an abundant, safe, high quality food supply and the information needed to make healthful dietary choices. To produce research that leads to a better understanding of the role of nutrition in human health and the informational, economic and environmental factors that govern consumer choice.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2014	0.0	0.0	3.0	0.0
2015	0.0	0.0	3.5	0.0
2016	0.0	0.0	3.5	0.0
2017	0.0	0.0	4.0	0.0
2018	0.0	0.0	4.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Conduct research; publish results in scientific, peer reviewed research journals and popular press; make presentations to colleagues at professional meetings; train graduate students. Deliver information and offer educational workshops on nutrition, health and diet. Work with educators and youth programs in conjunction with WVU Extension to encourage improved nutrition in children and to reduce childhood obesity in the State.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> Other 1 (extension is a separate unit) 	<ul style="list-style-type: none"> Other 1 (extension is a separate unit)

3. Description of targeted audience

The target audience for this program area includes dieticians, nutritionists, policy makers, researchers, extension specialists, 4-H and other youth program developers, community leaders and State citizens.

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
 - Direct Adult Contacts
 - Indirect Adult Contacts
 - Direct Youth Contacts
 - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Presentations on research at scientific meetings
- Popular press articles on research
- Completed graduate degree programs

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

O. No	Outcome Name
1	Annual reduction in state incidence of obesity -% reduction
2	Participants in nutrition workshops will increase their knowledge of the relation between nutrition and health (% of participants reporting a gain in knowledge).
3	Participants in nutrition workshops will gain an understanding of how to make healthy food choices (% reporting a gain in understanding).

Outcome # 1

1. Outcome Target

Annual reduction in state incidence of obesity -% reduction

2. Outcome Type : Change in Condition Outcome Measure

3. Associated Knowledge Area(s)

- 702 - Requirements and Function of Nutrients and Other Food Components
- 703 - Nutrition Education and Behavior

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

Participants in nutrition workshops will increase their knowledge of the relation between nutrition and health (% of participants reporting a gain in knowledge).

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 702 - Requirements and Function of Nutrients and Other Food Components
- 703 - Nutrition Education and Behavior
- 724 - Healthy Lifestyle

4. Associated Institute Type(s)

- 1862 Research

Outcome # 3

1. Outcome Target

Participants in nutrition workshops will gain an understanding of how to make healthy food choices (% reporting a gain in understanding).

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 702 - Requirements and Function of Nutrients and Other Food Components
- 703 - Nutrition Education and Behavior

- 724 - Healthy Lifestyle

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Economy
- Appropriations changes
- Competing Public priorities

Description

Reduced or eliminated funding would significantly impact timing of outcomes.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Experiment Station research program evaluation will take 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:

- Referee journal articles and books
- Professional presentations
- 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

In addition, every five years we will have a full portfolio review of our research programs in terms of:

- 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 timing of the first portfolio review will be determined by our new dean, in consultation with our visiting committee at our biannual spring meeting in 2013.

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Production/Sustainable Forestry

2. Brief summary about Planned Program

This program includes research to develop economically optimal, sustainable procedures for timber (primarily hardwood) management and harvest, to increase efficiency of utilization and develop new uses for hardwoods, and to devise means and processes to efficiently utilize wood and timber resources in unique and profitable ways. Timber management research includes specifically the development of models to predict yields from standing timber, protection of forest resources from insect pests, disease, and invasive species; harvest management for optimum regeneration and re-growth; responding to research needs and concerns of corporate and private owners; and providing economic comparisons among alternative management and harvesting methods.

Wood utilization research likewise will be focused on hardwoods with a goal of maximizing hardwood timber to lumber throughput, reducing impact of brown rot fungi; development of non-destructive methods to determine lumber strength and stiffness, expanding uses for Appalachian hardwoods, especially uses for harvest and processing residuals, and devising saw mill systems for moderate sized operations. Additional research will develop systems for use at harvest to optimize bucking; develop new uses for low quality hardwoods, use ground penetrating radar to develop nondestructive scanning methods to identify subsurface defects in hardwood logs, and incorporation of cellulose nanocrystals into biopolymer composites to determine the effect on mechanical properties.

West Virginia University Extension conducts educational outreach program to support research in timber management, logging, milling and forest stewardship practices, and wood utilization.

3. Program existence : Mature (More than five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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			65%	
124	Urban Forestry			5%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			10%	
511	New and Improved Non-Food Products and Processes			20%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Hardwood forests cover approximately 80% of the state of West Virginia and represent an enormous state resource. Station research in timber production and wood utilization is focused on efficient, environmentally friendly, and sustainable methods of timber management and harvest, protection of our forest resources from insect pests, diseases and invasive species, and the development of value-added wood products and unique, innovative new uses for hardwood lumber. Examples of specific research areas of interest include examination of alternative harvesting methods; predicting lumber yields from measures on standing timber; protecting stands from diseases such as phytophthora, pests like Gypsy Moth and invasive species like Ailanthus; overcoming copper tolerance of brown rot fungi; developing non-destructive methods to evaluate lumber strength and stiffness; designing sawing systems to optimize profitability for small mills, use of logging residues, etc.

2. Scope of the Program

- In-State Research
- Multistate Research
- Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Stands of hardwood timber in West Virginia represent a renewable resource which will exist in perpetuity if sustainably managed. Our research and outreach programs can help inform the forest industry and private landowners about opportunities and technologies that will improve their profitability while sustaining the resource base and the environment.

2. Ultimate goal(s) of this Program

To increase efficiency and profitability of forest and timber management; control threats to timber production from insects, diseases, and invasive species; develop innovative uses for hardwood products and structures, and assure industry sustainability. To help both large and small operations improve efficiency and sustainability.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2014	0.0	0.0	7.0	0.0
2015	0.0	0.0	7.0	0.0
2016	0.0	0.0	7.0	0.0
2017	0.0	0.0	7.0	0.0
2018	0.0	0.0	7.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Conduct research on wood science, timber production and processing and new product design. Improve utilization for forest biomass and residuals, study forest pests and invasive species, and communicate our findings, with the help of WVU Extension to the public and the forest products industry; report results in scientific journals, popular press and professional meetings; train graduate students.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> Other 1 (extension is a separate unit) 	<ul style="list-style-type: none"> Other 1 (extension is a separate unit)

3. Description of targeted 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.

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
 - Direct Adult Contacts
 - Indirect Adult Contacts
 - Direct Youth Contacts
 - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Presentations on research at professional meetings
- Popular press articles on research
- Completed graduate degree programs

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

O. No	Outcome Name
1	Growth in state timber industry - % change
2	Development of new state wood products and materials and new uses for forestry by products.
3	Program and workshop participants will gain information that will improve their forest operation management skills (% of participants who report a gain in knowledge).

Outcome # 1

1. Outcome Target

Growth in state timber industry - % change

2. Outcome Type : Change in Condition Outcome Measure

3. Associated Knowledge Area(s)

- 123 - Management and Sustainability of Forest Resources

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

Development of new state wood products and materials and new uses for forestry by products.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 123 - Management and Sustainability of Forest Resources

4. Associated Institute Type(s)

- 1862 Research

Outcome # 3

1. Outcome Target

Program and workshop participants will gain information that will improve their forest operation management skills (% of participants who report a gain in knowledge).

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 123 - Management and Sustainability of Forest Resources

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Competing Public priorities

Description

Loss or meaningful reduction of funding support could change drastically timing of outcomes

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Experiment Station research program evaluation will take 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:

- Referee journal articles and books
- Professional presentations
- 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

In addition, every five years we will have a full portfolio review of our research programs in terms of:

- 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 timing of the first portfolio review will be determined by our new dean, in consultation with our visiting committee at our biannual spring meeting in 2013.

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Sustainable Energy

2. Brief summary about Planned Program

This relatively new program focuses on biofuel and bioenergy production, including feedstock development and logistics, processing and conversion technologies, electricity and transportation fuel production and life cycle analysis. Focus of this program is on the development and analysis of sustainable systems for energy production from renewable, bio-based feedstocks. Analysis includes economic assessment, environmental impact determination and public policy evaluation; all measured relative to conventional energy production systems. Systems "development" will include designing methods for cost efficient production of renewable biofuels from agricultural and forest/wood product waste materials, from dedicated production of crops such as algae, grasses and rapid-growth trees, and from the co-processing of fossil and renewable energy sources. An additional component of this research will develop methods to selectively fractionate biomass cell walls into cellulose and lignin, to initiate conversion of cellulose for subsequent fermentation to ethanol or butanol.

Evaluation of environmental impact is a critical component of analysis for any alternative system for energy production. Davis College / West Virginia Station faculty have an extensive history of determining environmental consequences of fossil fuel based energy systems. These results will represent points of comparison for alternative systems producing energy from renewable, bio-based feed stocks. In general, environmental consequences will be determined on a watershed-wide basis and will include impact on soil and water quality as well as on plant and wildlife habitat.

Sustainable use of energy sources alternative to fossil fuel stores will depend upon economic considerations which, in turn, will be determined to a meaningful degree by public policy decisions. Energy policy issues span a broad array of disciplines, including legal issues associated with carbon storage, to costs of various sequestration strategies, to long-term environmental impacts, to contrasts involving non-adjacent areas of energy need and energy supply. Transition to a sustainable energy economy will depend upon adopting policies which encourage behavior consistent with attaining long-term societal goals and with few unintended consequences having negative impact. Analysis of alternative policy decisions will involve multidisciplinary approaches and the development of complex models which will accurately assess the impact of proposed policy and regulatory alternatives.

3. Program existence : Intermediate (One to five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
133	Pollution Prevention and Mitigation			10%	
403	Waste Disposal, Recycling, and Reuse			20%	
511	New and Improved Non-Food Products and Processes			40%	
605	Natural Resource and Environmental Economics			15%	
610	Domestic Policy Analysis			15%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

The U.S. has set an energy policy target of producing 20 percent of its transportation fuels from renewable sources by 2030. In order to meet that standard it will be necessary to develop ways of utilizing biomass, including residual biomass from agriculture and forestry, to produce that fuel. This target represents a significant challenge to the Land Grant University System.

Faculty at the West Virginia Experiment Station have a significant history of research related to the production and use of energy derived both from conventional fossil fuels (primarily coal) and, more recently from renewable feedstocks. Areas of research related to fossil fuel sources have focused on production efficiency and safety, environmental impact of production (soil and water quality, impact on wildlife habitat, etc.), and public policy issues related to energy harvest and use. Areas of research related to renewable feedstocks include developing systems for the dedicated production of biomass for energy production, and for using bio-materials currently discarded in agricultural production, timber harvest, and wood product manufacturing. West Virginia has access to large quantities of cellulosic waste and woody biomass as well as to a significant quantity of land better suited to the production of energy feedstock (grasses, rapidly growing trees, etc.) than to producing conventional agricultural commodities.

2. Scope of the Program

- In-State Research
- Multistate Research
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Reducing dependence on foreign sources of energy derived from fossil fuels, while developing renewable, more environmentally friendly, domestic sources will continue to be in the national interest and will remain a research priority for the future. The Land Grant System is particularly situated to contribute solutions to our country's energy problems.

2. Ultimate goal(s) of this Program

To make significant contributions through research and outreach to the efficiency and sustainability of energy production and use in the State and Nation.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2014	0.0	0.0	2.0	0.0
2015	0.0	0.0	2.5	0.0
2016	0.0	0.0	2.5	0.0
2017	0.0	0.0	3.0	0.0
2018	0.0	0.0	3.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Researchers will take a number of approaches regarding the development of renewable sources of energy, including feedstock production, feedstock logistics, research in pre-processing and conversion technologies, development of liquid and solid sources of energy, and life-cycle analysis. They will publish their research in scientific journals, make presentations at professional meetings, and in conjunction with WVU Extension, develop and transfer scalable technologies to State industries.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension	
Direct Methods	Indirect Methods
<ul style="list-style-type: none"> Other 1 (extension is a separate unit) 	<ul style="list-style-type: none"> Other 1 (extension is a separate unit)

3. Description of targeted audience

The target audience for this program area includes the bio-fuels and materials industries, the electricity generating industry, researchers, regulators, policy makers, and foresters.

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

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 - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

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V(H). State Defined Outputs

1. Output Measure

- Presentations on research at professional meetings
- Energy policy papers
- Completed graduate degree programs

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

O. No	Outcome Name
1	Work with the electrical generation industry to increase the percentage of renewable sources of biomass co-fired with coal (% increase per year)
2	Develop new processes for converting lignocellulose to usable sources of energy (number of new processes).
3	Percentage of participants in workshops held in the State on sustainable energy production and use who gain an understanding of the issue (% who report gains in knowledge).

Outcome # 1

1. Outcome Target

Work with the electrical generation industry to increase the percentage of renewable sources of biomass co-fired with coal (% increase per year)

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

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

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

Develop new processes for converting lignocellulose to usable sources of energy (number of new processes).

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 511 - New and Improved Non-Food Products and Processes

4. Associated Institute Type(s)

- 1862 Research

Outcome # 3

1. Outcome Target

Percentage of participants in workshops held in the State on sustainable energy production and use who gain an understanding of the issue (% who report gains in knowledge).

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 133 - Pollution Prevention and Mitigation
- 403 - Waste Disposal, Recycling, and Reuse

- 511 - New and Improved Non-Food Products and Processes
- 610 - Domestic Policy Analysis

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Economy
- Appropriations changes

Description

Growth or contraction in the state economy can have direct and significant effects on availability of support for research projects through state appropriations.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Experiment Station research program evaluation will take 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:

- Referee journal articles and books
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relevance given NIFA and State priorities

- Consideration of adding additional program areas given NIFA and State priorities

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