

2015 Pennsylvania State University Combined Research and Extension Plan of Work

Status: Submitted

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I. Plan Overview

1. Brief Summary about Plan Of Work

The College of Agricultural Sciences at Pennsylvania State University provides comprehensive support to the residents of Pennsylvania through the activities of the Pennsylvania Agricultural Experiment Station (AES) and Penn State Cooperative Extension (CES). We are responsive to stakeholder needs through translational research and delivery of science-based programs to clientele, but we also conduct internationally relevant fundamental research that generates baseline data to solve future problems and actively seek new and better ways to communicate our programs to audiences whom we have not reached in the past. Our faculty and staff, supported by federal base funding, effectively leverage this investment against many other funding sources to conduct programs of the highest caliber. We are committed to excellence in research, educating the next generation of agricultural professionals and citizens, and promoting life-long learning among the citizens of Pennsylvania. Our college's strategic plan is clear: "The mission of Penn State's College of Agricultural Sciences is to discover, integrate, and disseminate knowledge to enhance the food and agricultural system, natural resources and environmental stewardship, and economic and social well-being, thereby improving the lives of people in Pennsylvania, the nation, and the world."

The college is in the midst of updating its strategic plan. The last plan (<http://agsci.psu.edu/about/strategic/CAS-2008-2013-Strategic-Plan.pdf/view>) was developed in 2008. The new plan, which will be finalized by July 1, 2014, is incorporating broad internal and external stakeholder feedback. Because the plan is still in flux, the college leadership has decided to wait until next year to incorporate its revisions into the Combined Research and Extension Plan of Work for 2016. At that time, we will present a reorganization of planned programs to reflect the following seven strategic themes:

Advanced Agricultural and Food Systems - Transforming thinking and practice in agricultural and food systems through research and extension programming focused on productivity, sustainability, and adaptability.

Biologically Based Materials and Products- Discovering novel approaches to using genetic systems and biological materials for value-added commercial and consumer products.

Community Resilience and Capacity- Helping communities improve their economic resilience, create sustainable infrastructures, and promote their local economy through value-added opportunities and new business development.

Environmental Stewardship and Resilience- Providing innovative research and extension programming to enhance and protect managed and natural ecosystems, ecosystem services, and human well-being.

Global Engagement- Providing global solutions to challenges in agriculture, health, and sustainability that impact the future of an interconnected world.

Integrated Health Solutions- Advancing and improving the health of humans, animals, and communities through research and extension programming into preventive, corrective, diagnostic, and predictive solutions to challenges presented by lifestyle, diseases, pests, and toxins.

Positive Future for Youth, Families, and Communities - Providing a wide range of evidence-based programming to support healthy families, build positive youth skills, and strengthen intergenerational relationships within rural and urban communities.

Likewise, we have identified topics that will be embedded or integrated across all of the themes identified above: Sustainability, Climate change, Human dimensions, Entrepreneurship, and Diversity.

The College of Agricultural Sciences is addressing complex societal issues that transcend disciplines to impact people on scales ranging from local to global. The finalized cross-cutting themes will utilize the interdisciplinary expertise of our faculty, extension educators, and staff in all mission areas within the college to generate and disseminate knowledge that can be translated into solutions for these critical issues. Faculty focus groups are working to address a specific set of questions that will strategically direct team-based activities within the college.

The planned programs described in our 2016 Plan of Work will build from the framework of the college's 2014-2019 strategic plan and the systems approach that we have identified as a key element for generating impact.

The current focus on the health of the Chesapeake Bay and questions being raised across the Appalachians about extraction of natural gas from the Marcellus shale deposits serve as reminders of the value of natural resources in Pennsylvania. Our need to produce food, fiber, and fuel must be balanced with the need for protection of environmental quality. We are engaged in demonstrating best practices and disseminating these among farmers and conservation partners, but new technologies are needed. Pennsylvania agriculture is dominated by livestock production, and this agricultural portfolio is under pressure from both the water and air quality perspectives and the competition for alternative land uses with a "suburbanizing" population. These conflicts require research and education.

Our planned programs capture the systems thinking and cut across disciplines uniting our research efforts with our extension education capacity. Penn State has the good fortune of providing an environment that encourages interdisciplinary work and values outreach to stakeholders. The University has built a framework of university-wide consortia and institutes (Life Sciences; Energy and Environment; Social Sciences--Children, Youth, and Families; Materials; Rock Ethics; Sustainability), and the College of Agricultural Sciences plays an integral role in these organizations. This interdisciplinary philosophy has reinforced the natural tendency of our faculty and extension educators to work cooperatively to solve problems. Coupled with the joint research-extension appointments of many of our college faculty, our work, as represented in this Plan of Work, effectively unites fundamental knowledge with practical solutions delivered to stakeholders. The net result is a tangible benefit in economic prosperity and quality of life for Pennsylvania citizens.

A few explanatory notes are necessary regarding the report that follows. We are implementing a new system to measure impacts that can be used for federal reporting, as well as for our own college-wide planning, assessment, improvement, and strategic communication. While we have included only two static state-defined outcome measures in this plan, we anticipate being able to provide a number of program-specific outcomes in each of our planned program areas that would show measureable qualitative outcomes. In addition, specific quantitative outcome measures will be identified and reported in future plans and subsequent annual reports. Please see examples in the 2013 Annual Report of Accomplishment and Results.

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

Year	Extension		Research	
	1862	1890	1862	1890

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Year	Extension		Research	
	1862	1890	1862	1890
2015	337.9	0.0	552.8	0.0
2016	337.9	0.0	552.8	0.0
2017	337.9	0.0	552.8	0.0
2018	337.9	0.0	552.8	0.0
2019	337.9	0.0	552.8	0.0

II. Merit Review Process

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

- Internal University Panel
- Combined External and Internal University Panel
- Expert Peer Review

2. Brief Explanation

Both cooperative extension and agricultural experiment station programs undergo thorough and comprehensive review processes.

Each of the identified programmatic issues are assigned to one of eleven integrated, multidisciplinary State Extension Teams (SETs) made up of field-based extension educators and faculty with split appointments in both extension and research efforts. Team members from the field are chosen to broadly represent all parts of the Commonwealth, and faculty members are chosen to represent the research and extension perspectives of all relevant disciplines. Extension Program Leaders (EPLs) provide overall leadership to the SETs with District and state administrators and academic unit leaders serving in liaison roles to each team. All of the programs are reviewed by research and/or extension administrators. Additionally, logic models are developed by each SET to guide the programming efforts of field-based educators and faculty members with extension appointments, who contribute to applied research priorities.

Pennsylvania Agricultural Experiment Station projects, which partially comprise our planned programs, are reviewed by qualified and knowledgeable scientists. Non multistate projects are reviewed internally, while multistate projects are reviewed by external reviewers.

As new Penn State extension programmatic issues or agricultural experiment station projects are implemented, stakeholder groups and/or program advisory groups provide ongoing review of the educational and research programs to ensure that programs are focusing on priority needs as identified by key advisory groups in the college. All reviewers' critiques and comments provide us with mechanisms for enriching and improving our educational and research programs.

Through the evaluation process that is part of the logic model, feedback from stakeholders identifies areas that applied research needs to address. In addition, after resources have been identified to direct extension program areas where limited knowledge occurs, fundamental and applied research are identified to be carried out during the period of the program. Fundamental research is largely driven by availability of extramural funding sources and the peer review process associated with that funding.

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?

The planned multi and joint activities conducted at Penn State address issues that have been identified through the planning process and through needs assessments in collaboration with Cooperative Extension, the Agricultural Experiment Station, and/or resident education faculty and audiences. In addition, multi and joint activities are conducted within the framework of the College of Agricultural Sciences five-year strategic plan (<http://agsci.psu.edu/about/strategic/CAS-2008-2013-Strategic-Plan.pdf>), which identifies areas of critical needs at the state level. The college strategic priorities determine our faculty hires and program fund allocations for each of these issue areas, and faculty develop their educational and research programs on the basis of these critical issues.

The agricultural system spans the farm-to-fork spectrum in Pennsylvania. The critical issues involve creation and dissemination of new knowledge that helps the Pennsylvania agricultural industry capture more value-added aspects of commodities produced in the Commonwealth. Plants with new traits that result in local adaptation, pest resistance, and improved nutritional and biomaterial (including bioenergy) characteristics are near-term needs. New knowledge to improve livestock reproduction, particularly in dairy and egg production, remains a high priority. We must also address, through partnership with industry, development of new products with enhanced nutritional values. Research on new solutions will be coupled with delivery through extension.

Youth development topics range from providing enhanced subject matter knowledge beyond that available in schools to providing opportunities for better lifestyle decision-making to creating a culture of leadership among youth. We continue to focus on the creation and delivery of research-based knowledge on decision-making that will augment after-school programs and dovetail with state educational standards. The importance of our nonformal youth education efforts in contributing to STEM education efforts should not be overlooked. Family and consumer science programs focus on diet, nutrition, and health with efforts in the evaluation of food and health and food safety. Our stakeholders continue to be concerned with balancing the necessities of agricultural production with expectations of newly rural residents who interpret their quality of life very differently than traditional agriculture-based residents. We will continue to provide tools to municipal officials and other decision-makers to help them balance these competing land use decisions, and we continue to engage in research-informed education on the value of agriculture and minimizing conflicts among citizen constituencies.

Renewable energy resources and the extraction of new sources of nonrenewable fuels are of great interest to stakeholders. Our initial work with property owners and resource-associated industries has expanded to address other citizen interests, such as potential impacts on water supplies, invasive species and forest fragmentation, property values, and community resilience, and we will continue in this vein.

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

Focus on underserved populations has long been a specific goal of our extension and

research programs. An assessment of underserved groups will also guide the program planning process. Programs that meet the needs of underserved groups across the state are of continuing importance, and the issue of diversity is one that crosses all planned program issue areas. Our college's Diversity and Civil Rights page can be viewed at <http://agsci.psu.edu/faculty-staff/administrative-info/diversity>.

Cooperative Extension boards and committees strive to have demographic representation of respective county demographics; minorities representing county populations, including Hispanics, African Americans, Asians, and other cultural groups such as Anabaptists, serve on these groups.

Examples of specific needs of underserved and underrepresented populations in Pennsylvania include research and extension programming on women in agriculture, cultural differences in the agricultural workplace involving the Hispanic workforce in agriculture, and development and implementation of effective programs to help youth at risk make positive lifestyle decisions. Women are a growing force in the management of agricultural operations and businesses, and traditional approaches for the extension delivery of research-based recommendations have not been effective at reaching these audiences. We will invest research and extension funding in a joint program to establish and deliver new programs and evaluate the effectiveness of these programs. The Hispanic workforce in Pennsylvania agriculture is growing, and we will continue to work with joint function and multistate programming to improve cultural understanding that will help managers more effectively interact with their workforce. Several funded programs deal with the development of new educational programs for youth at risk, based on the science of youth development, community involvement, and leadership, and the implementation of these programs in multiple locations around Pennsylvania. These programs are both multistate and joint research/extension efforts.

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

Each planned program included in this Plan of Work will include expected outcomes and impacts. Progress toward the anticipated outcomes is guided by the logic models and will be reported under the respective planned program. The following examples are derived from our participation in USDA-approved multistate activities and joint research/extension programs.

Food and Fiber Systems - Our focus on reducing inputs into agricultural production relies on new research data and translation of those data to practice in the production regions of Pennsylvania. Our work on emerging and existing pest problems that are important to Pennsylvania agriculture and the northeast/mid-Atlantic regions, including brown marmorated stink bugs, is an excellent example of AES-supported research in the basic biology of horticultural and agronomic pests, ultimately yielding recommendations to growers that will significantly reduce pesticide inputs and costs to growers. Predictive models and biologically based pest management tools developed through research will guide decisions in the field and result in more informed management decisions. Our dairy and poultry production requires collaboration among nutritionists, reproductive biologists, agronomists, economists, and marketing specialists. We expect reduced input costs, improved efficiencies of operation, and, among some producers, selection of value-added options to increase revenues.

Environmental Management - Linked to the Food and Fiber Systems program, the reliance of Pennsylvania agriculture on livestock production, especially dairy and poultry, creates significant environmental challenges. The increased focus on the health of the Chesapeake Bay means that new policies will be introduced here in Pennsylvania and other states within the watershed before being applied to other watersheds nationwide. We are balancing the application and demonstration of current best management practices with the need to develop and validate new technologies and to insert the best available science into policy-making.

Economic and Community Development - Our focus on economic and community development is designed to help communities improve their economic resilience. A major focus in rural Pennsylvania is designed to help the region adapt to natural gas extraction from Marcellus shale deposits. This effort was began through landowners approaching Cooperative Extension about leasing agreements, but has now grown to a joint research-extension enterprise as we fill in the gaps in our current knowledge on how best to help shape the financial windfall that rural communities are experiencing into sustainable growth in those communities and help with developing environmental and local infrastructural concerns. Another focus is on better connecting value-added opportunities within the agricultural community to new businesses that support the local economy. Regional and local food systems are current issues that we are addressing.

Global Food Security and Hunger - This program is a capstone of many of the other planned programs and involves our portfolio of international activities. Solutions for global food security are reliant upon the discovery and development of new genetic resources combined with a thorough understanding of the functional utility of those resources and the associated production practices that can be transferred to food-insecure populations. The transfer of these resources and practices must be accomplished within the context of applicable sociological networks. Engagement of our social scientists is essential to develop appropriate tools that can measure the acceptance of new varieties and production methods so that they can be integrated into local food systems. Developing management systems and economic tools that encourage producers to be globally competitive in their commodity and value-added production is another important component that will contribute to solutions for global food security and hunger.

Climate Change - Climate change issues arise in many contexts relative to agricultural production. We are continuing to work across research and extension objectives to establish science-based methods to evaluate the role of agriculture in greenhouse gas production. There is substantial interest in carbon credits and the like among our Pennsylvania stakeholders, but the implementation of these concepts is still in early stages, and science is needed to underlie the development of tools, the establishment of policy, and the education of the public to implement these practices. In addition to activities related to the causal roles of climate change, there is significant interest in the production risk shifts that climate change is imposing on crop and forest management. Energy and environmental issues associated with changing climate are concerns of communities nationwide. We expect to have an impact on Pennsylvania policy development relative to region-specific approaches to mitigate climate change. Educational programs will continue to be developed and delivered to help producers and communities deal with the many issues associated with climate change.

Sustainable Energy - The national projections and mandates for renewable fuel feedstocks tend to take a regional perspective. We are likewise focused on identifying the most efficient use of our feedstock acreage given our climate and topography. This will involve research on production efficiencies for new crops--some annual and some perennial--and the translation of that research into recommendations for farmers, foresters, and other land managers. Another significant barrier to implementation progress in biomass energy systems is in processing and transport of biomass. We will conduct research on densification and efficient supply chain issues to translate to industry for adoption.

Childhood Obesity, Chronic Health Issues, and Healthy Lifestyle - Our extension programming in this program area will focus on prevention education to a variety of appropriate audiences. Evidence-based programs will be delivered to schools, camps, and communities; an interdisciplinary approach will work to establish healthy populations based upon a combination of diet, exercise, and self image. In addition, extension will work with our 4-H and youth audiences through programs like Harvest-4-Health that integrate science and health education, while providing a community service.

Food Safety - Our food safety portfolio extends from the farm to the fork, with work in pre- and post-harvest environments to assess food-borne pathogen loads and establish Good Agricultural Practices (GAPs) that will be broadly applicable to producers across multiple states. Research and extension in processing and distribution reduce risks to consumers, and extension programs at the consumer level will increase understanding of how consumers can influence the vast majority of food safety incidents. We will assess our contributions to the science behind GAPs and our ability to deliver these tools to Pennsylvania commodities. Our HACCP and ServSafe® training are other key outcomes that have a demonstrated direct positive impact on consumer food safety.

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

The measures used to determine the impact of joint and multi program activities will demonstrate the effectiveness of planned programs. Much of our research is conducted in direct response to needs expressed by stakeholders through Cooperative Extension. In turn, the delivery of research efforts occurs through Cooperative Extension programming. Specific examples of this effectiveness are described in the planned programs sections of this Plan of Work.

IV. Stakeholder Input

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

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

Brief explanation.

Stakeholder input is continually sought to help set the course for CES and AES programs. Our primary stakeholder input is received through cooperative extension. CE engages in periodic statewide needs assessments, and the results of these assessments are incorporated into our Extension Program SharePoint site and our Extension Program Activity System (EPAS). These tools, which are built on components of the logic model, are used to prepare the annual cooperative extension programs. Thus, stakeholder input is a key attribute of extension programming. This, in turn, provides input into our research agenda, especially through faculty who are jointly appointed on extension and research funding. In addition, extension county-based personnel confer with their program advisory groups as they determine the local focus of their educational programs.

College administration and faculty advisory groups confer regularly with key stakeholder groups. The Penn State Agricultural Council (<http://agcouncil.cas.psu.edu>) provides us with direct contact to nearly 100 member organizations and groups representing the agricultural industry across Pennsylvania. Also part of the Ag Council membership are such organizations as the Chesapeake Bay Foundation and the County Commissioners Association of Pennsylvania--we seek input for all sectors representing the interests of Pennsylvania citizens. In addition, college leadership meets multiple times per year with individual stakeholder groups including, but not limited to, the Pennsylvania Farm Bureau, PennAg Industries, Pennsylvania Forest Products Association, Pennsylvania Department of Agriculture, County Commissioners Association of Pennsylvania, etc.

Through direct faculty and extension educator contacts, we have regular contact with the private sector to assess their specific needs. For example, the following groups provide valuable feedback-- Pennsylvania Nutrition Education Network, the Intergenerational Initiatives Advisory Group, the StrongWomen program leaders, the PROSPER program collaborators, and the PA Office of Financial Education. Penn State has a well-developed organizational structure for interacting with industry; our Industrial Research Office serves as a liaison to specific industrial partners.

Also in our stakeholder base are state and federal partners; we have regularly scheduled meetings with agencies such as the Pennsylvania Department of Agriculture, the Pennsylvania Department of Environmental Protection, the Pennsylvania Department of Health, and the US Department of Agriculture's Agricultural Research Service and Animal and Plant Health Inspection Service. These stakeholder meetings provide feedback on programming for Hatch, McIntire-Stennis, Smith Lever, and Animal Health funds.

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
- Open Listening Sessions

Brief explanation.

County, District, and SET program advisory committees continue their role in providing valuable information on extension programming needs. Program advisory committee members are selected to represent program areas, emerging issues, geographic areas, and population diversity. These groups help extension educators with program design and implementation, which may include identifying resources to support the programs, tailoring the content to specific audience needs, and marketing the programs to targeted audiences and communities.

In the establishment of program advisory committees, our policy is that these committees need to represent the demographics of the commodity, community, or workforce. District and County Extension Boards and program advisory committees are representative of demographics of the County/District and, where appropriate, Hispanics, African Americans, Asians, or other minorities serve on these groups and provide input to extension programs. Annual reports from counties/Districts document these efforts. The same is true in the establishment of internal and external focus groups. Penn State Agricultural Council meetings are publicly announced and our broad representation is constantly reassessed to ensure that new and traditionally underserved audiences are included.

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
- Survey of traditional Stakeholder individuals
- Meeting specifically with non-traditional individuals

- Survey specifically with non-traditional individuals

Brief explanation.

To collect stakeholder input, educators or faculty met with program advisory committees or individuals or solicited input at educational meetings. During and after extension educational programs, program participants request additional programs or updates, or make suggestions on new topics where an educational program would be helpful to them.

This input may be verbal only or collected in meeting survey instruments. To collect more detailed information from traditional and non-traditional stakeholders, sophisticated survey instruments or focus group meetings are implemented and the data collected are summarized. Requests for information from county extension offices through telephone calls is also a measure of clientele needs. If similar information is requested repeatedly, that is a sign that an issue is of concern to the public.

In addition, our Ag Council delegates will assist us with the identification and prioritization of a small number of specific learning objectives for extension programs. These will be used to populate a post-program evaluation and a longer term customized survey to be sent to individuals approximately 9-12 months after they've completed the extension program(s). The post-program evaluation will ask participants what they expect to achieve on specific objectives. The longer term survey will garner self-reports of impacts the individuals have achieved. If an individual attended more than one program, their survey would include questions addressing the expected impacts from all programs.

3. A statement of how the input will be considered

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

Brief explanation.

Information collected from stakeholders will continue to be used to adjust issue areas that determine Cooperative Extension programming. These stakeholder priorities also directly influence applied research activity through local decisions about research priorities, availability of funding from certain extramural funding sources, including stakeholder groups such as industry associations, and hiring decisions for faculty and extension educators. Stakeholder input not only informs planning, but also influences resource allocations. Stakeholder feedback also indicates where volunteers and donors would be interested in assisting with the program.

We engage representatives of the Penn State Agricultural Council as key team members on our internal implementation teams. This serves to inform our programs on the real-world demands for new information and programs.

Both Ag Council and Penn State Extension Council serve in an advisory capacity to the SETs structure implemented in CES; advisory committees for SETs will seek membership from a large stakeholder base.

V. Planned Program Table of Content

S. No.	PROGRAM NAME
1	Childhood Obesity, Chronic Health Issues, and Healthy Lifestyles
2	Climate Change
3	Food Safety
4	Global Food Security and Hunger
5	Sustainable Energy
6	Economic and Community Development
7	Environmental Management
8	Food and Fiber Systems

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Childhood Obesity, Chronic Health Issues, and Healthy Lifestyles

2. Brief summary about Planned Program

Food and lifestyle choices are often inextricably linked to chronic health issues that are costing our nation in terms of treasure, productivity, and quality of life. Research and extension programs that focus on these complex, interrelated issues are the primary activities in this planned program area.

The problem of childhood obesity, with its links to other chronic health problems such as diabetes and early onset heart disease, must be addressed through a combination of approaches. An understanding of the underlying biological and sociological bases of chronic health problems is needed to promote activities that lead to healthier lifestyles. The food system embedded within our communities strongly influences the availability of nutritious, high-quality food and reflects the importance of local, as well as national, economic factors and policy decisions.

Families are a crucial link in teaching healthy behaviors. It is important that those behaviors involve good nutrition and physical activity as the cornerstone of preventing obesity in children and adolescents. Often families are challenged both by time constraints and economic barriers to provide or prepare solid, balanced, and nutritionally viable meals to their children.

Extension programs will use innovative interdisciplinary approaches to discover, translate, and apply how nutrition and physical activity can prevent disease and promote good health and well-being. Programs will use the socio-ecological model as a framework to address multiple factors that influence an individual's ability to change. Youth organizations, such as 4-H, will offer programs that help young people increase their knowledge and offer opportunities to improve healthy eating and physical activity habits. The production of our food also presents significant hazards and health-related issues. Extension activities will focus on diverse programs that affect rural health and safety.

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
607	Consumer Economics	14%		10%	
701	Nutrient Composition of Food	10%		1%	
702	Requirements and Function of Nutrients and Other Food Components	10%		10%	
703	Nutrition Education and Behavior	16%		14%	
721	Insects and Other Pests Affecting Humans	10%		3%	
723	Hazards to Human Health and Safety	10%		47%	
724	Healthy Lifestyle	14%		0%	
802	Human Development and Family Well-Being	16%		15%	
	Total	100%		100%	

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

1. Situation and priorities

Research shows that the majority of overweight children will become overweight adults. The most recent statistics indicate that 67% of the population in the United States is considered overweight or obese, with Pennsylvania ranking 29th in comparison with other states in the nation. Body mass index (BMI) statistics released in Pennsylvania in late 2008 indicated 35% of children in kindergarten through sixth grade at or above the 85th percentile BMI. Obesity and its health risks are both urban and rural issues. To reverse the trend of rising childhood and adult obesity rates, prevention is the most effective approach.

Only 31% of U.S. adults report that they engage in regular leisure-time physical activity, which is defined as either three sessions per week of vigorous physical activity lasting a minimum of 20 minutes or five sessions per week of light to moderate physical activity lasting a minimum of 30 minutes. About 40% of adults report no leisure-time physical activity. As children get older, participation in regular physical activity decreases dramatically. 42% of children aged 6-11 obtain the recommended 60 minutes per day of physical activity, whereas only 8% of adolescents achieve this goal.

Obesity-related costs can also be measured in dollars. One study noted that obesity-associated annual hospital costs increased from \$35 million during 1979-1981 to \$127 million during 1997-1999. In 2004, \$4.1 billion of the state's medical expenditures were attributable to adult obesity. On average, people who are considered obese pay 42% more in health care costs than normal-weight individuals.

2. Scope of the Program

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

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

1. Assumptions made for the Program

Childhood obesity and chronic health issues are serious nationwide problems requiring an understanding of the fundamental sociological, biological, and economic causes combined with a population-based prevention approach. The goal for prevention is energy balance: healthy eating behaviors and regular physical activity to achieve a healthy weight while protecting health and normal growth and development.

Preventing childhood obesity is a collective responsibility; multiple sectors and stakeholders must be involved in societal changes at all levels. It is anticipated that funding will increase to support the planned program as there is more national and state recognition that childhood obesity is a significant problem. Community/school based and environmental interventions are recommended as the most feasible ways to support healthful lifestyles for the greatest number of children and their families. Funding to support investigations into the biological bases of chronic health problems continues to be strong.

2. Ultimate goal(s) of this Program

1. Increase healthy eating and physical activity opportunities for Pennsylvania families. 2. Increase the percentage of youth who are at a healthy weight. 3. Increase the percentage of youth who consume a healthy diet. 4. Increase the percentage of adults and children who participate in the recommended amounts of physical activity. 5. Increase understanding of the sociological, biological, and economic causes of chronic health 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
2015	110.8	0.0	32.0	0.0
2016	110.8	0.0	32.0	0.0
2017	110.8	0.0	32.0	0.0
2018	110.8	0.0	32.0	0.0
2019	110.8	0.0	32.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Research and extension will partner in addressing the issues surrounding childhood obesity and chronic health problems to develop and deliver solutions for our communities. Research programs will focus on unraveling the complex underlying causes of chronic health problems as well as understanding the nutritional composition of foods that contribute to a healthy lifestyle. Economic and policy analyses will inform efforts to promote sustainability within and beyond our communities. Educational programs, interactive physical activity, and activities designed to attract youth will be conducted in schools, out-of-school locations, camps, and communities. Evidenced-based practices will be utilized to ensure that the programs will be effective and produce positive results. Program partnerships will be strengthened with collaborations within the university, counties, communities, state, other universities, and nation.

A health-centered approach that focuses on the whole child--physically, mentally, and socially--will be used rather than a weight-centered approach. The emphasis is on living actively, eating in normal and

healthy ways, and creating a nurturing environment that helps children recognize their own worth and that respects cultural food and family traditions.

A series of educational events and activities will be utilized to reinforce educational information and appropriate behavior practices. Parental and leader involvement will be included as an integral part of programs, highly encouraged and supported. The Harvest 4-Health program in collaboration with the state 4-H program and Master Gardeners, will emphasize growing foods for healthy eating and gardening activities that promote physical activity.

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"> ● Education Class ● Workshop ● Group Discussion ● Other 1 (Growing Gardens) 	<ul style="list-style-type: none"> ● Newsletters ● Web sites other than eXtension

3. Description of targeted audience

Target audiences include health care professionals, health- and nutrition-related researchers, nutritionists, youth, 4-H members, teachers, school nurses, community groups and volunteers, community recreation and sports directors, parents, and after-school and daycare providers.

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

- Number of college-initiated technology disclosures.
- Number of participants in extension education classes and workshops.

- 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	Percentage of extension class/workshop participants who expect to implement/adopt practices. (This is a short-term outcome measure.)
2	Percentage of extension class/workshop participants who respond to a follow-up survey with a self-report that they have implemented/adopted practices. (This is a medium-term outcome measure.)

Outcome # 1

1. Outcome Target

Percentage of extension class/workshop participants who expect to implement/adopt practices. (This is a short-term outcome measure.)

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 607 - Consumer Economics
- 701 - Nutrient Composition of Food
- 702 - Requirements and Function of Nutrients and Other Food Components
- 703 - Nutrition Education and Behavior
- 721 - Insects and Other Pests Affecting Humans
- 723 - Hazards to Human Health and Safety
- 724 - Healthy Lifestyle
- 802 - Human Development and Family Well-Being

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 2

1. Outcome Target

Percentage of extension class/workshop participants who respond to a follow-up survey with a self-report that they have implemented/adopted practices. (This is a medium-term outcome measure.)

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 607 - Consumer Economics
- 701 - Nutrient Composition of Food
- 702 - Requirements and Function of Nutrients and Other Food Components
- 703 - Nutrition Education and Behavior
- 721 - Insects and Other Pests Affecting Humans
- 723 - Hazards to Human Health and Safety
- 724 - Healthy Lifestyle
- 802 - Human Development and Family Well-Being

4. Associated Institute Type(s)

- 1862 Extension

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Economy
- Appropriations changes
- Government Regulations
- Competing Public priorities
- Other (Extramural Funding)

Description

Some child care, school, and community environments can influence children's behaviors related to food intake and physical activity. Unemployment of parents, government policies toward families, inflation, transportation, and food availability and types of healthy food are all factors. Alternatively, busy parents who work may be less likely to provide adequate physical activity for their children and healthy food for their children, resorting to prepackaged, processed, and fast foods. The local environment related to playgrounds, safe bike paths, swimming pools, lighting, sidewalks, and unsafe neighborhoods affects child and family physical activity. Lack of access to affordable, healthy food choices in neighborhood food markets can be a barrier to purchasing healthy foods.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Extension requires each State Extension Team (SET) to implement evaluation tools and collect impact data. This information is reported through the Extension Program Activity System (EPAS). Each program team has its own set of evaluation tools that it uses for assessment of their programs. In addition, we have asked each SET to establish an external advisory team to use as a direct method of assessing whether the educational programs are on target and meeting the industry or audience needs. We hope to implement a customer satisfaction instrument that will provide feedback on the quality and value that our programs provide. This will be implemented after the programs have had adequate time to impact our audiences.

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Climate Change

2. Brief summary about Planned Program

Programs will address the full breath of climate change sciences spanning physical, biological, and social uncertainties, risks, and responses--those that are underway as well as those on the frontier. Robust research and extension will foster interdisciplinary, multifunctional teams and approaches that will link multiple institutions and span, connect, and garner resources that can measure, forecast, and specify the complexities of climate change in context to priority sectors, including water quality and quantity, air quality (greenhouse gas emissions, carbon sequestration in working lands), risk assessment, and decision-making, as well as the emerging paradigms for sustainable agriculture and forestry.

Research and extension will support carbon sequestration, mitigation of greenhouse gases, and development of science-informed policies for supporting management of multifunctional working lands with enhancement of the ecosystems services they can provide. Furthermore, the stresses of change on biodiversity from the molecular through population levels will be critically addressed within this approach. Interdisciplinary, multifunctional teams are essential to the identification of critical gaps and for addressing the emerging frontiers within climate change that will enable the integrated approaches necessary for addressing the complexities of climate change.

The issues and impacts that PA AES and CES will address through research and outreach include climate change uncertainties, risk management, climate futures and forecasts, water resources, forests and wildlife, aquatic ecosystems and fisheries, agriculture production and insurance, energy, and economic barriers and opportunities. Research and extension emphasis will be placed on forecasts, impacts, and regional vulnerabilities for agriculture, forests, and human populations, as well as decision-making tools for adaptive management by sector.

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
103	Management of Saline and Sodic Soils and Salinity	2%		0%	
111	Conservation and Efficient Use of Water	15%		5%	
132	Weather and Climate	16%		3%	
133	Pollution Prevention and Mitigation	15%		53%	
141	Air Resource Protection and Management	12%		1%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	12%		24%	
306	Environmental Stress in Animals	12%		1%	
605	Natural Resource and Environmental Economics	16%		13%	
	Total	100%		100%	

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

1. Situation and priorities

AES and CES have partnered with the Commonwealth of Pennsylvania in response to Pennsylvania's Act 70 of 2008, which mandated a specific analysis of the potential impact to multiple sectors in response to climate change. Researchers developed the Pennsylvania Climate Impact Assessment (June 2009), which inventoried the potential impacts of global climate change on Pennsylvania's climate, human health, economy, and management of economic risk, forests, wildlife, fisheries, recreation, energy, agriculture, and tourism. The assessment comprehensively identified both the opportunities and barriers created by the need for alternative sources of energy, climate-related technologies, services and strategies, carbon sequestration technologies, capture and utilization of fugitive greenhouse gas emissions, and other mitigation strategies. The assessment used a mixture of approaches, including integrated quantitative modeling of sectors and extensive stakeholder engagement. While the findings are based on readily available data, literature, and preliminary quantitative analyses, a more in-depth analysis is required because of the currently limited scientific literature addressing the impacts of projected climate change in Pennsylvania.

The primary findings under selected warming scenarios include: 1) annual precipitation is expected to increase between 6 and 10%, 2) warming will lead to longer growing seasons with corresponding frost day decreases, 3) precipitation will become more extreme with longer dry periods and greater intensity of precipitation, and 4) there is substantial uncertainty relative to future tropic and extra-tropical cyclones for the state (including suggestions of fewer storms with increased intensity).

Research and extension expected to stem from the assessment address all aspects of adaptive management, risk communication, and sector-specific responses. Extension has established a program team within the Renewable Natural Resources group titled "Climate Change and Renewable Natural Resources," which is focused on translating models for incorporation at the forest manager level. Given that 70% of Pennsylvania forests are under private ownership, providing extensive need and opportunity for implementation of adaptive management strategies will increase the likelihood of sound science-based land use decisions. Both the Field and Forage and Horticultural Crops state extension teams use numerous pest prediction models (insects, weeds, and diseases) as early warning systems for pest development that are driven by climatic and real-time weather data. Additional program priority initiatives

that extension will focus on include pest prediction and response, water quality and quantity, animal welfare and environments, food safety and quality, bio-based and on-farm energy production and use, green infrastructure, and sustainable agricultural businesses (entrepreneurship). State Extension Teams that will participate in these program priority initiatives include: animal systems (dairy, livestock, equine, and poultry), agricultural entrepreneurship, and economic and community development.

2. Scope of the Program

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

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

1. Assumptions made for the Program

The assumptions made for this program focus largely on Pennsylvania-specific research and extension as assessed for Pennsylvania audiences, decision-makers, and sectors. However, development of research and extension approaches for climate change sciences will be applicable across the Mid-Atlantic region, within the Chesapeake Bay, Great Lakes, and Ohio/Mississippi River watersheds, and in some cases across the nation. Climate change studies necessitate scaling from the local stream reaches and local water quality/quantity impacts up to the watershed, regional, and estuary/bay levels. Research focused on place-based adaptive management strategies will result in scalable approaches for informing decision-making at higher order physiographic scales. Penn State has demonstrated through its leadership for Consortium for Atlantic Regional Assessment (CARA) that it effectively facilitates multi-institutional research and delivery approaches. A continued emphasis on building multi-institutional approaches will be a high priority for addressing regional to global research and extension questions that will inform stakeholder groups and sectors on adaptive strategies.

2. Ultimate goal(s) of this Program

The climate change planned program area will seek to address high priority research and extension that will explore and educate on these primary areas: 1) climatic drivers of change, 2) monitoring of changing conditions across sectors, 3) impacts of changing climate for agriculture, forestry, water quality and quantity, ecosystems, and human population, and 4) strategies for adaptive management.

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
2015	8.9	0.0	25.9	0.0
2016	8.9	0.0	25.9	0.0
2017	8.9	0.0	25.9	0.0
2018	8.9	0.0	25.9	0.0
2019	8.9	0.0	25.9	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

The "Climate Change and Renewable Natural Resources" extension program will reach private forest landowners (responsible for 12 million forested acres across the Commonwealth) to increase working knowledge on forest management options for increasing carbon sequestration, mitigation of long-term climate change, reduction of carbon emissions, and potential participation in environmental markets for ecosystem services. This program will increase understanding of climate change impacts on Pennsylvania's natural resources and increase the ability of forest managers/owners to participate in emerging markets and to offset emissions through improved forest management practices.

Various modes of delivery will be employed for programs within this planned program to incorporate research and extension. The Agriculture and Environment Center (AEC) will offer web and field-based training for practitioners and others who seek to improve water, air, and land quality in working and other landscapes. All programs are designed to highlight and explain the science that informs the research, application, and practices that improve environmental outcomes by preventing or reducing emissions of legacy (nutrients and sediments) and emerging contaminants.

Researchers in Animal Science; Plant Science; Ecosystem Science and Management; Agricultural and Biological Engineering; and Agricultural Economics, Sociology, and Education serve as the content specialists for framing the extension messages for whole farm emissions reduction and GHG mitigation.

Research approaches will identify risk management and communications that will inform working land management options for adaptations of agriculture to climate change, develop tools (online tutorials, information sheets, calculators, etc.) to assist the suite of local, state, and federal agencies and collaborating nongovernmental agencies in the evaluation and selection of management strategies for multiple scales ranging from individual farms/working lands to watersheds and larger basins. Regionally unique collaboration will be sought which will team researchers, extension educators, environmental/conservation/agricultural nongovernment organizations (NGOs), and federal, state, and local governments to find effective solutions to problems and resolution to issues. This approach will broadly seek active stakeholder engagement in both the research elements and tool development.

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"> ● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations 	<ul style="list-style-type: none"> ● Newsletters ● TV Media Programs ● Web sites other than eXtension ● Other 1 (Webinars) ● Other 2 (Asynchronous e-learning modules)

3. Description of targeted audience

Target audiences include municipalities, planning agencies, citizens groups and associations, farm and forest managers, conservation practitioners, agriculture and forest industry, local municipalities, energy consumers, civic groups, green industries, nongovernmental organizations, policy makers, and local, regional, state, and federal agencies.

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

- Number of college-initiated technology disclosures.
 - - Number of participants in extension education classes and workshops.
- 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	Percentage of extension class/workshop participants who expect to implement/adopt practices. (This is a short-term outcome measure.)
2	Percentage of extension class/workshop participants who respond to a follow-up survey with a self-report that they have implemented/adopted practices. (This is a medium-term outcome measure.)

Outcome # 1

1. Outcome Target

Percentage of extension class/workshop participants who expect to implement/adopt practices. (This is a short-term outcome measure.)

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 103 - Management of Saline and Sodic Soils and Salinity
- 111 - Conservation and Efficient Use of Water
- 132 - Weather and Climate
- 133 - Pollution Prevention and Mitigation
- 141 - Air Resource Protection and Management
- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants
- 306 - Environmental Stress in Animals
- 605 - Natural Resource and Environmental Economics

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 2

1. Outcome Target

Percentage of extension class/workshop participants who respond to a follow-up survey with a self-report that they have implemented/adopted practices. (This is a medium-term outcome measure.)

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 103 - Management of Saline and Sodic Soils and Salinity
- 111 - Conservation and Efficient Use of Water
- 132 - Weather and Climate
- 133 - Pollution Prevention and Mitigation
- 141 - Air Resource Protection and Management
- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants
- 306 - Environmental Stress in Animals
- 605 - Natural Resource and Environmental Economics

4. Associated Institute Type(s)

- 1862 Extension

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

If natural disasters occur, the availability of funding to support efforts in climate change may change and result in changes to our programs. Likewise, economic trends can change the appropriations and impact policy and regulations. Extramural funding for the research gaps identified is paramount and will continue to be sought on a competitive basis.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Extension requires each State Extension Team (SET) to implement evaluation tools and collect impact data. This information is reported through the Extension Program Activity System (EPAS). Each program team has its own set of evaluation tools that it uses for assessment of their programs. In addition, we have asked each SET to establish an external advisory team to use as a direct method of assessing whether the educational programs are on target and meeting the industry or audience needs. We hope to implement a customer satisfaction instrument that will provide feedback on the quality and value that our programs provide. This will be implemented after the programs have had adequate time to impact our audiences.

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Food Safety

2. Brief summary about Planned Program

Food safety concerns have revealed the complex nature of the modern food system with its multifaceted distribution networks that extend from the farm-gate to the consumer's plate. The new regulation from Food Safety and Modernization Act of 2011 will be a major driven for research and extension. Research and extension programs will focus on issues of food quality and safety to address concerns of producers, processors, and consumers. Collaboration with industry partners to mitigate the risks of food safety incidents and to develop functional and improved nutritional characteristics of foods and ingredients are an important driver of food science and related research. New technologies are required for producing and processing foods that retain or enhance nutritional value, while ensuring quality and safety. Enhanced diagnostic tools are being developed to detect, identify, and track food-borne pathogenic microorganisms, with a focus on approaches that will reduce the potential of food contamination at multiple levels in the food system.

Scientists and communicators with strengths in plant and animal sciences, food science, animal and human nutrition, veterinary medicine, economics, and business will contribute to research and extension on the complex, interrelated aspects of food safety. Extension programming will address food safety issues with consumers, producers, and the processing industry by providing training for certifications and informing the public and industry of food safety guidelines, policies, and recommendations. This will enhance Pennsylvania's role as a reliable producer and supplier of high quality, safe, and nutritious food and food products and will aid in ensuring Pennsylvania's economic future.

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
404	Instrumentation and Control Systems	5%		5%	
501	New and Improved Food Processing Technologies	20%		50%	
503	Quality Maintenance in Storing and Marketing Food Products	20%		0%	
504	Home and Commercial Food Service	20%		0%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	20%		0%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	15%		45%	
	Total	100%		100%	

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

1. Situation and priorities

Awareness of the critical nature of the safety of our food supply from farm to table has increased dramatically in recent years. The Food Safety and Modernization Act of 2011 will fundamental change how food systems are regulated. These new regulations will impact those that grow and process food in the United States. It is estimated that over 76 million food-borne illnesses, 325,000 hospitalizations, and 5,000 deaths occur in the United States each year. The economic impact of food-borne illness, in terms of medical care, lost wages, and associated costs, is estimated to be in the billions of dollars per year. The Healthy People 2010 initiative and the USDA Dietary Guidelines include the safety of foods in their recommendations, emphasizing that safe foods as well as nutritious foods are vital to good health.

In 1999, the Commonwealth of Pennsylvania passed the Food Employee Certification Act, which requires one supervisory employee from for-profit facilities that carry a Pennsylvania Department of Agriculture license to attend an approved food safety course and pass an approved examination. Cooperative Extension is in a unique position to provide the educational and testing components of this requirement in a local setting, thus providing convenient access to training for the owners and operators of these Pennsylvania businesses to maintain their licensure.

Recently more people have become sick after eating raw fruits and vegetables contaminated with harmful microorganisms. Most of the outbreaks have been traced to crops grown in other parts of the U.S. or in other countries. But microbial contamination of fresh produce can happen anywhere. As consumer demand continues to shift away from heat-processed fruits and vegetables and toward fresh, ready-to-eat produce, Pennsylvania growers need to keep the food supply safe. Food safety has become a critical issue throughout the fresh produce industry as food service and retail buyers increasingly require growers and packers to develop and implement food safety plans. Training of immigrant and non-English-speaking farm workers is an important component of preventing on-farm contamination of food.

2. Scope of the Program

- In-State Extension
- In-State Research

- Multistate Research
- Multistate Extension
- Integrated Research and Extension
- Multistate Integrated Research and Extension

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

1. Assumptions made for the Program

Food safety risks will continue to be present regardless of the source of the food, with globalization intensifying the potential for worldwide outbreaks, intentional contamination, and new pathogens. It is assumed that global climate change will further exacerbate the situation. Contamination of foods by biological, chemical, and/or physical hazards throughout the food continuum will be present regardless of the agronomic or animal management practices used to produce foods. New and improved methods to assess and control these new or established hazards will be required. With the growing interest in locally grown foods and the consumption of foods that are less processed, the opportunity for contamination from the point of production to consumption is increased. Proper food handling in the home and local eateries requires an understanding of how to avoid development of food-borne pathogens.

2. Ultimate goal(s) of this Program

The ultimate goal is to create and transfer knowledge through an interdisciplinary and systems approach (from farm to the plate) to improve health and well-being in Pennsylvania, the United States, and throughout the world. We envision that Penn State will be a place where industry leaders, policy-makers, and the public will come together for solutions to local and global health, wellness, and food safety and defense problems as or even before they arise.

As a result of the program, food handlers will:

- increase their knowledge in the area of food safety
- implement changes to enhance food-handling practices in their operation so as to prevent the contamination of food
- train or share information on safe food handling with other staff in the establishment and on the farm
- meet requirements to apply for the Pennsylvania Department of Agriculture Food Employee Certification to maintain their operating license

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
2015	19.1	0.0	12.8	0.0
2016	19.1	0.0	12.8	0.0
2017	19.1	0.0	12.8	0.0
2018	19.1	0.0	12.8	0.0
2019	19.1	0.0	12.8	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

High priority will be placed on conducting research to identify causal pathogens. Rapid detection of pathogens combined with an information network to trace the problem to the source is critical for timely intervention. Ensuring the health of Pennsylvania food animals will be an important activity.

Research efforts will be directed toward identification of the bioactive roles for nutrients in normal and abnormal human metabolism and the impact of production and processing methods on nutrient composition of foods. Novel processes for food safety and for production and bioprocessing of bio-based value-added products will be studied, as well as methods to improve the shelf life of processed foods. Dissemination of these research findings as new or continued extension programming will provide a means for individuals, industry, and communities to learn and change.

Workshops will address food safety for producers and processors. The Dairy Hazard Analysis and Critical Control Point (HACCP) Workshop includes the development of the required prerequisite programs, such as Good Manufacturing Processes (GMPs) and Sanitation Standard Operating Procedures (SSOPs), conducting a hazard analysis, identifying critical control points, monitoring procedures, establishing critical limits and corrective actions, and verifying and record keeping procedures. The Food Defense Workshop covers the fundamentals of assessing and managing the risk associated with intentional contamination in food manufacturing facilities. The Food Microbiology Short Course provides insight into the most recent developments of food-borne pathogens, toxins, and contaminants that may occur in a food plant environment. The Better Process Control School (BPCS) certifies supervisors of thermal processing systems, acidification, and container closure evaluation programs for low-acid and acidified canned foods.

Extension programs will be focused on providing the food industry with practical and timely training and recommendations on how to manage the risks with emphasis on prevention and preparedness. The Penn State Food Safety website will serve as a portal for educational information on workshops, seminars, and newsletters that are directed toward specific target audiences for the purposes of education, information sharing, and networking. Maintaining an open dialogue with food professionals in the private food industry will help to focus and emphasize which diet, food, nutrition, and food safety issues should be current priorities.

From the industry perspective, the main protector of our food supply is not regulatory authorities, but the food industry itself. Opportunities provided by extension, which include topics such as Good Agricultural Practices (GAPs) for local producers, HACCP training for food and animal products processors and food services, ServSafe® for retail food, and extensive consumer education, will be conducted. Non-English-speaking worker training will be an important focus of GAPs programs.

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"> ● Education Class ● Workshop 	<ul style="list-style-type: none"> ● Newsletters

3. Description of targeted audience

Target audiences include human service providers, managers and volunteers of nonprofit organizations, community groups, general public, animal producers, state and local government employees and agencies, youth, produce growers, and owners, operators, managers, and employees of retail and food service or production operations.

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

- Number of college-initiated technology disclosures.
 - Number of participants in extension education classes and workshops.
- 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	Percentage of extension class/workshop participants who expect to implement/adopt practices. (This is a short-term outcome measure.)
2	Percentage of extension class/workshop participants who respond to a follow-up survey with a self-report that they have implemented/adopted practices. (This is a medium-term outcome measure.)

Outcome # 1

1. Outcome Target

Percentage of extension class/workshop participants who expect to implement/adopt practices. (This is a short-term outcome measure.)

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 501 - New and Improved Food Processing Technologies
- 503 - Quality Maintenance in Storing and Marketing Food Products
- 504 - Home and Commercial Food Service
- 711 - Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 2

1. Outcome Target

Percentage of extension class/workshop participants who respond to a follow-up survey with a self-report that they have implemented/adopted practices. (This is a medium-term outcome measure.)

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 501 - New and Improved Food Processing Technologies
- 503 - Quality Maintenance in Storing and Marketing Food Products
- 504 - Home and Commercial Food Service
- 711 - Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

4. Associated Institute Type(s)

- 1862 Extension

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Economy
- Appropriations changes
- Public Policy changes

- Government Regulations
- Competing Public priorities
- Other (Extramural Funding)

Description

Food safety is recognized as a human health, national security, and major economic issue. Therefore any of the factors selected above could directly affect the programs offered through Penn State.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Extension requires each State Extension Team (SET) to implement evaluation tools and collect impact data. This information is reported through the Extension Program Activity System (EPAS). Each program team has its own set of evaluation tools that it uses for assessment of their programs. In addition, we have asked each SET to establish an external advisory team to use as a direct method of assessing whether the educational programs are on target and meeting the industry or audience needs. We hope to implement a customer satisfaction instrument that will provide feedback on the quality and value that our programs provide. This will be implemented after the programs have had adequate time to impact our audiences.

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Global Food Security and Hunger

2. Brief summary about Planned Program

This priority science area will focus and capture the efforts of multidisciplinary program teams across the system to provide the science and outreach required to boost U.S. agricultural production, improve global capacity to meet the growing food demand, and foster innovation in fighting hunger by addressing food security for everyone, but especially for vulnerable populations. Research and extension program areas addressing agriculture productivity will be rooted in an understanding of the underlying genetic mechanisms as they relate to the fundamental biology of plants and animals and translating that information into practice. Improving the productivity of plant and animal systems is a balance between maximizing the genetic potential of organisms and minimizing losses due to pests and poor agricultural practices. Programs will help producers increase production, while improving sustainability. New discoveries in biotechnology will add value as exports to developing nations.

Hunger experienced by specific local, regional, or national populations can be the effect of climate and weather conditions for a specific geographic area or of incidents such as a natural disaster or political unrest. Food shortages and hunger for special populations can be alleviated by planning and implementing strategic educational initiatives to address the uncertainty of the events of the future. International agricultural programs take research and outreach to developing countries through collaborative research projects, local training efforts to address the complex issues surrounding global food security and hunger, and opportunities for students to work across the globe to address food issues. Ensuring an adequate and safe food supply for local and world populations begins at the most local level--the farm.

Research and extension will continue to provide growers with the science-based information to enhance production without negative environmental impact. As world populations increase, U.S. food production capability will become instrumental in addressing the need for more food. Penn State-developed technology and modern science-based resources can be a solution to help solve world hunger when exported and adopted by food-producing nations around the world. Hunger is real, but can be minimized, if not eliminated, by adoption of sustainable food production methods based on research and extension programs that focus on efficiently increased production with a sustainability and environmental stewardship focus.

Processing and manufacturing of food products is a major economic contributor for local, state, regional, and national food sectors. Pennsylvania is a leader in the industry. Research and extension programs will continue to partner with the food manufacturing and processing industries to ensure safe, wholesome products entering the food chain from Pennsylvania growers and processors.

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
201	Plant Genome, Genetics, and Genetic Mechanisms	10%		20%	
202	Plant Genetic Resources	10%		4%	
206	Basic Plant Biology	10%		13%	
302	Nutrient Utilization in Animals	10%		9%	
303	Genetic Improvement of Animals	10%		5%	
304	Animal Genome	10%		9%	
311	Animal Diseases	10%		18%	
502	New and Improved Food Products	12%		7%	
606	International Trade and Development	2%		3%	
610	Domestic Policy Analysis	2%		4%	
611	Foreign Policy and Programs	2%		6%	
704	Nutrition and Hunger in the Population	10%		0%	
722	Zoonotic Diseases and Parasites Affecting Humans	2%		2%	
	Total	100%		100%	

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

1. Situation and priorities

Three billion additional people to feed, shrinking amounts of arable land, climate change, increased natural disasters, energy and environmental issues, pests and diseases, political and social issues--all these factors and more will affect the future availability of food for a hungry world. More food will be needed. Across the food sector continuum, science-based research and education can address the increasingly complex issues facing producers, processors, manufacturers, distributors, and consumers.

At the federal level, food safety, food security, and food availability have been elevated to the highest priority for our nation. There is an expectation that the United States food system can rise to the challenges of feeding more people with less land, under increasingly challenging economic, social, political, and environmental conditions.

The research and extension system is a proven leader in discovery of answers and implementation of solutions to feed the world. Research and extension programs to enhance production efficiency through genetic enhancement, reproductive and yield enhancement, and adjustment to more widely variable environmental conditions will result in more plant and animal food sources. Land use planning protects valuable production capability for crops and livestock. Integrated pest management and precision feeding and nutrient management practices reduce the use of pesticides, fertilizers, and nutrients that can have a negative effect on the food that is produced and on the environment. Adoption of business planning and continuity of operations planning for food producers and food processors reduces the effect of risk and disasters, including weather and terrorist activities, that would negatively affect the food supply and consumer confidence in the food system. Nutrition education programs for underserved, hard to reach,

and vulnerable populations result in the ability of those food consumers to purchase, store, prepare, and serve to their families a more nutritious and healthy diet while reducing the cost of food.

2. Scope of the Program

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

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

1. Assumptions made for the Program

Programs will depend on enhanced competitive grant success; multistate, multidisciplinary task force approach; holistic approach to solve multiple problems simultaneously, which will require both basic and applied integrated research that is then translated to extension programs across several disciplines; enhanced local community interaction with partners and collaborators; and environmental regulations and policies. Furthermore, researchers and extension agents will need to work together to identify issues and efforts to solve problems, not symptoms. Organized direction via the U.S. government's Feed the Future initiative would help ensure best utilization of scarce resources in this priority area.

Although food security outside the U.S. is important, there are many rural and urban residents within the U.S. who live in food deserts where high quality, nutritious, and/or fresh foods are difficult or impossible to access.

2. Ultimate goal(s) of this Program

The ultimate goals for research and extension activities in Global Food Security and Hunger are to keep Pennsylvania and United States agriculture competitive while reducing global food insecurity. More diverse populations of individuals need to have a secure, affordable, and safe food supply. Agriculture producers need to adopt production practices that are economically and environmentally favorable and will allow them to maintain a sustainable and competitive position in the world market. Specifically, we seek the following: more producers adopting sustainable practices; enhanced control of greater numbers of diseases and pests with minimal economic, environmental, and social impact; reduction in real and perceived risks associated with the use of genetically modified varieties and species, antibiotics, and pesticides; increased productivity with fewer inputs; and increased expertise and technology that can be exported globally. In addition, accessibility to high quality, nutritious, and fresh foods will be improved.

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
2015	32.9	0.0	140.8	0.0
2016	32.9	0.0	140.8	0.0
2017	32.9	0.0	140.8	0.0

Year	Extension		Research	
	1862	1890	1862	1890
2018	32.9	0.0	140.8	0.0
2019	32.9	0.0	140.8	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Research and extension will partner to identify the changing needs of individuals, families, businesses, communities, and larger populations. Increased market analysis and needs assessment will determine the critical questions and needs of various populations that can be addressed and solved through the land-grant mission. Program advisory groups and other government and nongovernment stakeholder groups will be encouraged to work collaboratively across disciplines. Transdisciplinary teams will take a more global approach to problems that affect global food security and hunger. There will be an effort to help society understand the interconnected nature and complexity of the food and agriculture system and how the decisions and actions of a single individual may affect others downstream, downwind, across the community, or on the other side of the globe.

We have become a more global community, and we must continue to educate our audiences about the complex food and agriculture system. At the local level, research and extension programs will help producers increase yields and improve the sustainability of production agriculture. Extension education will improve the competitive edge for food producers, processors, distributors, and retailers. Consumer nutrition education will result in a population that is more capable of making food purchasing decisions that will provide a more nutritious, safer, more economical, and healthier diet. Processors will be educated to improve quality control management.

A variety of educational methodologies will be deployed including one-on-one, group education, conferences and workshops, published information, web-based information, and web-based interaction. Teams of scientists, educators, and industry and agency representatives will collaborate to provide a more comprehensive approach than what can be accomplished by any one entity. Market enhancement at the local, regional, and worldwide levels will be a priority. State Extension Teams that focus on animal and plant systems, renewable natural resources, agricultural entrepreneurship, food and health sciences will be engaged in this important program area. Key program priority initiatives that will address this issue include animal welfare and environment, water quality and quantity, food safety and quality, sustainable agricultural businesses, pest prediction and response, and childhood obesity.

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"> ● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations 	<ul style="list-style-type: none"> ● Newsletters ● Web sites other than eXtension ● Other 1 (Webinars)

3. Description of targeted audience

Target audiences include agricultural producers, farmers, landowners, commodity organizations, agriculture services/businesses, nonprofit associations/organizations, community groups, consumers,

general public, government personnel, human service providers, special populations (at-risk and underserved audiences), students/youth, volunteers/extension leaders, international agencies, international universities, international researchers, global populations, and local, state, and federal agencies.

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

- Number of college-initiated technology disclosures.
 - Number of participants in extension education classes and workshops.
- 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	Percentage of extension class/workshop participants who expect to implement/adopt practices. (This is a short-term outcome measure.)
2	Percentage of extension class/workshop participants who respond to a follow-up survey with a self-report that they have implemented/adopted practices. (This is a medium-term outcome measure.)

Outcome # 1

1. Outcome Target

Percentage of extension class/workshop participants who expect to implement/adopt practices. (This is a short-term outcome measure.)

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms
- 202 - Plant Genetic Resources
- 206 - Basic Plant Biology
- 302 - Nutrient Utilization in Animals
- 303 - Genetic Improvement of Animals
- 304 - Animal Genome
- 311 - Animal Diseases
- 502 - New and Improved Food Products
- 606 - International Trade and Development
- 610 - Domestic Policy Analysis
- 611 - Foreign Policy and Programs
- 704 - Nutrition and Hunger in the Population
- 722 - Zoonotic Diseases and Parasites Affecting Humans

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 2

1. Outcome Target

Percentage of extension class/workshop participants who respond to a follow-up survey with a self-report that they have implemented/adopted practices. (This is a medium-term outcome measure.)

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms
- 202 - Plant Genetic Resources
- 206 - Basic Plant Biology
- 302 - Nutrient Utilization in Animals
- 303 - Genetic Improvement of Animals
- 304 - Animal Genome
- 311 - Animal Diseases
- 502 - New and Improved Food Products
- 606 - International Trade and Development

- 610 - Domestic Policy Analysis
- 611 - Foreign Policy and Programs
- 704 - Nutrition and Hunger in the Population
- 722 - Zoonotic Diseases and Parasites Affecting Humans

4. Associated Institute Type(s)

- 1862 Extension

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

Resources allocated to support research and extension education are stressed in a changing economy. Genetic and biometric advances in breeding and varieties have a direct correlation to yield and sustainability. Climate change and changing weather patterns, which result in local to national environmental variations, result in immediate changes in yield and long-term challenges for sustainability. More frequent weather anomalies such as extreme drought, severe cold, ice, hurricanes, tornadoes, hail, early and late frost, flooding, earthquakes, etc., will all have a local to regional impact on productivity and yield. Political conditions can affect local to national populations negatively as food shortages lead to hunger. Invasive and new pests and diseases typically have a negative effect on production and sustainability. The world economy, national economies, and the vitality of local communities can have a negative effect on the ability of individuals and families to afford adequate, safe, and nutritious food. Increased emphasis on environmental impact may affect current and future production practices. The economy and availability of energy sources will have a direct effect on productivity, processing, distribution, and availability of food for everyone. Competition of crops as energy sources will also stress our food production systems. Economically challenged populations will be more dramatically affected and may need to be addressed uniquely.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Extension requires each State Extension Team (SET) to implement evaluation tools and collect impact data. This information is reported through the Extension Program Activity System (EPAS). Each program team has its own set of evaluation tools that it uses for assessment of their programs. In addition, we have asked each SET to establish an external advisory team to use as a direct method of assessing whether the educational programs are on target and meeting the industry or audience needs. We hope to implement a customer satisfaction instrument that will provide feedback on the quality and value that our programs provide. This will be implemented after the programs have had adequate time to impact our audiences.

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Sustainable Energy

2. Brief summary about Planned Program

The Marcellus shale and Utica shale natural gas reserves in Pennsylvania have resulted in an opportunity to develop a domestic energy resource in the state. In response, comprehensive research and outreach programs have been initiated to understand the potential community, economic, and environmental issues associated with the development of the Marcellus and Utica shale resource in the state. Extension educational programs include the development of webinars, conferences, newsletters, tours, and factsheets on understanding the potential of the resource, gas leasing considerations, and other topics related to the development of these resources. Engagement with county commissioners, state government agencies and officials, and the industry is a critical part of the outreach effort.

Renewable energy development that has minimal environmental impacts and limited effects on food and feed prices presents new opportunities and challenges. The development of alternative energy strategies is also a function of federal, state, and local policies that either subsidize or restrict development. Regionally adapted renewable energy solutions are sought as priorities to establish the supporting research and outreach programs required to foster the appropriate advancement of these technologies.

Outreach programs have continued to be developed that address the potential of various alternative energy feedstocks for energy. The public, communities, and potential project developers require a comprehensive understanding of feedstock production and availability, sustainable harvest strategies and cost, feedstock logistics, and the optimum methods of utilizing the resource most efficiently. Research initiatives focus on evaluations of cropping systems on dairy farms, development of novel bioenergy crops, development of sustainability criteria for harvesting crop residues, and evaluations of cost and logistic issues associated with the harvest of woody biomass for energy. Emerging markets for ecosystem service credits that are often generated in conjunction with renewable energy project developments are key components of business plans. These include renewable energy credits, carbon credits, and nutrient trading credits.

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
123	Management and Sustainability of Forest Resources	33%		65%	
125	Agroforestry	33%		17%	
131	Alternative Uses of Land	34%		18%	
	Total	100%		100%	

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

1. Situation and priorities

Pennsylvania continues to experience a rapidly changing environment in the area of sustainable energy. The discovery of a significant Marcellus and Utica shale natural gas resource has generated an unprecedented need for information on a wide range of topics for a diverse clientele ranging from landowners, local government officials, and concerned citizens. Initially the interest focused on the potential of the resource and potential economic considerations, but rapidly evolved into environmental and community impacts, and financial management issues. Public concern has intensified on taxation, water and air quality issues, and long-term management considerations of the resource.

Since 2004, state and federal initiatives have encouraged the development of alternative energy resources in the state. At the federal level, the Renewable Fuel Standard has provided mandates for alternative fuels such as ethanol and biodiesel and has recently been updated to include advanced biofuels from a wider array of feedstocks and processing technologies. Federal tax credits for biofuels have resulted in a rapid expansion of the industry in Pennsylvania, with ethanol production capacity in the state now exceeding 100 million gallons/year and biodiesel capacity at over 50 million gallons per year.

At the state level, renewable power standards have stimulated the development of solar, wind, biomass, and other renewable energy production tactics. Low natural gas prices due to the development of the Marcellus and Utica shale resource have slowed investment in some renewable technologies, but volatile oil prices have again caused an increase in the development of combustion technologies that can help to reduce dependence on fuel oil as a heating source and renewed interest in alternatives to gasoline.

2. Scope of the Program

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

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

1. Assumptions made for the Program

Funding will remain constant or increase in support of this planned program. Marcellus and Utica shale development will continue in the state and our programs will evolve to meet the needs of clientele.

Development will likely expand across the state and experiences from initial lease and drilling will provide a basis for future programming. As renewable energy technologies evolve along with mandates for increased levels of renewable and alternative energy there will be a need for research and outreach associated with the development of these technologies and government policies. The development of these major natural gas fields will impact our water resources, forests, agricultural lands and communities. The wealth generated by the extraction of these resources will be uneven across the general population, creating conflicts between the haves and have-nots. The development and marketing on bio-based fuels and by-products will have an impact on crop prices and the costs associated with livestock production in the state.

2. Ultimate goal(s) of this Program

The ultimate goal of the sustainable energy program is to help society develop sustainable energy resources from traditional sources such as natural gas and also from renewable resources such as wind, solar, waste, woody biomass, or energy crops in the state. As part of this goal, our institution can provide a research and development role for some of these technologies and provide a voice in the science-based development of effective state and local policies surrounding these energy resources. Our goal is also to create through our educational programs an informed clientele who make informed decisions regarding energy development that lead to a more sustainable future for our state and nation. Economic and Community Development extension programs are focused on helping communities manage the new wealth they are acquiring and use the opportunity to develop a long-term diverse and sustainable economic base.

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
2015	9.1	0.0	13.3	0.0
2016	9.1	0.0	13.3	0.0
2017	9.1	0.0	13.3	0.0
2018	9.1	0.0	13.3	0.0
2019	9.1	0.0	13.3	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Plans for Marcellus and Utica shale education programs going forward include outreach and research on a variety of related topics from across Penn State. The Marcellus Shale Center for Outreach and Research has been established to bring the university's broad research and outreach capability together to address issues associated with gas extraction. Educational programs will utilize the expertise available within the Marcellus Education Team, from other researchers across the University system, and colleagues at land-grant institutions in the Appalachian basin impacted by Marcellus shale development.

From the outreach side, we are planning to enhance and expand the delivery of information via webinars, video conferencing, online content, and through planned in-person seminars. Increased use of public media as an outreach tool is currently expanding, and we have in motion several projects with the public broadcasting units at Penn State to reach the constantly expanding stakeholder audiences throughout the Commonwealth. Research programs will focus on natural resource policies that affect public and private lands as well as energy impacts on natural resources and society. Many of our projects stress management aspects of forest ecosystems, as these represent a significant renewable energy

source for both now and in the future. Other projects are directed to feedstock improvement and the continued development of nonfood crops as feedstock sources for sustainable energy. We will continue to participate as strong contributors to the considerable work in sustainable energy that is ongoing across the university.

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"> ● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations 	<ul style="list-style-type: none"> ● Public Service Announcement ● Newsletters ● Web sites other than eXtension ● Other 1 (Webinars)

3. Description of targeted audience

Target audiences include general public, landowners, energy project developers, state and federal agencies, extension educators, state and local community leaders, energy companies, entrepreneurs, and 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

- Number of college-initiated technology disclosures.
- Number of participants in extension education classes and workshops.

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	Percentage of extension class/workshop participants who expect to implement/adopt practices. (This is a short-term outcome measure.)
2	Percentage of extension class/workshop participants who respond to a follow-up survey with a self-report that they have implemented/adopted practices. (This is a medium-term outcome measure.)

Outcome # 1

1. Outcome Target

Percentage of extension class/workshop participants who expect to implement/adopt practices. (This is a short-term outcome measure.)

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 123 - Management and Sustainability of Forest Resources
- 125 - Agroforestry
- 131 - Alternative Uses of Land

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 2

1. Outcome Target

Percentage of extension class/workshop participants who respond to a follow-up survey with a self-report that they have implemented/adopted practices. (This is a medium-term outcome measure.)

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 123 - Management and Sustainability of Forest Resources
- 125 - Agroforestry
- 131 - Alternative Uses of Land

4. Associated Institute Type(s)

- 1862 Extension

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Economy
- Appropriations changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Other (Extramural Funding)

Description

Public interest in the Marcellus, Utica, or renewable energy strategies is tied closely to the

economy and public policy. Increases in economic activity and energy prices could greatly increase the interest in the development of these resources and the potential for secondary issues to develop. Both of these industries are also closely tied to public policy, and development is a function of tax, subsidy, and environmental policy. Changes in any policy often require subsequent interpretation and education and create additional opportunities for engagement through extension. These changes also create opportunities for public policy research on energy policy, which is a strength of the college.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Extension requires each State Extension Team (SET) to implement evaluation tools and collect impact data. This information is reported through the Extension Program Activity System (EPAS). Each program team has its own set of evaluation tools that it uses for assessment of their programs. In addition, we have asked each SET to establish an external advisory team to use as a direct method of assessing whether the educational programs are on target and meeting the industry or audience needs. We hope to implement a customer satisfaction instrument that will provide feedback on the quality and value that our programs provide. This will be implemented after the programs have had adequate time to impact our audiences.

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Economic and Community Development

2. Brief summary about Planned Program

Strong communities are built upon the foundation of resilient individuals and families. These foundations, however, are being stressed by globalization of our economy, resulting in a displaced workforce, and by the changing demographics of our citizens. Shifting workforce needs require opportunities to help train or retrain workers for new job opportunities.

Penn State demonstrates commitment to the citizens of the Commonwealth through a diverse array of research and extension programs that address long-standing and emerging issues, such as the Marcellus shale gas drilling and regional food systems. Many of our research efforts in this planned program address civic engagement and effective community institutions to provide residents and businesses with the proper tools to address local problems that affect their community.

This research is delivered via extension programming in a variety of forms, including work with local governments and nongovernmental organizations, advice to businesses new and old, and facilitation of community strategic planning and visioning. Experiences gained during our first 150 years now must be adapted to apply to a changed and continually changing environment.

In the early days of our research and extension programs, we focused primarily on a rural audience, and Pennsylvania, although still highly rural in nature, is now a much more tightly woven patchwork of communities. The success of our traditional rural audience is becoming more and more dependent on the interconnections between our rural, suburban, and urban centers. Many regions that are key agricultural production zones are also now preferred residential locales. This mix creates a variety of tensions that can be resolved only through creative translation of the latest social science and agricultural research into programs that help to provide solutions for previously unknown problems. A current example of rural-urban interface tensions is the definition of "customary agricultural practices." Such definitions were unnecessary in the recent past, but now are important to crafting sensible solutions to conflicting pressures on land use.

In addition to these pressures, the recent exploration and drilling of the Marcellus shale for natural gas and the beginning of efforts to drill the Utica shale are stressing Pennsylvania communities in many new ways. Communities are already faced with impacts on infrastructure (roads, school systems, etc.), social services, housing, etc. While there are many challenges facing our communities, there are many opportunities that research and extension can help. Our contributions to these and other community-based conflicts are central for ensuring a high quality of life for Pennsylvania residents.

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
125	Agroforestry	0%		1%	
134	Outdoor Recreation	1%		0%	
401	Structures, Facilities, and General Purpose Farm Supplies	2%		5%	
512	Quality Maintenance in Storing and Marketing Non-Food Products	7%		1%	
601	Economics of Agricultural Production and Farm Management	1%		5%	
602	Business Management, Finance, and Taxation	6%		7%	
603	Market Economics	1%		6%	
604	Marketing and Distribution Practices	8%		10%	
608	Community Resource Planning and Development	12%		7%	
609	Economic Theory and Methods	5%		1%	
801	Individual and Family Resource Management	10%		5%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	3%		14%	
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures	1%		0%	
805	Community Institutions, Health, and Social Services	10%		6%	
806	Youth Development	12%		6%	
901	Program and Project Design, and Statistics	10%		5%	
902	Administration of Projects and Programs	1%		1%	
903	Communication, Education, and Information Delivery	10%		20%	
	Total	100%		100%	

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

1. Situation and priorities

Pennsylvania is a state in transition. Our rural nature is changing with the redistribution of populations toward more urban areas, and the diversity of the Commonwealth's population is shifting. In addition, the Marcellus and Utica shale gas fields and their exploration are bringing new financial resources into the state and new pressures that potentially affect the well-being of communities. These changes require a shift from some of our traditional research and extension focal areas to areas that permit us to address emerging issues. Pennsylvania communities need help finding new ways to generate a local economy, particularly our smaller, more rural communities that have lost key employers because of globalization, consolidation, and/or aging facilities.

As the human landscape changes within the state, our civic structure struggles to cope with this change. State and local governments need research and advice on how to adapt regulations and policies (e.g., zoning, taxes) to situations different from those in place when the regulations were adopted. They also need help dealing with the stresses being placed on their social services and infrastructure. Communities that were relatively isolated and closed have opened, both physically through population shifts and virtually through information technology. Access to technology is a major limitation to economic growth and health care.

With the rapid development of the gas fields in Pennsylvania, opportunities for new jobs are being created along with the need to provide job training. The need for research-based programs that have a positive influence on community vitality is greater than it has ever been. There is a great need for research and extension to help communities take advantage of the new wealth created from gas drilling to develop more resilient economies that will allow continued prosperity once the natural gas play is over. Programs that focus on adding value locally to agricultural products offer an opportunity to help revitalize our communities. Research related to food system network analysis provides insights that may offer new approaches to building more sustainable communities.

2. Scope of the Program

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

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

1. Assumptions made for the Program

Funding will remain constant or increase in support of this planned program. The nature of Pennsylvania communities will continue to shift, creating more rural-urban interfaces, with the problems and opportunities that they bring. The Marcellus and Utica shale gas drilling will increase rapidly over the next four years. New tensions in these changing communities will demand a population interested in positive civic engagement, and this population will require a deep understanding of issues relevant to both rural and nonrural citizens.

2. Ultimate goal(s) of this Program

The ultimate goal of our Economic and Community Development programs is to help Pennsylvania communities develop stronger and more sustainable economic systems. This in turn will help individual citizens enjoy more fulfilling lives. These goals will be achieved through our extension programs in economic and community development, agricultural entrepreneurship, agricultural business, and Marcellus shale. Ultimately, we are addressing concerns articulated in a recent Brookings Institution report that Pennsylvania is facing declining intercity infrastructure, expanding urban areas that outpace our population growth rate, declining job opportunities, and youth migration out of the state. Our goal is to help reverse these trends by improving community economic resilience.

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
2015	68.0	0.0	23.5	0.0
2016	68.0	0.0	23.5	0.0
2017	68.0	0.0	23.5	0.0
2018	68.0	0.0	23.5	0.0
2019	68.0	0.0	23.5	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Research will be conducted on the sociological aspects of civic engagement, network analysis, and community and family resilience that affect our communities. A significant portion of our research portfolio includes economic studies across a wide range of topics, including rural economic development, marketing, entrepreneurship, and sustainability within the food system. Extension education programs will focus on the programmatic needs of our stakeholders in the areas of value-added agriculture, issues associated with Marcellus shale gas drilling, municipal planning, and regional and local food systems.

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"> ● Education Class ● Workshop ● Group Discussion ● Demonstrations 	<ul style="list-style-type: none"> ● Public Service Announcement ● Newsletters ● TV Media Programs ● Web sites other than eXtension ● Other 1 (Webinars)

3. Description of targeted audience

Target audiences include general public, county and municipal planning commissioners, zoning officials, elected officials, policy makers, engineers, agencies and organizations, attorneys, residents, natural gas company personnel, farmers, local merchants, civic leaders, and legislators.

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

- Number of college-initiated technology disclosures.
 - Number of participants in extension education classes and workshops.
- 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	Percentage of extension class/workshop participants who expect to implement/adopt practices. (This is a short-term outcome measure.)
2	Percentage of extension class/workshop participants who respond to a follow-up survey with a self-report that they have implemented/adopted practices. (This is a medium-term outcome measure.)

Outcome # 1

1. Outcome Target

Percentage of extension class/workshop participants who expect to implement/adopt practices. (This is a short-term outcome measure.)

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 125 - Agroforestry
- 134 - Outdoor Recreation
- 401 - Structures, Facilities, and General Purpose Farm Supplies
- 512 - Quality Maintenance in Storing and Marketing Non-Food Products
- 601 - Economics of Agricultural Production and Farm Management
- 602 - Business Management, Finance, and Taxation
- 603 - Market Economics
- 604 - Marketing and Distribution Practices
- 608 - Community Resource Planning and Development
- 609 - Economic Theory and Methods
- 801 - Individual and Family Resource Management
- 803 - Sociological and Technological Change Affecting Individuals, Families, and Communities
- 804 - Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures
- 805 - Community Institutions, Health, and Social Services
- 901 - Program and Project Design, and Statistics
- 902 - Administration of Projects and Programs
- 903 - Communication, Education, and Information Delivery

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 2

1. Outcome Target

Percentage of extension class/workshop participants who respond to a follow-up survey with a self-report that they have implemented/adopted practices. (This is a medium-term outcome measure.)

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 125 - Agroforestry
- 134 - Outdoor Recreation
- 401 - Structures, Facilities, and General Purpose Farm Supplies
- 512 - Quality Maintenance in Storing and Marketing Non-Food Products
- 601 - Economics of Agricultural Production and Farm Management

- 602 - Business Management, Finance, and Taxation
- 603 - Market Economics
- 604 - Marketing and Distribution Practices
- 608 - Community Resource Planning and Development
- 609 - Economic Theory and Methods
- 801 - Individual and Family Resource Management
- 803 - Sociological and Technological Change Affecting Individuals, Families, and Communities
- 804 - Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures
- 805 - Community Institutions, Health, and Social Services
- 806 - Youth Development
- 901 - Program and Project Design, and Statistics
- 902 - Administration of Projects and Programs
- 903 - Communication, Education, and Information Delivery

4. Associated Institute Type(s)

- 1862 Extension

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

A variety of factors influence potential outcomes in Economic and Community Development. This is an area where public policy and regulations can influence the research needs and the delivery of research results to stakeholders through Cooperative Extension. Population changes are of particular importance in both priority setting for research and extension and for availability of funding to conduct that work. Appropriations could have an impact (positive or negative) on recruiting and retention of AES and CES personnel. The rate at which gas drilling increases in the state will greatly influence the scope and degree of research and extension programming. It is our hope that key programs will continue to grow in future years, but the challenge of reduced federal funding for agricultural research and extension dictate that we anticipate maintaining current levels of output.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Extension requires each State Extension Team (SET) to implement evaluation tools and collect impact data. This information is reported through the Extension Program Activity System (EPAS). Each program team has its own set of evaluation tools that it uses for assessment of their programs. In

addition, we have asked each SET to establish an external advisory team to use as a direct method of assessing whether the educational programs are on target and meeting the industry or audience needs. We hope to implement a customer satisfaction instrument that will provide feedback on the quality and value that our programs provide. This will be implemented after the programs have had adequate time to impact our audiences.

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Environmental Management

2. Brief summary about Planned Program

Environmental quality is affected by a broad spectrum of activities on the terrestrial and aquatic landscapes, including agricultural practices, natural gas drilling, forest resource management, wildlife and fisheries management, land use decisions, population dynamics, and recreation--all of which will likely be influenced by climate change. Research and extension programs will focus on the protection, enhancement, and restoration of environmental resources to develop sustainable management approaches for the use and preservation of these fragile resources. The management of our natural resources can have direct and substantial influences on environmental outcomes. In the agricultural sector, producers manage soil resources, balance nutrients, and protect air and water quality, while maintaining production efficiencies as environmental regulations are being more stringently enforced.

Pennsylvania has significant forest resources, 70% of which is under private ownership; the balance is under state, federal, and industry control. The economics of land use and balancing timber production with recreation, wildlife management, environmental degradation, and land development pressure are critical issues facing forest landowners in the state. Local and state governments and nongovernmental organizations in partnerships with AES and CES work together to develop and implement policies based on science for the effective management of natural resources and protection of the environment.

Key demands for research and extension programming encompass nutrient management, including the economic trade-offs and considerations at the farm, watershed, and regional scales. Addressing issues surrounding odor and gaseous emissions from livestock operations, tillage practices in sequence with innovations in manure application, regional waste-to-energy technologies, and effects on water quality are included in our programming portfolio. Implementation of integrated pest management programs is an important component necessary to develop sustainable management approaches for environment protection. A wide range of natural resource management activities focuses on forest management for timber production, recreation, wildlife management, economics of natural resource management practices, and land use decision-making. Extension programs will also address community and urban natural resource management.

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
101	Appraisal of Soil Resources	10%		9%	
102	Soil, Plant, Water, Nutrient Relationships	19%		23%	
104	Protect Soil from Harmful Effects of Natural Elements	12%		1%	
112	Watershed Protection and Management	20%		14%	
122	Management and Control of Forest and Range Fires	2%		2%	
135	Aquatic and Terrestrial Wildlife	5%		22%	
136	Conservation of Biological Diversity	8%		6%	
216	Integrated Pest Management Systems	16%		17%	
403	Waste Disposal, Recycling, and Reuse	4%		6%	
405	Drainage and Irrigation Systems and Facilities	4%		0%	
	Total	100%		100%	

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

1. Situation and priorities

Pennsylvania exhibits a significant wealth of natural resources, but also sits at a crossroads with regard to environmental issues surrounding both the management of those natural resources and the maintenance of a vibrant agricultural economy. The questions being posed to our research and extension professionals are both production issues and policy issues. This planned program provides clear opportunities for research and outreach that will have impact.

Nutrient management is a perfect example of the nature of the problems that Pennsylvania faces. Livestock agriculture is the major contributor to agricultural income in the state. However, the nutrient load produced by livestock is concentrated in areas that are prone to development for new housing and associated activities, and the production areas threaten important watersheds. Continued viability of livestock agriculture relies on solutions that balance production efficiencies, neighbor perceptions, and environmental quality. Research by AES scientists is addressing animal nutrition to minimize nutrient feed-through, mitigate odors, and develop alternative methods of waste handling. This research is translated to programs that can be implemented by producers. Science-based information is shared with stakeholders, including nongovernmental agencies and policy-makers in government, to help guide decisions.

A second complex system that requires our input is in the management of forest resources. The balance of forest harvest practices, forest regeneration, airborne pollution, and deer populations is ultimately responsible for successful forest management. Each of these variables is complex in itself, but a need continues to exist not only for research on the individual variables, but also for system-level research and outreach on the intersection of these variables.

Furthermore, the value of the forest being managed is a function of the wood products generated. This industry has been under significant pressure from foreign competition and new products are needed to revitalize the industry and create new value from our forests. Necessary research encompasses topics like materials research, nanotechnology, bio-based product and bio-derived energy options, and

manufacturing techniques to maximize use of the raw material.

Water quality and quantity is likely to be a critical agricultural and societal issue in the future. In Pennsylvania, we face issues from quality of private well supplies to the condition of the Chesapeake Bay. The economics of alternative natural resource and environmental decisions must be examined and optimized. The expansion of Marcellus and Utica shale natural gas exploration and drilling will affect wildlife, water, forests, and agriculture in Pennsylvania.

2. Scope of the Program

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

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

1. Assumptions made for the Program

Funding will remain constant or increase in support of this planned program. Local governments will require assistance in addressing competing land use and economic issues involving natural resources and the environment. Reliance on renewable, bio-based sources for materials will continue to increase. Public interest in managing natural resources will continue to present competing, and sometimes conflicting, demands. Interest in environmental quality will continue to drive a need for better stewardship.

2. Ultimate goal(s) of this Program

Identify and evaluate ecosystem services provided by working lands as part of the suite of products and services provided by agriculture and forests. Improve urban environments through green infrastructure research and extension. Develop and implement new odor and nutrient management methods to facilitate the balance between agriculture and the environment, enabling productive and integrated animal agriculture that protects and sustains environmental quality--air, water, and land. Develop and disseminate forest management solutions that address biotic and abiotic effects on forest regrowth. Provide policy-makers with science-based recommendations for regulations and best practices in environmental stewardship. Minimize the impact of gas drilling activities on Pennsylvania's natural resources.

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
2015	40.2	0.0	85.6	0.0
2016	40.2	0.0	85.6	0.0
2017	40.2	0.0	85.6	0.0
2018	40.2	0.0	85.6	0.0
2019	40.2	0.0	85.6	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

A broad range of research and extension activities will be performed in this program area. Policy-makers will be provided with science-based recommendations for regulations and best practices in environmental stewardship. The Pennsylvania Discovery Watersheds Initiative addresses nonpoint source pollution stemming from residential, agricultural, forested, commercial, and municipal sectors. Community-based tools will be developed to: a) reduce pollutant loads, b) improve local water quality, and c) remove stream impairments. This program will extend lessons learned from targeted pilot watersheds (USDA Showcase Watershed, Conewago Creek) and utilize e-newsletters, webinar trainings, best management practices (BMPs), and innovations in policy, monitoring, and other components of successful watershed programs.

The Pond and Lake Management Program will focus on improving management of water bodies that are important agricultural and recreational resources, but also represent both sources and sinks for water pollutants. This program seeks to educate pond and lake owners about proper construction, management, and state regulations.

The Safe Drinking Water program will educate private water system owners about the proper location, construction, and management of their drinking water supply. General water supply management programs will focus on emerging contamination issues, such as Marcellus shale natural gas drilling and pharmaceuticals in water, and the management of on-lot septic systems. This program utilizes trained volunteers and educators to present drinking water clinics, webinars, online home study courses, portable classrooms, and one-on-one interactions.

Community and Urban Forestry programs will educate the public on consumptive land development patterns and how they affect sustainable natural resources and their provision of ecosystem benefits. Other urban programming will focus on the development of green infrastructure. New odor and nutrient management methods will be developed and implemented to facilitate the balance between agriculture and the environment, enabling productive and integrated animal agriculture that protects and sustains environmental quality.

The Sustaining Pennsylvania's Forests program will focus on how to maintain the health and sustainability of woodlots to provide for future forest health and productivity, including well-planned and executed timber harvests; new value-added, bio-derived products from sources such as woods; and economic analyses of the generation of these products as potential business opportunities in Pennsylvania.

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"> ● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations ● Other 1 (e-classroom) 	<ul style="list-style-type: none"> ● Public Service Announcement ● Newsletters ● TV Media Programs ● Web sites other than eXtension ● Other 1 (Webinars) ● Other 2 (Blogs)

3. Description of targeted audience

Target audiences include agricultural producers, natural resources managers, policy-makers,

nongovernmental organizations, private forest landowners, wood products producers, municipalities, planners, legal professionals, gas drilling company employees, and local, regional, and state agencies.

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

- Number of college-initiated technology disclosures.
 - Number of participants in extension education classes and workshops.
- 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	Percentage of extension class/workshop participants who expect to implement/adopt practices. (This is a short-term outcome measure.)
2	Percentage of extension class/workshop participants who respond to a follow-up survey with a self-report that they have implemented/adopted practices. (This is a medium-term outcome measure.)

Outcome # 1

1. Outcome Target

Percentage of extension class/workshop participants who expect to implement/adopt practices. (This is a short-term outcome measure.)

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 101 - Appraisal of Soil Resources
- 102 - Soil, Plant, Water, Nutrient Relationships
- 104 - Protect Soil from Harmful Effects of Natural Elements
- 112 - Watershed Protection and Management
- 122 - Management and Control of Forest and Range Fires
- 135 - Aquatic and Terrestrial Wildlife
- 136 - Conservation of Biological Diversity
- 216 - Integrated Pest Management Systems
- 403 - Waste Disposal, Recycling, and Reuse
- 405 - Drainage and Irrigation Systems and Facilities

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 2

1. Outcome Target

Percentage of extension class/workshop participants who respond to a follow-up survey with a self-report that they have implemented/adopted practices. (This is a medium-term outcome measure.)

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 101 - Appraisal of Soil Resources
- 102 - Soil, Plant, Water, Nutrient Relationships
- 104 - Protect Soil from Harmful Effects of Natural Elements
- 112 - Watershed Protection and Management
- 122 - Management and Control of Forest and Range Fires
- 135 - Aquatic and Terrestrial Wildlife
- 136 - Conservation of Biological Diversity
- 216 - Integrated Pest Management Systems
- 403 - Waste Disposal, Recycling, and Reuse
- 405 - Drainage and Irrigation Systems and Facilities

4. Associated Institute Type(s)

- 1862 Extension

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

A variety of factors influence potential outcomes in environmental management. This is an area where public policy and regulations can influence the research needs and the delivery of research results to stakeholders through Cooperative Extension. Unexpected natural climate variation continues to influence priority identification. Changing demographics and land use decisions are key drivers for environmental management. Appropriations affect recruiting and retention of AES and CES personnel; however, it is our hope that key programs will continue to grow in future years. The challenge of reduced federal funding for agricultural research and extension dictate that we anticipate maintaining current levels of output.

An additional external factor would be natural gas prices.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Extension requires each State Extension Team (SET) to implement evaluation tools and collect impact data. This information is reported through the Extension Program Activity System (EPAS). Each program team has its own set of evaluation tools that it uses for assessment of their programs. In addition, we have asked each SET to establish an external advisory team to use as a direct method of assessing whether the educational programs are on target and meeting the industry or audience needs. We hope to implement a customer satisfaction instrument that will provide feedback on the quality and value that our programs provide. This will be implemented after the programs have had adequate time to impact our audiences.

V(A). Planned Program (Summary)

Program # 8

1. Name of the Planned Program

Food and Fiber Systems

2. Brief summary about Planned Program

Research and extension program areas will employ a comprehensive, systems-based approach to address the complex issues surrounding the production, processing, and utilization of food and fiber. The drivers for the food and fiber systems are undergoing a fundamental shift that increasingly emphasizes consumer needs and desires in combination with those of producers. Research and extension programs will focus on the farm-to-fork continuum, with emphasis on research-based educational programs for the producers and consumers of our agricultural commodities. Our work will be responsive to consumers who are demanding that safe, wholesome food is produced in an environmentally and ethically responsible manner. With agriculture as the largest industry in Pennsylvania, Penn State will continue to provide educational science-based programs that improve the profitability and sustainability of production agriculture.

Actions to increase the value of goods and services within the food and fiber sector increase profitability at the local and regional levels. These efforts take into consideration and address the changing societal awareness and interest in animal welfare. The health and welfare of production animals is a priority for producers and consumers; furthermore, a fundamental understanding of animal health can translate to issues that affect human health care. Agencies at the state and federal levels and the consuming public have a heightened awareness and expectation for environmental issues as important factors in plant and animal production. Producers are informed and educated on best management practices (BMPs) that increase the level of profitability and sustainability of food and fiber systems in an environmentally acceptable manner. The interrelationships among plants, animals, people, and the environment are reflected in regulatory policies that influence decision-making relative to agricultural production.

Consumer desires for high quality, pest- and pathogen-free agricultural products that are produced with a minimum of pesticides are a continuing challenge. Effective pest management strategies, with a focus on a systems approach, in both plant and animal agriculture have been at the heart of Penn State excellence for many years. As new pests emerge, as our portfolio shifts, and as environmental knowledge and rules change, we are faced with the continued need to devise new strategies that acknowledge these changes and take advantage of emerging technologies. The development of monitoring and predictive tools to assess pest presence and spread, the accurate identification of pest species, and the integration of pest control into other management decisions are all key areas in our AES and CES portfolios.

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
121	Management of Range Resources	1%		0%	
204	Plant Product Quality and Utility (Preharvest)	10%		5%	
205	Plant Management Systems	10%		13%	
211	Insects, Mites, and Other Arthropods Affecting Plants	15%		27%	
212	Pathogens and Nematodes Affecting Plants	4%		15%	
213	Weeds Affecting Plants	4%		3%	
214	Vertebrates, Mollusks, and Other Pests Affecting Plants	3%		0%	
215	Biological Control of Pests Affecting Plants	4%		3%	
301	Reproductive Performance of Animals	4%		8%	
305	Animal Physiological Processes	4%		9%	
307	Animal Management Systems	10%		2%	
308	Improved Animal Products (Before Harvest)	4%		1%	
312	External Parasites and Pests of Animals	3%		2%	
313	Internal Parasites in Animals	2%		0%	
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals	3%		2%	
315	Animal Welfare/Well-Being and Protection	10%		1%	
402	Engineering Systems and Equipment	2%		4%	
404	Instrumentation and Control Systems	2%		2%	
511	New and Improved Non-Food Products and Processes	5%		3%	
	Total	100%		100%	

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

1. Situation and priorities

Pennsylvania agriculture generates nearly \$6 billion in farm-gate sales. Over 60,000 Pennsylvania farms contribute to the national food and fiber supply. A growing segment of the agriculture production sector is new farmers. This group is younger, with smaller farms, greater off-farm income, and smaller per-farm income than the average. This group of "new farmers" will need access to science-based answers to the agriculture production questions that extension can answer.

New and emerging issues, along with increasing consumer demands on the system, will provide challenges to all agricultural producers. The college's commitment to entrepreneurship continues to

expand and build on existing programs that provide entrepreneurial skill development for Pennsylvania's food and fiber sectors. Applied research and outreach activities built upon a comprehensive understanding of fundamental biological mechanisms to enable prediction and response to pests, pathogens, and infectious diseases remain a priority. Additionally, the college will continue to pursue proactive and cost-effective approaches to anticipate, isolate, and eradicate outbreaks, including potential bioterrorist threats affecting crop, livestock, and forest production, as well as exploring and developing alternative production practices and programs for the prevention and growth control of invasive species to limit economic damage.

2. Scope of the Program

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

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

1. Assumptions made for the Program

Research and extension programs will continue to focus on providing information to producers and consumers to make informed decisions. The focus of programming is moving from isolated, unidirectional solutions to a more holistic approach that matches resources, skills, alternatives, and implications to strengthen the economic, social, environmental, and political stability of the agricultural sector. Increasing consumer expectations for sustainable production and processing protocols, including animal welfare, quality assurance, marketability, safety, environmental stewardship, and other factors, will add new dimensions for producing, processing, distributing, and the ultimate consumption of food produced on Pennsylvania farms. Interest in carbon footprints and in local or regional food systems and community-based agriculture will continue to grow, demanding that relevant research provide solutions for producers.

The global economy, including global production factors and increasing world populations, will have an increasing effect on local and regional production. Agricultural security management practices to address natural (pests, diseases, and weather adversity) and intentional (accidental and intentional contamination and disruption issues) threats will require vigilance, preparedness, and mitigation to reduce, eliminate, manage, and control potential negative production factors. Increasing environmental expectations for agriculture require science-based solutions to address the demand for better environmental stewardship. Collectively and individually, these current and future issues will require a continued strong presence for Penn State AES and CES with the food and fiber sector for Pennsylvania and the world.

2. Ultimate goal(s) of this Program

Multidisciplinary teams of extension educators will provide information to the food and fiber sector to enable them to make informed decisions. Educational programs informed by research will provide options for the food and fiber sector to learn about, understand, gain skill in, and implement BMPs to maintain and enhance the sustainability of Pennsylvania's agricultural production. Pennsylvania farmers will produce high quality food and fiber products in an economically and environmentally advantageous manner. Producers will increase international market share for food and fiber. Production practices will result in increased profitability, increased yields, reduced costs, and improved environmental impact. Industries allied with production agriculture will enhance the economic impact for local communities and the state. Penn State Extension will provide leadership for regional and national extension programs.

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
2015	49.0	0.0	218.9	0.0
2016	49.0	0.0	218.9	0.0
2017	49.0	0.0	218.9	0.0
2018	49.0	0.0	218.9	0.0
2019	49.0	0.0	218.9	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

AES research will provide new discoveries and applications to enable solutions to the myriad challenges faced by plant and animal production, processing, and utilization by connecting research questions and approaches in a systems fashion. Beyond technical solutions, our scientists will also conduct research into the sociological, economic, and financial impacts of new and alternative scopes for farm operations. A large component of this program will involve research and outreach on the biology and management of agricultural pests, reproductive biology of animals, and animal welfare. Extension Program Teams will develop educational materials that translate research into information applicable to solve current and emerging issues for food and fiber systems. Stakeholder groups will create partnerships with extension to extend resources and provide support and advocacy for the needs of agriculture. Multidisciplinary educational intervention will address complex production, marketing, environmental, economic, and societal issues that influence agriculture. Programs will strive to maintain the level of agriculture production, and thus, the economic drivers for individuals, communities, commodity groups, consumers, and the state and nation.

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"> ● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations 	<ul style="list-style-type: none"> ● Public Service Announcement ● Billboards ● Newsletters ● TV Media Programs ● eXtension web sites ● Web sites other than eXtension ● Other 1 (Webinars) ● Other 2 (Social Media)

3. Description of targeted audience

Target audiences include agricultural producers, policy-makers, state and federal agencies, extension educators, agricultural consultants, commodity groups, consumers, teachers, youth, volunteer leaders, parents, farm owners, farm managers, and agribusiness.

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

- Number of college-initiated technology disclosures.
 - Number of participants in extension education classes and workshops.
- 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	Percentage of extension class/workshop participants who expect to implement/adopt practices. (This is a short-term outcome measure.)
2	Percentage of extension class/workshop participants who respond to a follow-up survey with a self-report that they have implemented/adopted practices. (This is a medium-term outcome measure.)

Outcome # 1

1. Outcome Target

Percentage of extension class/workshop participants who expect to implement/adopt practices. (This is a short-term outcome measure.)

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 121 - Management of Range Resources
- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems
- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Pathogens and Nematodes Affecting Plants
- 213 - Weeds Affecting Plants
- 214 - Vertebrates, Mollusks, and Other Pests Affecting Plants
- 215 - Biological Control of Pests Affecting Plants
- 301 - Reproductive Performance of Animals
- 305 - Animal Physiological Processes
- 307 - Animal Management Systems
- 308 - Improved Animal Products (Before Harvest)
- 312 - External Parasites and Pests of Animals
- 313 - Internal Parasites in Animals
- 314 - Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals
- 315 - Animal Welfare/Well-Being and Protection
- 402 - Engineering Systems and Equipment
- 404 - Instrumentation and Control Systems
- 511 - New and Improved Non-Food Products and Processes

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 2

1. Outcome Target

Percentage of extension class/workshop participants who respond to a follow-up survey with a self-report that they have implemented/adopted practices. (This is a medium-term outcome measure.)

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 121 - Management of Range Resources
- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems

- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Pathogens and Nematodes Affecting Plants
- 213 - Weeds Affecting Plants
- 214 - Vertebrates, Mollusks, and Other Pests Affecting Plants
- 215 - Biological Control of Pests Affecting Plants
- 301 - Reproductive Performance of Animals
- 305 - Animal Physiological Processes
- 307 - Animal Management Systems
- 308 - Improved Animal Products (Before Harvest)
- 312 - External Parasites and Pests of Animals
- 313 - Internal Parasites in Animals
- 314 - Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals
- 315 - Animal Welfare/Well-Being and Protection
- 402 - Engineering Systems and Equipment
- 404 - Instrumentation and Control Systems
- 511 - New and Improved Non-Food Products and Processes

4. Associated Institute Type(s)

- 1862 Extension

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

There is probably no industry more affected by adverse factors than production agriculture. Weather extremes and anomalies dramatically affect plant health and productivity. Experts agree that we should expect more weather extremes and anomalies in the future with climate change. Not only do Pennsylvania producers directly recognize effects of adverse weather on their crops and herds, but weather affecting crop and animal production in distant parts of the world influences market prices for products and commodities produced and utilized by Pennsylvania agriculture producers. Market fluctuations are also affected by political factors, consumer demand, societal influences, and production methods. Governmental and other political regulations locally, nationally, and internationally affect market share for Pennsylvania producers. Understanding the global influence for markets of commodities produced and utilized by Pennsylvania producers can help reduce risk and ultimately improve profitability for producers. Financial support from local, state, and national public sources is under increasing scrutiny. Support levels are stagnant, decreasing, or in rare instances, increasing

slightly. As a result, research and outreach programming is reviewed to adjust and balance programming with available support as necessary. Current trends indicate lower funding and increasing costs, which can only be accommodated by fewer programs and fewer people.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Extension requires each State Extension Team (SET) to implement evaluation tools and collect impact data. This information is reported through the Extension Program Activity System (EPAS). Each program team has its own set of evaluation tools that it uses for assessment of their programs. In addition, we have asked each SET to establish an external advisory team to use as a direct method of assessing whether the educational programs are on target and meeting the industry or audience needs. We hope to implement a customer satisfaction instrument that will provide feedback on the quality and value that our programs provide. This will be implemented after the programs have had adequate time to impact our audiences.