

2017 Pennsylvania State University Combined Research and Extension Plan of Work

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I. Plan Overview

1. Brief Summary about Plan Of Work

The College of Agricultural Sciences at Penn State will provide comprehensive support to the residents of Pennsylvania through the activities of the Pennsylvania Agricultural Experiment Station (AES) and Penn State Cooperative Extension (CES). We will be responsive to stakeholder needs through translational research and delivery of science-based programs to clientele, but we will 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 new audiences. Our faculty and staff, supported by federal base funding will 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, translate, 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."

This Plan of Work presents our vision for the future with regard to the Pennsylvania AES and CES. It will guide our efforts in the College in the upcoming years.

The College of Agricultural Sciences will address complex societal issues that transcend disciplines to affect people on scales ranging from local to global. Below we lay out a revised set of seven planned programs. The new planned programs 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.

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. Laying the groundwork for biobased energy and industries in Pennsylvania.

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

Environmental Resilience - Providing innovative research and extension programming to enhance and protect managed and natural ecosystems, ecosystem services, and human well-being. Exploring potential issues resulting from global climate change, and possible mitigation and adaptation.

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 food safety, 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.

The planned programs build from the framework of the College's 2014-2019 strategic plan and incorporate broad internal and external stakeholder feedback. We developed these planned programs by analysis of cross-cutting emerging themes across the College. We solicited and received input from College leadership advisory groups, topical faculty focus groups, college employees, and the Penn State Ag Council.

The College considers both the strategic plan and the plan of work to be dynamic documents that allow for new scientific approaches to be developed and integrated into the thematic areas. The College's strategic plan discusses future initiatives in microbiomes, environment and health, applied evolution, human and community resilience, and landscape stewardship, all of which fit well within the cross-cutting thematic areas that provide the basis of the planned programs. Departmental annual reviews and strategic plans, as well as their signature research areas, also inform the POW and planned programs.

Our planned programs will capture the systems approach that we have identified as a key element for generating impact 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 (e.g., Life Sciences; Energy and Environment; Social Sciences--Children, Youth, and Families; Materials; 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, will effectively unite fundamental knowledge with practical solutions delivered to stakeholders. The net result will be a tangible benefit in economic prosperity and quality of life for Pennsylvania citizens.

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

Year	Extension		Research	
	1862	1890	1862	1890
2017	460.9	0.0	705.2	0.0
2018	460.9	0.0	705.2	0.0
2019	460.9	0.0	705.2	0.0
2020	460.9	0.0	705.2	0.0

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

Year	Extension		Research	
	1862	1890	1862	1890
2021	460.9	0.0	705.2	0.0

II. Merit Review Process

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

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

2. Brief Explanation

Both CES and AES programs undergo comprehensive review utilizing a number of merit review processes.

Internal university panels will be used to review AES projects. The Hatch, McIntire-Stennis, Animal Health, and State projects will be internally reviewed at initiation by at least two qualified faculty. In addition, external university panels are used for Multistate Research Project (MRP) activities. Both extension and academic faculty are encouraged to participate to meet the jointly agreed objectives. These projects are reviewed multiple times through the five-year duration.

External non-university panels are used as new Penn State extension programmatic issues or AES projects are implemented. Stakeholder and/or program advisory groups provide ongoing review of programs to ensure a focus on priority needs as identified by advisory groups. Reviewers' comments provide mechanisms for improving our educational and research programs.

Combined internal and external university panels are assigned to each of the programmatic issues. These panels are integrated, multidisciplinary State Extension Teams (SETs) made up of field-based extension educators and faculty with split appointments in both extension and research. Team members broadly represent all parts of the Commonwealth, and faculty members are chosen to represent relevant research and extension perspectives. Extension Program Leaders provide overall leadership to the SETs, and programs are reviewed by extension administrators. State administrators and academic unit leaders serve as liaisons to each team. Each SET developed a program plan, based on logic model components, that will guide extension programming and applied research efforts.

Combined internal and external university and external non-university panels will be used to create advisory committees for each program team. These panels will assist in identifying issues where expertise can be applied in program efforts. The work plans will be developed and revised with input from the advisory committees.

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?

College administrators will actively encourage engagement in multistate, multidisciplinary, and joint activities. The planned multi and joint activities conducted at Penn State will address issues 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 will be conducted within the framework of the College of Agricultural Sciences' newly revised five-year strategic plan for 2014-2019, which identifies areas of critical need at the state level. The College's strategic priorities will determine our faculty hires and program fund allocations for each of these issue areas, and faculty will develop their educational and research programs on the basis of these critical issues. The College's planned programs will also reflect the most important issues identified by local, state, and national planning.

Our multi and joint activities will focus on cross-cutting issues that affect diverse stakeholders and locations. Teams of community-based extension personnel and campus-based specialists will integrate needs and educational efforts. They will benefit from team-based needs evaluation, priority identification, and plan development, implementation, and evaluation.

Stakeholder feedback will influence all aspects of our programs, including the origination of new programming, the sunseting of programs that are no longer needed, hiring decisions, budget priorities, etc. (see below for more specific examples of stakeholder groups we meet with regularly). Through the evaluation process, feedback from stakeholders will identify areas needing further research. Fundamental and applied research will be planned and carried out. Fundamental research will be largely driven by availability of extramural funding sources and the peer review process associated with that funding.

Stakeholder feedback will be gathered at the level of the College, the department, specialties within departments, statewide extension programmatic areas, specific extension curricula, and specific extension events. Stakeholder groups will be asked, among other things, to identify new and emerging issues and additional stakeholders.

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

Focus on underserved populations will continue to be a specific goal of our extension and research programs. Assessment of underserved groups will continue to guide the program planning process. Programs that meet the needs of underserved groups across the state will be of continuing importance, and the issue of diversity will cross all planned program areas. We will regularly work with groups representing underserved and underrepresented populations. Below are some highlights:

- Cooperative Extension boards and committees will strive to represent respective county demographics. Minorities representing county populations, including Hispanics, African Americans, Asians, and other cultural groups, such as Anabaptists, will serve on these groups.

- We will continue to adapt curricula to accommodate extension programming for diverse audiences, including Spanish, Chinese, and perhaps other languages.
- The Pennsylvania Women's Agricultural Network (PA-WAgN) will support women in agriculture by providing positive learning environments, networking, and empowerment opportunities based on member needs. We will continue to study the adoption of conservation measures among women farmers.
 - We will continue to research food deserts and how to ameliorate them. Urban gardening and schoolyard gardening extension programs will teach about healthy foods, encourage healthy lifestyles, and donate produce to local food banks. We will continue to donate produce from some of our research plots to food banks.
 - Penn State's Young Grower Alliance (YGA) will continue to support more than 160 young people as they transition into careers as specialty crop growers. YGA, a multistate program, will offer education, support, and networking to young people interested in or just beginning their horticultural career. YGA will help with effective farmland transition planning and preservation.
 - We will continue to research effective ways to support grandparents raising their grandchildren and implement our findings through extension.
 - The Dining with Diabetes and Strong Women/Growing Stronger programs will target older Pennsylvanians who need help living with diabetes and including healthier eating and exercise in their lives.

The College has an active and all-inclusive diversity program that helps to ensure understanding and appreciation for diversity among all faculty, staff, and students. Our aim is to create an environment where differences are considered assets that make us better learners, teachers, scholars, researchers, extension educators, employees, students, and citizens.

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

Each planned program will include expected outcomes and impacts. Progress toward the anticipated outcomes will be guided by the program plans and will be reported under the respective program. Outcomes are expected on local, state, national, and international scales. Items for assessment include new relevant knowledge gained by clientele and resulting changes in action and condition, such as economic or environmental changes. Expected extension outcomes may include measures such as clientele's knowledge gain; anticipated and actual behavior changes of clientele; economic, social, and/or environmental impacts of those behavior changes; average cost savings from implementation of program suggestions; continued support for underrepresented audiences; jobs; new businesses created; or improvements in health and fitness, among other things.

Research-based outcomes may include new scientific knowledge generated, new technologies generated or significantly improved, new cultivars, new biomaterials, new beneficial reuses of wastes, environmental improvements, advancements toward new therapeutics, and economic improvements, among other things.

Outcomes will help us advance agriculture and food systems, develop the economy for biobased materials and products, improve community resilience and capacity, increase environmental resilience and global engagement, address integrated health solutions, and ensure a positive future for youth, families, and communities.

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 will occur through Cooperative Extension programming. Specific examples of this effectiveness are described in the planned programs sections of this Plan of Work and will be reported on in subsequent annual reports.

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 specifically with non-traditional groups
- Other (County Extension Boards)

Brief explanation.

College administration and faculty advisory groups will confer regularly with key stakeholder groups. The Penn State Ag Council (<http://agcouncil.cas.psu.edu>) will provide 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 will seek input for all sectors representing the interests of Pennsylvania citizens. In addition, college leadership will meet multiple times per year with individual stakeholder groups, such as the Pennsylvania Farm Bureau, PennAg Industries, Pennsylvania Forest Products Association, Pennsylvania Department of Agriculture, State Horticultural Association of Pennsylvania, etc.

Also in our stakeholder base are state and federal partners, with whom we will have regularly scheduled meetings. Examples include 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.

Listening sessions, such as routine meetings with the Penn State Agricultural Council, are held to seek input from the representative traditional and non-traditional stakeholders. The broad representation of the Penn State Agricultural Council is constantly reassessed to ensure that new and traditionally underserved audiences are included.

Targeted invitations to traditional and non-traditional stakeholder groups and/or individuals are used heavily in our extension efforts. Invitations are extended to these stakeholders and members of the general public to identify industry representatives and/or individuals that would formulate program advisory committees (e.g., Ag Business/Economic and Community Development Advisory Committee, Intergenerational Initiatives Advisory Group, StrongWomen program leaders, PROSPER program collaborators, etc.).

Surveys of traditional and non-traditional stakeholder groups and/or individuals are used to collect more detailed information from stakeholders. Sophisticated survey instruments and/or focus groups

meetings are implemented and the data collected are summarized.

Stakeholder input will be continually sought to help set the course for CES and AES programs. Our primary stakeholder input will be received through Cooperative Extension. More statewide extension programs are using retrospective evaluation to gather information about the number of participants who actually put into practice lessons learned through extension programs. Measuring costs averted or profit increased can show powerful, tangible benefits of our programming--the type of feedback that keeps people coming back for more information. The results of these assessments will be incorporated into our Extension Program SharePoint site and our Extension Program Activity System (EPAS).

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 External Focus Groups
- Other (External Consultants)

Brief explanation.

Advisory committees, such as program advisory committees at the county, district, and state extension team (SET) level and the University Industry Advisory Committee, will assist our programs with identification and selection of stakeholder individuals and groups. Program advisory committee members will be selected to represent program areas, emerging issues, geographic areas, and population diversity. These groups will 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.

External focus groups, such as the County Extension Boards, will be representative of demographics of the county/district in which they serve, and where appropriate, Hispanics, African Americans, Asians, Anabaptists, or other minorities serve on the groups and provide input to extension programs. Our programs will meet the needs of traditional agricultural information consumers (i.e., farmers, rural residents), as well as homeowners, newer audiences in urban areas, and, increasingly, those historically underserved by extension.

Penn State Ag Council meetings will be publicly announced, and broad representation will be constantly reassessed to ensure the inclusion of new and traditionally underserved audiences.

External consultants (i.e., Aspen Group, Fieldstone Innovations, etc.) have been contracted to assist in identifying industry stakeholders that can provide leveraging dollars and research opportunities for faculty, and help establish long-term working relationships.

Some extension programs, such as the Center for Private Forests, seek affiliate members and organizations as direct collaborators.

The reorganization of our college in 2013 from 12 departments into 9 presented new opportunities to engage or re-engage stakeholders and to fine-tune our stakeholder groups. It also afforded the opportunity to establish new stakeholder groups, such as the BioRenewable Systems Advisory Committee.

Maintaining contact with alumni is an important strategy throughout the College. This helps meet our students' needs for career networking, builds direct links to our stakeholder groups and industries, and increases the likelihood of leveraging funds in the future. Alumni and friends banquets and football tailgates are common throughout the College, and enjoy continuing high attendance.

Our faculty serve on dozens of state and federal government and professional association boards and groups. Their selection and election to these roles reflects their stature in their fields. They will continue this service.

2(B). A brief statement of the process that will be used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them

1. Methods for collecting Stakeholder Input

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

Brief explanation.

To collect stakeholder input, educators or faculty will hold regularly scheduled meetings, such as advisory groups and Penn State Agricultural Council. Meetings and/or surveys will occur with members of traditional or non-traditional groups, but all are viewed as stakeholders.

Individual meetings resulting from office visits, farm visits, etc. will allow stakeholders to provide feedback. During and after extension educational programs, participants may request additional programs or updates, or suggest new topics about which an educational program would be helpful. This input may be verbal only or collected in meeting survey instruments. Phone and email requests for information from county extension offices will be additional measures of clientele needs. If similar information is requested repeatedly, that is a sign that an issue is of concern to the public.

To collect more detailed information from traditional and non-traditional stakeholders, sophisticated survey instruments or focus group meetings will be implemented and the data collected will be summarized.

Our Ag Council delegates will assist us with identifying and prioritizing 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 will include questions addressing the expected impacts from all programs.

Most departments and extension programs will hold at least annual meetings with stakeholders to share updates and gather feedback. All departments and extension programs will maintain websites and distribute regular electronic and/or hard-copy communications and/or social media messages to stakeholders. These avenues will allow stakeholders to provide feedback on new developments. Many programs will hold regular field tours (e.g., pasture walks) and site tours, which allow them to see conditions on the ground and hear from stakeholders directly. The Department of Food Science will hold regular tours of food industry plants and sites to learn about real-life issues and challenges and to engage one-on-one with stakeholders.

The dean's industry tour series will bring some of the College's leaders into some of the state's largest agricultural industry facilities to learn about their challenges and about how Penn State researchers might help. A recent tour of the Utz Quality Foods, Inc., factory catalyzed a new research project helping them with food sensory evaluation.

Some extension offerings meet regulatory requirements, such as the ServSafe course for retail food service and restaurant managers. The fact that companies send employees to participate in these courses year after year indicates a degree of satisfaction with the value of the 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
- Other (how and where programs are offered)

Brief explanation.

Budget Process: Availability of funding from certain extramural funding sources will influence resource allocations.

To Identify Emerging Issues: Stakeholder feedback will help to identify emerging issues that would benefit from extension programming and/or research when multiple stakeholders indicate the same need.

Redirect Extension Programs: Information collected from stakeholders will continue to be used to adjust issue areas that determine Cooperative Extension programming. We will engage representatives of the Penn State Agricultural Council as key team members on our internal implementation teams. This will serve to inform our programs on the real-world demands for new information and programs.

Redirect Research Programs: Information collected from stakeholder groups, such as industry associations, will continue to be used to directly influence applied research

activity through local decisions about priorities. We will engage representatives of the Penn State Agricultural Council as key team members on our internal implementation teams. This will inform our programs on the real-world demands for new information and programs.

In the Staff Hiring Process: Information collected from stakeholders will continue to influence hiring decisions for faculty and extension educators to address unmet needs. Stakeholder feedback also indicates where volunteers and donors would be interested in assisting with programs and initiatives.

In the Action Plans: Our mission is to serve our stakeholders, so we will analyze the information gathered from stakeholders and adjust our action plans as needed to meet their needs.

To Set Priorities: Our stakeholders' priorities must be our priorities, and we will adjust our programs as needed.

Other - how and where programs are offered: Stakeholder input will directly impact how we offer our extension programs. Feedback has indicated that additional methods of program delivery are needed as demands for resources and/or time increase. As a result, educational opportunities will be explored and offered via other methods - podcasts, online webinars, synchronous and asynchronous means - migrating away from the traditional classroom setting. In addition, we anticipate that stakeholder input will help determine the locations and times that extension programs are offered. With the restructuring of extension into statewide efforts (previously county-based), stakeholder need will be a deciding factor on where the program is held.

V. Planned Program Table of Content

S. No.	PROGRAM NAME
1	Advanced Agricultural and Food Systems
2	Biologically Based Materials and Products
3	Community Resilience and Capacity
4	Environmental Resilience
5	Global Engagement
6	Integrated Health Solutions
7	Positive Future for Youth, Families, and Communities

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Advanced Agricultural and Food Systems

2. Brief summary about Planned Program

We are entering a new era in which decisions and actions taken within agricultural and food systems are affecting the nutritional quality of food as well as the ecological environment, with the most noticeable impacts on water quality and land use. As a result, society is increasingly demanding that agricultural and food systems activities be conducted in a socially and environmentally responsible manner.

The Pennsylvania agricultural system spans the farm-to-fork spectrum. The critical issues involve creation and dissemination of new knowledge that helps the industry capture more value-added aspects of commodities produced in the Commonwealth. New crops and plants with new traits that result in local adaptation, pest resistance, and improved nutritional and biomaterial characteristics are near-term needs. New knowledge to improve livestock production and reproduction, particularly in dairy and egg production, remains a high priority. These efforts will strengthen farm solvency and, thereby, the health of rural communities. The rise of the biofuels industry will expand the range of viable crops, but this will also increase competition for farmland. We are addressing, through partnership with industry, development of new products with enhanced nutritional values. The nation's pollinators are rapidly declining; Penn State has long been at the forefront of this issue and will remain so. Our scientists are also involved in efforts to efficiently address profit-slashing plant pests in an environmentally benign manner.

We are undergoing paradigm shifts in recognizing the roles of microbial functional and phylogenetic diversity in agricultural systems. Because of the inherently applied nature of agricultural research and managed systems, microbiome research can move from its current exploratory phase to knowledge that can solve problems that impact agricultural productivity, especially in plant productivity and health. The long-term goal of phytobiome work in the College is a comprehensive understanding of all living organisms in, on, and around plants to improve crop productivity. The initiative will translate basic research to identify new crop methods and systems, thereby informing efforts to double the production of safe and nutritious food, feed, and fiber.

Researchers in the College aim to transform practice in agricultural and food systems through research on productivity, sustainability, and adaptability. Development of cost-effective scale-adapted equipment to mechanize some of the labor-intensive aspects of farming, such as fruit harvesting, should improve farm productivity and reduce dependence on transient labor. Innovations such as these entail coupling the College's strong expertise in the fundamental agricultural sciences with engineering and precision technologies, economics, and social sciences. This work also includes the use of field-level geographic information systems (GIS) data with climate models to increase understanding of the interplay among human activity, agricultural production, and the environment. Research on new advanced agricultural solutions will be coupled with delivery through extension.

The diversity of the state's food and fiber systems, the mix of urban and rural landscapes, and the nonagricultural rural economy in gas drilling give Pennsylvania the potential to lead agricultural research and extension nationally for the coming decades by developing and implementing solid and creative solutions to the issues it faces.

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

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

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

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

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources	5%		5%	
102	Soil, Plant, Water, Nutrient Relationships	5%		5%	
111	Conservation and Efficient Use of Water	5%		5%	
123	Management and Sustainability of Forest Resources	5%		5%	
132	Weather and Climate	5%		5%	
201	Plant Genome, Genetics, and Genetic Mechanisms	5%		5%	
202	Plant Genetic Resources	5%		5%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	5%		5%	
204	Plant Product Quality and Utility (Preharvest)	5%		5%	
205	Plant Management Systems	5%		5%	
211	Insects, Mites, and Other Arthropods Affecting Plants	5%		5%	
212	Diseases and Nematodes Affecting Plants	5%		5%	
216	Integrated Pest Management Systems	5%		5%	
301	Reproductive Performance of Animals	5%		5%	
302	Nutrient Utilization in Animals	5%		5%	
306	Environmental Stress in Animals	5%		5%	
307	Animal Management Systems	5%		5%	
402	Engineering Systems and Equipment	5%		5%	
601	Economics of Agricultural Production and Farm Management	5%		5%	
602	Business Management, Finance, and Taxation	5%		5%	
	Total	100%		100%	

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

1. Situation and priorities

The 2012 Census of Agriculture showed that the market value of farm products produced in Pennsylvania was \$7.4 billion, up 27% over 2007, despite a 6% reduction in number of farms and a 1% reduction in number of acres in farms. Crop sales made up \$2.8 billion of that total (38%), and livestock accounted for \$4.6 billion (62%). Pennsylvania ranked in the top ten states for production of nursery, greenhouse, floriculture, and sod (4th); cut Christmas trees and short-rotation woody crops (4th); milk from cows (5th); tobacco (6th); horses, ponies, mules, burros, and donkeys (8th); and poultry and eggs (10th).

Pennsylvania's agricultural producers and processors face a dynamic environment subject to weather and climate locally and globally, global commodity markets, agricultural policies, environmental and food safety regulations, changing markets, changing population base and product demand, changing land uses, and increasing interest in organic and locally and/or sustainably produced products. Faculty and staff of the Penn State College of Agricultural Sciences are eminently prepared to help producers of all kinds and operation sizes conduct their businesses in the most economical, efficient, safe, and environmentally friendly way possible.

Research and extension priorities will include:

- pest and pathogen prediction and response
- furthering our understanding of chemical ecology so as to expand use of pheromone trapping
- development of and education in use of predictive disease models to reduce pesticide use or convert to nonchemical biological controls
 - studies of the spatial and temporal dynamics of plant pathogens that reduce productivity of agricultural systems and the biological, chemical, and environmental factors that affect pathogen movement and disease development locally, regionally, and globally
 - developing sustainable plant disease management strategies for agricultural crops and native ecosystems
 - breeding plants for resistance to disease
 - field testing new disease-tolerant plant genotypes propagated from tissue culture for tolerance to important diseases
 - plant-herbivore interactions
 - studying the phytobiome to improve crop productivity
 - study of microbial communities sustaining agricultural crops and natural ecosystems and influencing human health and food safety
 - agricultural production and processing, and natural resource engineering
 - intelligent controls, precision agriculture, agricultural safety and health, and specialty crops mechanization
 - harvest logistics and technologies
 - sustainable crop production, including sustainable dairy cropping systems, no-till and conservation cropping systems, legumes, green manure and cover crops, alternative weed management, and forage management for grass-fed livestock and human health
 - study of how climate change may affect agriculture
 - extension programs in forage crops, tree fruit and grapes, vegetable and berry crops, green industry, consumer horticulture, soils, dairy, and poultry, among others
 - research commercialization and industry engagement.

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

- Agricultural production can be politically sensitive, and programs need to be adaptable to changing interests and opportunities.
- Our stakeholders and the progression of scientific knowledge drive this program's priorities and issues.
- The topics in this planned program require multistate, multidisciplinary, and collaborative research and extension efforts.
- This planned program encompasses the full range of activities required for successful and sustainable agricultural production.
- The planned program is supported through research and extension.
- Society needs the information generated and shared through this planned program to continue to sustainably supply sufficient food, feed, and fiber for the growing world population.
- The consumer call for organic agricultural production will continue to increase.
- The consumer call for locally grown/raised and/or sustainably produced products will increase.
- The consumer call for animal products raised in less confinement and more natural settings will increase.
- Environmental and food safety regulations relevant to agriculture will increase.
- Pollinator populations will continue to be stressed for the foreseeable future.
- Increased efficiency can improve profitability of many agricultural and natural resource businesses.
- The price that producers earn for some agricultural products will not keep pace with costs of production.
- There is room to grow in the market for agricultural and natural resource goods and services through the development of new products and the exploitation of niches.
- Agricultural and natural resource businesses need to carefully manage labor inputs to help ensure efficient operation.
- Most people, including growers, producers, and managers of agricultural and natural resource companies, may not completely understand the impacts their actions have on the environment, or the implications of or opportunities stemming from environmental regulations and programs.
- We need a more complete understanding of best management practices and ways to meet both production and environmental objectives.
- People will be motivated to learn/change.
- External funds and agents can serve as catalysts for change.
- Staff can be recruited and hired with necessary skills and abilities.
- Education leads to changes in farm practices.
- The global economy, global political stability, and water scarcity will play increasing roles in agricultural production and product distribution.
- 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.

- Base federal funding will continue in support of research and staff on this program.
- Extramural funds will be obtained to support this program, using the base federal funding as leverage.

2. Ultimate goal(s) of this Program

- Help Pennsylvania farmers produce high quality food and fiber products in an economically and environmentally advantageous way.
- Increase international market share for Pennsylvania food and fiber products.
- Increase farming profitability through increased yields or efficiencies, mechanization, new products, or reduced costs.
 - Accurately predict pest problems and provide efficient and effective treatment recommendations.
 - Sustainably manage crop diseases.
 - Help prepare Pennsylvania agriculture for expected climate change.
 - Provide information to the food and fiber sector to enable them to make informed decisions.
 - Provide policy-makers with science-based recommendations for regulations and best practices related to agriculture and the environment.
 - Provide leadership and/or participate in regional, national, and international research and 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
2017	24.7	0.0	20.5	0.0
2018	24.7	0.0	20.5	0.0
2019	24.7	0.0	20.5	0.0
2020	24.7	0.0	20.5	0.0
2021	24.7	0.0	20.5	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

The Penn State College of Agricultural Sciences will conduct research activities that can be translated into solutions for crop and livestock production systems in laboratories, multiple field sites, and research stations in Pennsylvania, throughout the region, nationally, and internationally. All research laboratories, farms, and sites will be improved over time as program needs necessitate and resources allow.

Our faculty and staff will conduct appropriate levels of extension, education, and engagement work with stakeholders and colleagues at all levels. Extension programs will be developed and delivered based on need. Campus-based and county-based experts will collaborate to assess need for, plan, develop, implement, and evaluate relevant extension programming that brings about measurable enhancements. Extension work will be closely tied to research results, to transfer the latest information in a given field to on-the-ground practitioners.

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 (Webinars) 	<ul style="list-style-type: none"> ● Newsletters ● TV Media Programs ● eXtension web sites ● Web sites other than eXtension ● Other 1 (On-Line Videos) ● Other 2 (Publications and Guides)

3. Description of targeted audience

- agricultural producers/farmers/landowners
- agriculture services/businesses
- nonprofit associations/organizations
- business and industry
- community groups
- education
- general public
- government personnel
- human service providers
- local, regional, state, and federal agencies
- military
- non-governmental organizations
- nonprofit associations/organizations
- policy makers
- special populations (at-risk and underserved audiences)
- students/youth
- USDA
- volunteers/extension leaders

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 participants in extension education classes and workshops.
 - Number of technology disclosures involving college faculty, staff, extension educators, and students.
- 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	New crop varieties or lines.
2	Improved efficiency of operation for livestock producers.
3	Average cost savings from implementation of program suggestions.
4	Greater understanding of the biology of an invasive pest and/or new strategy for combating.
5	Cost savings from more efficient use of pesticide and/or herbicide.
6	Enhanced knowledge to address the pollinator crisis.
7	Innovation in farm machinery to increase efficiency and reduce labor costs.
8	Improved understanding of agricultural change expected with climate change.

Outcome # 1

1. Outcome Target

New crop varieties or lines.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms
- 202 - Plant Genetic Resources
- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants
- 204 - Plant Product Quality and Utility (Preharvest)

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 2

1. Outcome Target

Improved efficiency of operation for livestock producers.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 301 - Reproductive Performance of Animals
- 302 - Nutrient Utilization in Animals
- 307 - Animal Management Systems

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 3

1. Outcome Target

Average cost savings from implementation of program suggestions.

2. Outcome Type : Change in Condition Outcome Measure

3. Associated Knowledge Area(s)

- 601 - Economics of Agricultural Production and Farm Management
- 602 - Business Management, Finance, and Taxation

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 4

1. Outcome Target

Greater understanding of the biology of an invasive pest and/or new strategy for combating.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 216 - Integrated Pest Management Systems

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 5

1. Outcome Target

Cost savings from more efficient use of pesticide and/or herbicide.

2. Outcome Type : Change in Condition Outcome Measure

3. Associated Knowledge Area(s)

- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Diseases and Nematodes Affecting Plants
- 216 - Integrated Pest Management Systems
- 601 - Economics of Agricultural Production and Farm Management

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 6

1. Outcome Target

Enhanced knowledge to address the pollinator crisis.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 301 - Reproductive Performance of Animals
- 306 - Environmental Stress in Animals

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 7

1. Outcome Target

Innovation in farm machinery to increase efficiency and reduce labor costs.

2. Outcome Type : Change in Condition Outcome Measure

3. Associated Knowledge Area(s)

- 205 - Plant Management Systems
- 307 - Animal Management Systems
- 402 - Engineering Systems and Equipment
- 601 - Economics of Agricultural Production and Farm Management

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 8

1. Outcome Target

Improved understanding of agricultural change expected with climate change.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 101 - Appraisal of Soil Resources
- 102 - Soil, Plant, Water, Nutrient Relationships
- 111 - Conservation and Efficient Use of Water
- 123 - Management and Sustainability of Forest Resources
- 132 - Weather and Climate
- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Natural Disasters (drought, weather extremes, etc.)
- 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

Probably no industry is more affected by adverse factors than production agriculture. Weather extremes and anomalies dramatically affect plant and insect health. 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 used by Pennsylvania agriculture producers. Market fluctuations are also affected by political factors, consumer demand, societal influences, and production methods. Farm profitability is influenced by the price of farm inputs, such as the price of oil. Governmental and other political regulations locally, nationally, and internationally affect market share for Pennsylvania producers. Understanding the global influences on markets for commodities produced and used by Pennsylvania

producers can help reduce risk and ultimately improve profitability for producers. Growing demand for organic foods, locally or regionally produced foods, and meats produced in more "natural" settings affects farm management decisions and research and extension programming. Financial support from local, state, and national public sources is under increasing scrutiny. Support levels are stagnant, decreasing, or in rare instances, increasing.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Extension administration requests State Extension Teams (SET) to establish evaluation tools and collect impact data. This information will be reported through the Extension Program Activity System (EPAS) or collected on SharePoint. Each program team will use its own set of evaluation tools for program assessment. In addition, each SET will continue to establish or involve their respective external advisory team as a direct method of assessing whether the educational programs are on target and meeting the industry or audience needs. Customer satisfaction and needs assessment instruments (Salesforce and Atlas) will be implemented and will provide feedback on the quality and value that our programs provide.

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Biologically Based Materials and Products

2. Brief summary about Planned Program

The demand for biorenewable resources--materials made from living organisms, often converted into value-added products--continues to rise as a result of the need to reduce our dependency on fossil fuels.

Pennsylvania is heavily forested. This positions the state to compete effectively in emerging bioenergy development, as does the state's climatic and geographic suitability for growing a variety of emerging biofuels crops such as switchgrass. Renewable energy resources, especially biomass sources, are gaining a foothold in Pennsylvania, and we will continue to support these efforts, along with a focus on other biologically based materials and products. These efforts may identify new opportunities to turn agricultural waste into revenue-generating products and improve agricultural operations' bottom lines.

Biopolymers, such as cellulose, hemicellulose, pectin, starch, chitin, gelatin, collagen, and lignin, are chemical compounds produced by plants, animals, fungi, algae, and bacteria. They have amazing properties that can provide us with new materials science and engineering principles and allow the development of improved sustainable materials. Biomaterials work in our college will include a focus on multifunctional polysaccharide composites for many applications, including sustainable packaging; formaldehyde-free composites for the building industry; materials for healthcare, such as foams to stop blood flow and scaffolds for tissue regeneration; and food products. Virtually all of the materials studied are food polysaccharides for which water is the solvent, so these biochemicals are not only sustainable and safe, but also edible.

Nanocellulose is a new sustainable material expected to be a foundational bioproduct for countless commercial products ranging from improved polymer automotive body panels and next-generation batteries to cosmetic formulations and drug-delivery compositions. Our work here will focus on producing crystalline nanocellulose fibers with controlled size, crystallinity, and mechanical properties, as well as surface characteristics that permit their incorporation into industry-standard polymers.

Researchers will also explore improved manufacturing processes, wood composites with a focus on adhesives, chemistry of wood biopolymers, chemical treatments of wood, and lignin formation and lignin-protein interactions. Lignin is an important byproduct of cellulosic biofuel production for which researchers are seeking beneficial reuse alternatives.

Also of interest to researchers in the College are novel and advantageous ways of producing novel biomaterials in living organisms. A team of researchers is focused on developing design methods for rationally engineering biological organisms to produce novel or useful compounds. They are quantifying the rules by which organisms decode their DNA and execute complex functions, creating biophysical models of gene expression, regulation, and system function. They are using these models and methods to engineer new biochemical pathways and to better understand how and why natural systems behave as they do.

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

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

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

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

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources	7%		7%	
102	Soil, Plant, Water, Nutrient Relationships	8%		7%	
111	Conservation and Efficient Use of Water	7%		7%	
123	Management and Sustainability of Forest Resources	8%		8%	
125	Agroforestry	7%		7%	
131	Alternative Uses of Land	7%		7%	
132	Weather and Climate	6%		7%	
133	Pollution Prevention and Mitigation	7%		7%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	7%		7%	
206	Basic Plant Biology	5%		7%	
402	Engineering Systems and Equipment	8%		7%	
403	Waste Disposal, Recycling, and Reuse	7%		7%	
404	Instrumentation and Control Systems	8%		7%	
511	New and Improved Non-Food Products and Processes	8%		8%	
	Total	100%		100%	

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

1. Situation and priorities

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 been updated to include advanced biofuels from a wider array of feedstocks and processing technologies.

Lesser known biofuels are also gaining a foothold nationally and in Pennsylvania. A priority in this planned program is to identify the most effective and efficient growing, harvesting, transportation, storage, processing, and marketing systems for these emerging crops, which include switchgrass, willow, and

others. To be economically competitive and sustainable as a viable fuel source, they must be produced with almost equivalent efficiency as the leading fuel sources today.

Researchers in the College have significant expertise in biorenewable resources, or materials made from living organisms, often converted into value-added products. In particular, they have strengths in biomass improvement and utilization, and plant and microbial genetics and biotechnology. Products incorporating biochemicals may become more important to the economy than biofuels do.

Research and extension priorities will include:

- studying efficient growth, harvesting, processing, storage, and transport of various biofuel materials
- modeling metabolic pathways for improvements of bioproducts
- identifying new potential biofuels
- developing a range of bioproducts, mainly from plant-based polysaccharides
- removing and replacing toxins with biomaterials
- replacing petroleum derivatives with green materials and composites
- genetically engineering trees for improved conversion to biofuel
- optimizing fermentation processes
- using animal, human, and industrial wastes in economically valued ways
- research commercialization and industry engagement.

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

- The economics of biomaterials are challenging because most producers want biomaterials to be less expensive than the conventional materials they propose to replace.
- Consumer demand for more environmentally benign products is growing.
- 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.
- There will be continued support for efforts to make beneficial use of agricultural waste products.
- The development and marketing of biobased fuels and byproducts will affect crop prices and the costs associated with livestock production.
- The development of the Marcellus and Utica shale gas fields creates new and changing demands for research and extension programming.
- This program is required if new commercialized products are to emerge.
- Work in this planned program can help the U.S. and other countries move toward energy independence.

- Our stakeholders and the progression of scientific knowledge drive this program's priorities and issues.
- The topics in this planned program require multidisciplinary and collaborative research and extension efforts.
- Society needs the information generated and shared through this planned program to continue to sustainably meet the growing world population's need for new and improved chemicals and other biomaterials.
- Environmental regulations relevant to this program will increase.
- Increased efficiency can improve profitability of many biologically based materials and products businesses.
- There is room to grow in the market for biologically based materials and products through the development of new products and the exploitation of niches.
- People will be motivated to learn/change.
- External funds and agents can serve as catalysts for change.
- Staff can be recruited and hired with necessary skills and abilities.
- The global economy, global political stability, and water scarcity will play increasing roles in agricultural production and product distribution.
- Base federal funding will continue in support of research and staff on this program.
- Extramural funds will be obtained to support this program, using the base federal funding as leverage

2. Ultimate goal(s) of this Program

- Remove and replace toxins, such as those found in pesticides, with biobased substances that are safe for the environment and for human health.
- Replace petroleum derivatives with green materials and composites.
- Genetically engineer trees for improved conversion to biofuel.
- Discover economically valued uses for agricultural and industrial wastes.
- Maximize the efficiency of growing, harvesting, transporting, storing, and processing biofuels.
- Provide appropriate extension and outreach in these areas.
- Provide leadership and/or participate in regional, national, and international research and 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
2017	11.9	0.0	1.9	0.0
2018	11.9	0.0	1.9	0.0
2019	11.9	0.0	1.9	0.0
2020	11.9	0.0	1.9	0.0
2021	11.9	0.0	1.9	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

The Penn State College of Agricultural Sciences will conduct research activities that can be translated into solutions for biologically based materials and products in laboratories, multiple field sites, and research stations in Pennsylvania, around the region, nationally, and internationally, and sometimes with industrial partners. All research laboratories, farms, and sites will be improved over time as program needs necessitate and resources allow.

Our faculty and staff will conduct appropriate levels of extension, education, and engagement work with stakeholders and colleagues at all levels. Extension programs will be developed and delivered based on need. Campus-based and county-based experts will collaborate to assess need for, plan, develop, implement, and evaluate relevant extension programming that brings about measurable enhancements. Extension work will be closely tied to research results, to transfer the latest information in a given field to on-the-ground practitioners.

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 (Webinars) 	<ul style="list-style-type: none"> ● Newsletters ● TV Media Programs ● eXtension web sites ● Web sites other than eXtension ● Other 1 (On-line Videos) ● Other 2 (Publications and Guides)

3. Description of targeted audience

- agricultural producers/farmers/landowners
- agriculture services/businesses
- nonprofit associations/organizations
- business and industry
- community groups
- education
- general public
- government personnel
- local, regional, state, and federal agencies
- military
- non-governmental organizations
- nonprofit associations/organizations
- policy makers
- students/youth
- USDA
- volunteers/extension leaders

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 participants in extension education classes and workshops.
 - Number of technology disclosures involving college faculty, staff, extension educators, and students.
- 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	Increased knowledge about a biologically based product or chemical or a novel biologically based product or chemical.
2	New or improved use for agricultural waste product.

Outcome # 1

1. Outcome Target

Increased knowledge about a biologically based product or chemical or a novel biologically based product or chemical.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 125 - Agroforestry
- 131 - Alternative Uses of Land
- 133 - Pollution Prevention and Mitigation
- 206 - Basic Plant Biology

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

New or improved use for agricultural waste product.

2. Outcome Type : Change in Condition Outcome Measure

3. Associated Knowledge Area(s)

- 402 - Engineering Systems and Equipment
- 403 - Waste Disposal, Recycling, and Reuse
- 511 - New and Improved Non-Food Products and Processes

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

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
- Other (Extramural Funding)

Description

Weather extremes and anomalies dramatically affect biofuel crop 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, but weather affecting crop production in distant parts of the world influences market prices for products and commodities produced and used by Pennsylvania agriculture producers. Global oil supply, demand, and pricing can be volatile and greatly affects the viability of alternative fuel sources. Political factors, consumer demand, societal influences, and production methods also affect market fluctuations. Governmental and other political regulations locally, nationally, and internationally affect market share and economic viability for Pennsylvania producers. Public interest in biofuels and biobased products is tied closely to the economy and public policy, and development is a function of tax, subsidy, and environmental policy. Increases in economic activity and energy prices could greatly increase interest in the development of these resources. Changes in any policy often require subsequent interpretation and education and create opportunities for engagement through extension and for research on energy policy, which is a strength of the College.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Extension administration requests State Extension Teams (SET) to establish evaluation tools and collect impact data. This information will be reported through the Extension Program Activity System (EPAS) or collected on SharePoint. Each program team will use its own set of evaluation tools for program assessment. In addition, each SET will continue to establish or involve their respective external advisory team as a direct method of assessing whether the educational programs are on target and meeting the industry or audience needs. Customer satisfaction and needs assessment instruments (Salesforce and Atlas) will be implemented and will provide feedback on the quality and value that our programs provide.

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Community Resilience and Capacity

2. Brief summary about Planned Program

This planned program will involve helping communities improve their economic resilience, create sustainable infrastructures, and promote their local economy through value-added opportunities and new business development. One avenue of research involves analyzing the adoption and diffusion of new agricultural technologies; assessing physical, economic, and institutional barriers to adoption; and evaluating policies intended to overcome these barriers.

A major focus in rural Pennsylvania will be to help the region adapt to and thrive with natural gas extraction from Marcellus shale deposits. Our joint research-extension enterprise will develop new programs to meet continuing needs in mineral management, gas utilization, and global implications of shale energy. The team continues to work with local and international governments and with leaseholders and citizens to address issues arising from natural gas drilling, including royalties management, road and pipeline siting and maintenance, and water quality. This program will maintain its national and international reputation for providing an unbiased introduction to the opportunities and challenges surrounding shale gas development. The team partnered with twelve countries on six continents in the last program year, including indigenous groups on four continents.

Another team analyzed the impacts of Marcellus shale natural gas drilling on hotel revenues, studied the challenges and opportunities that come to local governments with Marcellus drilling, and evaluated the impacts of the natural gas boom on employment patterns. They also assessed the economic resilience of counties nationwide in the wake of the Great Recession. Other research analyzed the effects of the Las Vegas foreclosure crisis on quality of life.

The Penn State College of Agricultural Sciences has a distinguished history of scholarship that addresses the social, demographic, economic, and policy issues facing communities and their members. It also has addressed how human activity intersects with natural and agricultural systems. Broad research themes will include agriculture and food; communication and educational methods; community wellness and civic engagement; community, regional, and international development; environment and natural resources; international agriculture and diversity; leadership across the generations; and population processes and change.

Agritourism is a growing part of earnings for many farms. A team identified factors that make people more likely to participate in wine-tasting tourism. They also assessed the impacts of wine bottle labeling and profiled the preferences of wine drinkers.

The USDA AFRI-supported Northeast Regional Center for Rural Development helps Northeast individuals and communities understand the impacts of local and regional food systems and how to best capitalize on their potential benefits. A body of research involves estimating organic premiums for retail food. A related line of research is examining transitions to sustainability in the food supply chain, or "what happens when Walmart goes local?"

Extension will support this major topic area through leadership training, economic and community development, and entrepreneurship programs. Communities extend beyond the town or city boundary into the surrounding countryside. Therefore, agricultural businesses are a part of the community fabric and

contribute to their economic vitality. Efforts in advanced agriculture and biologically based materials and products may help farmers' bottom lines, thereby shoring up rural economies. Extension programs such as successful grant writing for nonprofits and local governments, and a workshop for people considering running for local office build local capacity.

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

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

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

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

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
131	Alternative Uses of Land	5%		10%	
601	Economics of Agricultural Production and Farm Management	10%		10%	
602	Business Management, Finance, and Taxation	10%		8%	
605	Natural Resource and Environmental Economics	10%		11%	
607	Consumer Economics	10%		10%	
608	Community Resource Planning and Development	15%		10%	
609	Economic Theory and Methods	10%		10%	
610	Domestic Policy Analysis	10%		11%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	10%		10%	
805	Community Institutions and Social Services	10%		10%	
	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 increasing. The Marcellus and Utica shale gas fields are bringing new financial resources into the state and new pressures that potentially affect the well-being of communities. Pennsylvania communities need help finding new ways to generate a local economy and develop the capacity for local governance.

As the human landscape changes within the state, our civic structure struggles to cope. State and local governments need research and advice on how to adapt regulations and policies to new situations. They

also need help dealing with the stresses 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 for job training. The need for research-based programs that have a positive influence on community vitality is great.

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.

Community resilience stems from the ability of communities and their residents to survive and thrive in the face of social, demographic, economic, and environmental changes. Resilience and sustainability are determined at the intersection of human and natural systems and require that humans recognize the interdependence of these systems to achieve sustainability. Community leaders and residents need to be prepared to engage issues and change behaviors that threaten sustainability.

Research and extension priorities will include:

- mineral management, gas utilization, and global implications of shale gas energy
- development and adoption of new theories, analytical methods, and strategies to address the issues facing the food system, including food insecurity and food deserts
 - women and minorities in farming
 - trade agreements
 - identifying healthcare disparities among minorities; consequences of economic restructuring, rural revitalization, policy design and analysis, and the linkages between sustainable development strategies and land use
 - economic and social impacts of land use change; impacts of globalization and cultural issues on food, agricultural, and community systems, as well as the transfer of knowledge, ideas, and practices in other countries; study of migration patterns
 - effective leadership programming for both youth and adults; the association between individual and community welfare
 - assessing potential economic impacts of various climate change scenarios on components of natural ecosystems, such as wildfires, coral reefs, and freshwater fish
 - research commercialization and industry engagement

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

- Natural gas production can be politically sensitive, and programs need to be adaptable to changing interests and opportunities.
- Our stakeholders and the progression of scientific knowledge drive this program's priorities and issues.
- The topics in this planned program require multidisciplinary and collaborative research and extension efforts.
- The planned program is supported through research and extension.
- Society needs the information generated and shared through this planned program if we are to maintain strong communities and strong, diverse economies.
- Communities can form coalitions to address problems.
- The nature of Pennsylvania communities will continue to shift, creating more rural-urban interfaces, with the problems and opportunities that they bring.
- Marcellus and Utica shale development will continue in the state, and our programs will evolve to meet the needs of clientele.
- The wealth generated by the extraction of these resources will be uneven across the general population, creating conflicts between the haves and have-nots.
- Environmental regulations relevant to this planned program will increase.
- Increased efficiency can improve profitability of many agricultural and natural resource businesses and communities.
- The price that producers earn for some agricultural products will not keep pace with costs of production.
- There is room to grow in the market for agricultural and natural resource goods and services through the development of new products and the exploitation of niches.
- Agricultural and natural resource businesses need to carefully manage labor inputs to help ensure efficient operation.
- Most people in local government may not completely understand the impacts of their communities' decisions on the environment, or the implications of or opportunities stemming from environmental regulations and programs.
- People will be motivated to learn/change.
- External funds and agents can serve as catalysts for change.
- Staff can be recruited and hired with necessary skills and abilities.
- Education and information leads to changes in behavior.
- The global economy and global political stability will play increasing roles in natural gas production and distribution.
- Base federal funding will continue in support of research and staff on this program.
- Extramural funds will be obtained to support this program, using the base federal funding as leverage.

2. Ultimate goal(s) of this Program

- Help Pennsylvania communities develop stronger and more sustainable economic systems, thereby helping individual citizens enjoy more fulfilling lives.
- Reverse trends of declining intercity infrastructure, expanding urban areas that outpace our population growth rate, declining job opportunities, and youth migration out of the state by improving community economic resilience.
- Reverse the trend of farm losses due to lack of profitability.
- Help society develop sustainable energy resources.
- Provide a voice in the science-based development of effective state and local policies related to energy resources.
- Create through our educational programs an informed clientele who make informed decisions

regarding energy development, leading to a more sustainable future for our state and nation.

- Provide policy-makers with science-based recommendations for community and environmental planning.
- Provide leadership and/or participate in regional, national, and international research and 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
2017	2.9	0.0	3.6	0.0
2018	2.9	0.0	3.6	0.0
2019	2.9	0.0	3.6	0.0
2020	2.9	0.0	3.6	0.0
2021	2.9	0.0	3.6	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

The Penn State College of Agricultural Sciences will conduct research activities that can be translated into solutions for community resilience and capacity in community settings throughout Pennsylvania, the region, nationally, and internationally. Research and extension work will build capacity for local governance and in the local economy. The work will help create resilient, vibrant, and collaborative communities that can address challenges and seize opportunities.

Our faculty and staff will conduct appropriate levels of extension, education, and engagement work with stakeholders and colleagues at all levels. Extension programs will be developed and delivered based on need. Campus-based and county-based experts will collaborate to assess need for, plan, develop, implement, and evaluate relevant extension programming that brings about measurable enhancements. Extension work will be closely tied to research results, to transfer the latest information in a given field to on-the-ground practitioners.

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

Extension

Direct Methods	Indirect Methods
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<ul style="list-style-type: none">● Education Class● Workshop● Group Discussion● One-on-One Intervention● Demonstrations● Other 1 (Webinars)	<ul style="list-style-type: none">● Newsletters● TV Media Programs● eXtension web sites● Web sites other than eXtension● Other 1 (On-Line Videos)● Other 2 (Publications and Guides)
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3. Description of targeted audience

- agricultural producers/farmers/landowners
- agriculture services/businesses
- nonprofit associations/organizations
- business and industry
- community groups
- education
- general public
- government personnel
- human service providers
- local, regional, state, and federal agencies
- military
- non-governmental organizations
- nonprofit associations/organizations
- policy makers
- special populations (at-risk and underserved audiences)
- students/youth
- USDA
- volunteers/extension leaders

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 participants in extension education classes and workshops.
- Number of technology disclosures involving college faculty, staff, extension educators, and students.
- 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	Average cost savings from implementation of program suggestions.
2	Number of new and beginning farmers assisted.
3	Number of farms helped to implement added-value opportunities.

Outcome # 1

1. Outcome Target

Average cost savings from implementation of program suggestions.

2. Outcome Type : Change in Condition Outcome Measure

3. Associated Knowledge Area(s)

- 601 - Economics of Agricultural Production and Farm Management
- 602 - Business Management, Finance, and Taxation
- 605 - Natural Resource and Environmental Economics
- 608 - Community Resource Planning and Development
- 610 - Domestic Policy Analysis

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 2

1. Outcome Target

Number of new and beginning farmers assisted.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 131 - Alternative Uses of Land
- 601 - Economics of Agricultural Production and Farm Management
- 803 - Sociological and Technological Change Affecting Individuals, Families, and Communities

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 3

1. Outcome Target

Number of farms helped to implement added-value opportunities.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 601 - Economics of Agricultural Production and Farm Management
- 607 - Consumer Economics
- 609 - Economic Theory and Methods

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 economic and community development. Natural disasters such as flooding can severely hamper communities' ability to function, govern, and create the products and services that provide necessary revenues under normal circumstances. This is an area where public policy and regulations can influence the research needs and the delivery of research results to stakeholders through 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 affect recruiting and retention of AES and CES personnel.

The evolution in natural gas development affects workforce and business development, infrastructure, public policy, and regulatory protocols, and thus has implications for local, state, national, and international economics. A rapidly shifting and historic sourcing of energy globally has affected educational programming needs in local communities in the Commonwealth, as well as around the world. Changes in governmental regulations require education on related impacts. The perception of extramural funding from industry continues as a sensitive issue and is leading our team to successfully seek new revenue streams to fund programmatic efforts and the associated staff. It has also led to new outreach on topics such as shale energy utilization, "social license," and the nexus of outreach and social media as stakeholder groups and their educational interests change

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Extension administration requests State Extension Teams (SET) to establish evaluation tools and collect impact data. This information will be reported through the Extension Program Activity System (EPAS) or collected on SharePoint. Each program team will use its own set of evaluation tools for program assessment. In addition, each SET will continue to establish or involve their respective external advisory team as a direct method of assessing whether the educational programs are on target and meeting the industry or audience needs. Customer satisfaction and needs assessment instruments (Salesforce and Atlas) will be implemented and will provide feedback on the quality and value that our programs provide.

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Environmental Resilience

2. Brief summary about Planned Program

Humans are changing the environment at an unprecedented rate, by introducing chemicals into ecosystems, polluting freshwater supplies, altering the climate, fragmenting forests, changing the balance among animal species, and other land-use practices. Providing innovative solutions to enhance and protect managed and natural ecosystems, ecosystem services, and human health and well-being is a major focus of researchers in the College.

Agriculture is both a provider and a consumer of ecosystem services. As such, we need to know more about how agriculture influences and is influenced by the surrounding landscape. Our research will increasingly focus on landscape-scale modeling of ecosystem processes such as wildfire and nutrient cycling. Agricultural landscapes are key determinants of water quality. With climate change, we expect more extremes in storm water runoff. Our research will address improved management of the quality and volume of runoff from agricultural landscapes, and how to protect the ecosystems that this runoff affects. The Food Safety Modernization Act and Good Agricultural Practices are creating demand for training on agricultural water quality issues. The watershed education team will continue to develop new programming to meet this need.

The issue of agricultural nutrients is a "systems" problem with solutions that require mutually reinforcing technologies, management strategies, policies, and market demand. The college will continue to develop innovative approaches to reduce nutrient pollution from agricultural and mixed-used watersheds in the Chesapeake Bay basin. By coupling satellite data with agricultural, hydrological, and socioeconomic models, and applying our expertise in communication and behavioral sciences, we will work to optimize farming practices and landscape management, rationalize government incentives and private investment, and build decision tools that provide farmers and policymakers with clear, practical choices.

Agricultural and other ecosystems must adapt to a changing climate. Consequently, with leveraged funding from a U.S. Department of Energy grant, researchers will engage in application-driven research to develop multi-model, multi-sector, multi-scale frameworks that assess impacts on energy-water-land from climate change-induced alterations in temperature, precipitation, and extreme climate events, and investigate how climate change will affect various ecosystems and how information can be shared across different scales. Other climate change research will examine food and water scarcity, as well as animal agriculture's contribution to greenhouse gas emissions. A changing climate and increasing globalization are increasing our vulnerability to invasive pests. Integrated pest management research in the college takes a systemic approach of preventing pest outbreaks and damage through biological control, habitat manipulation, best practices in plant/crop culture, and the use of resistant plant varieties. IPM improves environmental resilience by reducing the use of pesticides, herbicides, and fertilizers in agriculture.

Extraction of natural gas from the Marcellus shale benefits rural Pennsylvania economies, but can strain environmental resources. Penn State Extension's team of more than 40 county-based educators and faculty will continue to assess and address water and air quality, noise pollution, and other environmental impacts of natural gas extraction.

Other environmental resilience topics will include human dimensions of resource management; forest health and fragmentation; soil health; biogeochemistry; fish and wildlife biology and ecology; land use

impacts on water and forests; and minimizing the effects of livestock production on the environment.

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

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

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

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

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources	11%		10%	
102	Soil, Plant, Water, Nutrient Relationships	13%		10%	
111	Conservation and Efficient Use of Water	12%		12%	
112	Watershed Protection and Management	12%		11%	
121	Management of Range Resources	5%		5%	
123	Management and Sustainability of Forest Resources	15%		15%	
132	Weather and Climate	10%		15%	
133	Pollution Prevention and Mitigation	10%		11%	
136	Conservation of Biological Diversity	12%		11%	
	Total	100%		100%	

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

1. Situation and priorities

Human, community, and environmental health are directly affected by availability and quality of water and land worldwide. Water will most likely be the main factor limiting food production sufficient to feed the world's population. The utilization of water and land for growing crops, while concurrently protecting the water from nutrient runoff and hormone and pharmaceutical contamination, and the land from sediment loss and nutrient depletion, are challenges for which the College has a broad range of expertise. Competition for land and water is becoming increasingly intense due to population and economic growth, among other factors. Climate change will amplify these effects, and development of new supplies and water-saving technologies and institutions will become priorities. This links in many ways to advanced agricultural systems and to social policies and institutions to address these issues and thus requires the integration of knowledge from every department in the College. Our scientists examine the ability of natural systems to recover from disturbances and to tolerate or adapt to changing climate. In addition, members of the College work to improve our understanding of the risks facing both natural and managed systems as a result of global change factors, such as climate change, land-use change, and nutrient pollution.

Researchers in the College of Agricultural Sciences are investigating ecosystem resilience--the ability of a natural system to respond to a disturbance by resisting damage and recovering quickly--as well as the factors that affect resilience, such as invasive insects.

Research and extension priorities will include:

- finding solutions to vexing problems of water quality and quantity from an engineering perspective
- agricultural water quality to meet new food safety requirements
- the safety of private drinking water systems
- statewide air quality monitoring
- assessing risks, public perceptions, and management issues arising from environmental disasters
- evaluating economic efficiency, social equity, and environmental sustainability in the face of impacts on human and ecosystem well-being
- forest and soil health and monitoring
- fish and wildlife biology and ecology
- the effects of climate change on various ecosystems, and ways to mitigate and adapt to climate change
- reducing the effects of livestock production on the environment
- integrated pest management
- biologically based insect control
- invasive species effects and control
- mitigating the environmental effects of shale gas development.

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

- Environmental topics are politically sensitive, and programs need to be adaptable to changing interests and opportunities.
- Our stakeholders and the progression of scientific knowledge drive this program's priorities and issues.
- The topics in this planned program require multistate, multidisciplinary, and collaborative research and extension efforts.
- This planned program may touch on the full range of the world's ecosystems.
- The planned program is supported through research and extension.
- Society needs the information generated and shared through this planned program to continue to sustainably meet all the various needs, including for "invisible" ecosystem services and aesthetics, of the growing world population.
- The call for sustainable production will continue to increase in both plant and animal agriculture.

- Environmental and food safety regulations relevant to agriculture will increase.
- Local governments will require assistance in addressing competing land use and economic issues involving natural resources and the environment.
 - Interest in environmental quality will continue to drive a need for better stewardship.
 - Public interest in managing natural resources will continue to present competing, and sometimes conflicting, demands.
 - The development of major natural gas fields will affect our water resources, forests, agricultural lands, and communities.
 - Reliance on renewable, biobased sources for materials to replace petrochemical-based feedstocks will continue to increase.
 - Pollinator populations will continue to be stressed for the foreseeable future.
 - Increased efficiency and environmental sustainability can be simultaneously achieved for many agricultural and natural resource businesses.
 - The price that producers earn for some agricultural products will not keep pace with costs of production.
 - There is room to grow in the market for agricultural and natural resource goods and services through the development of new products and the exploitation of niches.
 - Agricultural and natural resource businesses need to carefully manage labor inputs to help ensure efficient operation.
 - Most people, including growers, producers, and managers of agricultural and natural resource companies, may not completely understand the impacts their actions have on the environment, or the implications of or opportunities stemming from environmental regulations and programs.
 - We need a more complete understanding of best management practices and ways to meet both production and environmental objectives.
 - People will be motivated to learn/change.
 - External funds and agents can serve as catalysts for change.
 - Staff can be recruited and hired with necessary skills and abilities.
 - The global economy, global political stability, and water scarcity will play increasing roles in agricultural production and product distribution.
 - Base federal funding will continue in support of research and staff on this program.
 - Extramural funds will be obtained to support this program, using the base federal funding as leverage.

2. Ultimate goal(s) of this Program

- Develop an integrated understanding of ecosystem processes through a holistic and multifaceted approach.
 - Improve our understanding of the potential effects of climate change on various ecosystems.
 - Modify agricultural and ecological practices to mitigate and adapt to the impacts of climate change.
 - Develop new technologies and land-use practices to improve air, soil, and water quality.
 - Guide development to minimize environmental impacts.
 - 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 nutrient management methods to facilitate the balance between agriculture and the environment, enabling productive and integrated animal agriculture that protects and sustains environmental quality.
 - 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.
 - Provide leadership and/or participate in regional, national, and international research and 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
2017	10.6	0.0	11.8	0.0
2018	10.6	0.0	11.8	0.0
2019	10.6	0.0	11.8	0.0
2020	10.6	0.0	11.8	0.0
2021	10.6	0.0	11.8	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

The Penn State College of Agricultural Sciences will conduct research activities that can be translated into solutions for environmental resilience in the field, laboratories, and community settings throughout Pennsylvania, the region, nationally, and internationally. Research and extension work will aim to unravel the complexities of ecosystem functioning, reveal the implications of expected climate change, help control nutrient flows into Chesapeake Bay, and improve drinking water quality, among other things.

Our faculty and staff will conduct appropriate levels of extension, education, and engagement work with stakeholders and colleagues at all levels. Extension programs will be developed and delivered based on need. Campus-based and county-based experts will collaborate to assess need for, plan, develop, implement, and evaluate relevant extension programming that brings about measurable enhancements. Extension work will be closely tied to research results, to transfer the latest information in a given field to on-the-ground practitioners.

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"> ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations ● Other 1 (Webinars) 	<ul style="list-style-type: none"> ● Newsletters ● TV Media Programs ● eXtension web sites ● Web sites other than eXtension ● Other 1 (On-Line Videos) ● Other 2 (Publications and Guides)

3. Description of targeted audience

- agricultural producers/farmers/landowners

- agriculture services/businesses
- nonprofit associations/organizations
- business and industry
- community groups
- education
- general public
- government personnel
- local, regional, state, and federal agencies
- military
- non-governmental organizations
- nonprofit associations/organizations
- policy makers
- special populations (at-risk and underserved audiences)
- students/youth
- USDA
- volunteers/extension leaders

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 participants in extension education classes and workshops.
 - Number of technology disclosures involving college faculty, staff, extension educators, and students.
- 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	Increased knowledge of ecosystem change expected with climate change.
2	Improved strategy for addressing nutrient pollution in Chesapeake Bay.
3	Improve urban environments through green infrastructure research and extension.

Outcome # 1

1. Outcome Target

Increased knowledge of ecosystem change expected with climate change.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 123 - Management and Sustainability of Forest Resources
- 132 - Weather and Climate

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

Improved strategy for addressing nutrient pollution in Chesapeake Bay.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 112 - Watershed Protection and Management
- 133 - Pollution Prevention and Mitigation

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 3

1. Outcome Target

Improve urban environments through green infrastructure research and extension.

2. Outcome Type : Change in Condition Outcome Measure

3. Associated Knowledge Area(s)

- 111 - Conservation and Efficient Use of Water
- 112 - Watershed Protection and Management
- 133 - Pollution Prevention and Mitigation

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

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

Various factors influence potential outcomes in environmental management. Unexpected natural climate variation continues to influence priority identification, necessitate reshuffling of calendars for planned experiments, and influence clientele participation and producer profitability, thereby affecting implementation of recommended practices. If natural disasters occur, the availability of funding to support efforts in climate change, or other areas, may change and result in changes to our programs. Public policy and regulations can influence the research needs and the delivery of research results to stakeholders through Cooperative Extension. The influence of natural gas and oil prices is unknown, but could be significant. 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. Extramural funding for the research gaps identified is paramount and will continue to be sought on a competitive basis. The challenge of reduced federal funding for agricultural research and extension dictates that we anticipate maintaining current levels of output.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Extension administration requests State Extension Teams (SET) to establish evaluation tools and collect impact data. This information will be reported through the Extension Program Activity System (EPAS) or collected on SharePoint. Each program team will use its own set of evaluation tools for program assessment. In addition, each SET will continue to establish or involve their respective external advisory team as a direct method of assessing whether the educational programs are on target and meeting the

industry or audience needs. Customer satisfaction and needs assessment instruments (Salesforce and Atlas) will be implemented and will provide feedback on the quality and value that our programs provide.

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Global Engagement

2. Brief summary about Planned Program

Global engagement is a growing planned program through which our researchers study diseases of plants and animals important as livelihoods to their growers and in the global economy, changes in demand for agricultural products in emerging economies, and plant breeding to foster drought resistance, among other topics.

The College of Agricultural Sciences is committed to making advances toward solving some of the world's most pressing problems. To do so, our faculty will continue to collaborate extensively with colleagues and partners from around the world. Such international partnerships are crucial to leveraging scarce research dollars and to gaining access to unique sites, ideas, technologies, and populations. We will foster a welcoming climate for international students, scholars, and visitors in which the free flow of information and ideas leads to creative and innovative solutions for the challenges we face as a united global population.

One part of our research and extension work in this planned program aligns with the Feed the Future initiative, the Obama administration's initiative on global hunger and food security. We will provide growers with science-based information about sustainable food production that minimizes environmental impact. Program areas addressing agriculture productivity are 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.

We will seek sustainable intensification of agriculture in developing countries, so that we can help feed the world's increasing population with climate change-resistant crop lines and agricultural techniques to produce more food on the same area of arable land. Another focus of sustainable intensification is on value chains--helping farmers around the world develop new value-added, safe, and nutritious products and getting them to consumers.

Penn State researchers are advancing the role of women in agriculture by taking their successful Pennsylvania Women's Agricultural Network model to Honduras through a grant from U.S. AID. USDA's continuing support for this model in Pennsylvania made this grant possible. We are also working to increase opportunities for civic engagement and leadership by international youth, underserved populations, and women. One international team is working to build youth leadership and empowerment globally through sports.

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
102	Soil, Plant, Water, Nutrient Relationships	13%		12%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	14%		12%	
721	Insects and Other Pests Affecting Humans	10%		10%	
723	Hazards to Human Health and Safety	10%		10%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	30%		20%	
805	Community Institutions and Social Services	15%		20%	
806	Youth Development	8%		16%	
	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 and potable water, 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 stability of our world.

The research and extension system is a proven leader in discovering answers and implementing solutions to agricultural, environmental, and sociological challenges. 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, precision feeding, and nutrient management practices reduce the use of pesticides, fertilizers, and nutrients that can negatively affect food and 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. Nutrition education programs for underserved, difficult to reach, and vulnerable populations help those consumers purchase, store, prepare, and serve to their families a more nutritious and healthy diet while reducing the cost of food. Better nourished people are less susceptible to disease and political unrest.

We can take advantage of scalable geographies. Pennsylvania's farm fields tend to be relatively small compared to those in the Midwest, so techniques that are shown to work here should have more direct applicability to the small land holdings common around the world than would techniques developed in the Midwest.

Exports of Pennsylvania food, agriculture, and forestry products total more than \$1.5 billion annually and account for roughly 11,000 jobs, according to the Pennsylvania Department of Agriculture. The College needs to prepare its graduates, many of whom are from Pennsylvania and will remain in Pennsylvania, to

be players in the global marketplace. Penn State will continue to be a leader in food products manufacturing, and we are exporting our knowledge to global partners in this area as well.

Research and extension priorities will include:

- sustainably intensify agriculture using new crop lines resistant to drought and other appropriate techniques
- educating farmers globally about integrated pest management and helping them to implement appropriate systems
- successful strategies to engage youth, women, and minorities in social action and leadership
- research commercialization and industry engagement.

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

- Globally important problems are politically sensitive, and programs need to be adaptable to changing interests and opportunities.
- Global political instability will continue, and perhaps increase, as population rises, resources become more scarce, and the changing climate increases competition for water and arable land.
- The global economy, global political stability, and water scarcity will play increasing roles in agricultural production and product distribution.
- Agricultural security management practices to address natural (pests, diseases, and weather adversity) and human-caused (accidental and intentional contamination and disruption issues) threats will require vigilance, preparedness, and mitigation to reduce, eliminate, manage, and control potential negative production factors.
- Our stakeholders and the progression of scientific knowledge drive this program's priorities and issues.
- The topics in this planned program require multinational, multistate, multidisciplinary, and collaborative research and extension efforts.
- The planned program is supported through research and extension.
- Society needs the information generated and shared through this planned program to continue to sustainably supply sufficient food, feed, and fiber for the growing world population.
- Careful plant breeding can eventually yield more drought-tolerant crop lines.
- Increased efficiency can improve profitability of many agricultural and natural resource businesses.
- The price that producers earn for some agricultural products will not keep pace with costs of production.
- There is room to grow in the market for agricultural and natural resource goods and services through the development of new products and the exploitation of niches.

- Most people, including growers, producers, and managers of agricultural and natural resource companies, may not completely understand the impacts their actions have on the environment, or the implications of or opportunities stemming from environmental regulations and programs.
- Programs will depend on a holistic approach to solve multiple problems simultaneously, which will require integrated research that is translated to extension programs across several disciplines.
- Enhanced local community interaction with partners and collaborators will be necessary.
- Researchers and extension educators will need to work together to identify issues and make efforts to solve problems, not symptoms.
- People will be motivated to learn/change.
- Staff can be recruited and hired with necessary skills and abilities.
- Education and information lead to changes in behavior.
- Base federal funding will continue in support of research and staff on this program.
- Extramural funds will be obtained to support this program, using the base federal funding as leverage.
- External funds and agents can serve as catalysts for change.

2. Ultimate goal(s) of this Program

- Determine how crop productivity can be sustainably intensified in compromised or low-fertility soils.
- Transfer effective, place-appropriate agricultural techniques around the world.
- Improve understanding of factors affecting technology acceptance.
- Improve integrated pest management around the world.
- Enhance opportunities for women, minorities, and other challenged groups.
- Enhance youth leadership, civic engagement, and social action globally.
- Clarify how best to help visiting scholars and scientists learn new technologies and approaches.
- Provide policy-makers with science-based recommendations for best practices in global engagement.
- Provide leadership and/or participate in regional, national, and international research and 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
2017	1.4	0.0	0.3	0.0
2018	1.4	0.0	0.3	0.0
2019	1.4	0.0	0.3	0.0
2020	1.4	0.0	0.3	0.0
2021	1.4	0.0	0.3	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

The Penn State College of Agricultural Sciences will conduct research activities that can be translated into solutions for global engagement in the field, laboratories, and community settings in Pennsylvania and throughout the world. Research and extension work will address global agricultural challenges, such as

climate change and drought and social issues, such as building youth engagement and leadership skills.

Our faculty and staff will conduct appropriate levels of extension, education, and engagement work with stakeholders and colleagues at all levels. Extension programs will be developed and delivered based on need. Campus-based and county-based experts will collaborate to assess need for, plan, develop, implement, and evaluate relevant extension programming that brings about measurable enhancements. Extension work will be closely tied to research results, to transfer the latest information in a given field to on-the-ground practitioners around the world.

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 (Webinars) 	<ul style="list-style-type: none"> ● Newsletters ● TV Media Programs ● eXtension web sites ● Web sites other than eXtension ● Other 1 (On-Line Video) ● Other 2 (Publications and Guides)

3. Description of targeted audience

- agricultural producers/farmers/landowners
- agriculture services/businesses
- nonprofit associations/organizations
- business and industry
- community groups
- education
- general public
- government personnel
- human service providers
- local, regional, state, federal, and international agencies
- military
- non-governmental organizations
- nonprofit associations/organizations
- policy makers
- special populations (at-risk and underserved audiences)
- students/youth
- UNESCO
- United Nations
- USDA
- World Bank
- World Health Organization
- volunteers/extension leaders

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 participants in extension education classes and workshops.
 - Number of technology disclosures involving college faculty, staff, extension educators, and students.
- 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	Enhanced knowledge of drought tolerance in plants.
2	Improved understanding of life cycle of organisms involved in transmission of globally important diseases, such as malaria.
3	Successful strategy for engaging youth, women, or minorities in social action or leadership.

Outcome # 1

1. Outcome Target

Enhanced knowledge of drought tolerance in plants.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 2

1. Outcome Target

Improved understanding of life cycle of organisms involved in transmission of globally important diseases, such as malaria.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 721 - Insects and Other Pests Affecting Humans
- 723 - Hazards to Human Health and Safety

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 3

1. Outcome Target

Successful strategy for engaging youth, women, or minorities in social action or leadership.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 803 - Sociological and Technological Change Affecting Individuals, Families, and Communities
- 805 - Community Institutions and Social Services
- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

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

Natural disasters and weather extremes can raise urgent needs that require the reshuffling of schedules and funding for other planned activities. They can also affect crop planting and harvest schedules. The tight economy increases social instability and raises the need for programs that build youth civic engagement and leadership. Public policy and appropriations changes affect the flow of extramural funding. Competing public priorities and programmatic challenges can make it difficult to focus on a problem long enough to bring real change. Population changes continue to create new pest concerns.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Extension administration requests State Extension Teams (SET) to establish evaluation tools and collect impact data. This information will be reported through the Extension Program Activity System (EPAS) or collected on SharePoint. Each program team will use its own set of evaluation tools for program assessment. In addition, each SET will continue to establish or involve their respective external advisory team as a direct method of assessing whether the educational programs are on target and meeting the industry or audience needs. Customer satisfaction and needs assessment instruments (Salesforce and Atlas) will be implemented and will provide feedback on the quality and value that our programs provide.

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Integrated Health Solutions

2. Brief summary about Planned Program

Researchers in the College will advance and improve the health of humans, animals, and communities through research into preventive, corrective, diagnostic, and predictive solutions to the challenges presented by lifestyle, diseases, pests, and toxins.

A rising world population and the production of animals at increasingly higher densities create conditions favoring the rapid spread of disease and the emergence of new pathogens. One health studies focus on the interactions among human, animal, and environmental health. Our researchers will work collaboratively to apply infectious disease dynamics and molecular immunology to these problems. They will study the origins of pathogens, host response to environmental pressures, the effects of nutrition on host response, mechanisms of action, and potential control points for various hosts and diseases. Other areas of investigation will focus on the microbial ecology and dynamics of human and animal pathogens with emphasis on reducing antibiotic use.

Americans are increasingly concerned about the relationship between food and personal health. There is a need to produce plants and animals with improved nutrition and functional molecules. Identifying these molecules and developing processes to maximize nutrient or functional molecule retention in food products and deliver the molecules as needed is a goal. Research in functional foods will include the fate of phytonutrients during food processing, the role these compounds play in mitigating chronic diseases, and understanding how functional molecules behave in foods during processing and storage. Understanding the contribution of whole foods is also essential to understand the influence of food on specific aspects of health.

Two new and expanding areas of research in our College are nutrigenomics, the study of interaction of dietary components with the genome and resulting changes in gene expression, and nutrigenetics, the study of variations in dietary responses due to genetic predispositions. Basic and translational collaborative research will develop dietary recommendations, foods, or food processing techniques beneficial to gastrointestinal health, inflammation, and nutrition. Human and animal microbiome analysis provides powerful tools to better understand how individuals will respond to specific interventions and to understand mechanisms of action. We want to understand the effects of foods or nutrients on the microbiome in maintaining intestinal health, and the effects of natural products on the gut microbiome.

New federal regulations mandating farm-to-fork accountability for food safety measures have vastly increased the need for effective, safe agricultural practices for the state's farms and food processing facilities. Research in food safety will include continuing efforts to develop molecular subtyping methods for various foodborne pathogens and work focused on control of microorganisms in muscle food products. Extension activity in food safety will remain a large program, including, among other things, retail ServSafe training, industrial HACCP (Hazard Analysis and Critical Control Point) training, and outreach regarding requirements of the Food Safety Modernization Act and Good Agricultural Practices (GAP).

Food and lifestyle choices are often inextricably linked to health issues that are costing our nation money, productivity, and quality of life. The problems of obesity and other chronic diseases will be addressed through innovative research and extension programs to discover, translate, and apply the role of nutrition and physical activity in disease prevention and health promotion.

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
301	Reproductive Performance of Animals	3%		6%	
303	Genetic Improvement of Animals	6%		6%	
304	Animal Genome	6%		6%	
306	Environmental Stress in Animals	6%		6%	
307	Animal Management Systems	6%		6%	
311	Animal Diseases	6%		11%	
315	Animal Welfare/Well-Being and Protection	4%		6%	
402	Engineering Systems and Equipment	7%		6%	
501	New and Improved Food Processing Technologies	7%		6%	
502	New and Improved Food Products	7%		6%	
503	Quality Maintenance in Storing and Marketing Food Products	8%		6%	
504	Home and Commercial Food Service	8%		4%	
601	Economics of Agricultural Production and Farm Management	7%		6%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	7%		7%	
721	Insects and Other Pests Affecting Humans	6%		6%	
722	Zoonotic Diseases and Parasites Affecting Humans	6%		6%	
	Total	100%		100%	

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

1. Situation and priorities

Anchored by international giants such as Hershey Foods Corporation and H.J. Heinz Company, Pennsylvania is a national leader in produce and processed foods. Food companies in the state ship about

\$32 billion of food and \$4 billion of beverages each year. Research and extension programs will continue to partner with the food manufacturing and processing industries to ensure that safe, wholesome products enter the food chain from Pennsylvania growers and processors.

As the world population continues to rise, plants and animals used in agriculture will be grown in increasing densities, presenting a variety of issues, such as the concentrated use of chemicals and the spread of infectious diseases that may affect human health.

Researchers in the Department of Veterinary and Biomedical Sciences are concerned with the health of animals at every level, not just as it relates to production. They will educate animal workers in safe, humane handling and care to improve animal quality of life and reduce disease transmission. The environmental footprint of agriculture is large, but this work can help to reduce it. The work will be relevant both in Pennsylvania and around the world.

An individual's health is dictated by genetics, but also is largely influenced by behavior and the environment. For example, the built environment can affect human health by influencing food choices and ease of daily exercise.

Prevention of the growing epidemic of chronic disease, including gastrointestinal disorders, is a major concern for the U.S. health care system. Low-grade inflammation in the gut may lead to development of a number of diseases, including inflammatory bowel disease, colon cancer, and type-2 diabetes. Food and food components have been shown to both prevent and promote oxidative stress and inflammation in the gastrointestinal system. Researchers will use a unique food systems approach (farm to fork to function) to understand and improve the health profiles of food products and to support development of specialized food products for prevention and management of chronic diseases.

Nutrients are now understood to be bioactive molecules that can affect risk for chronic diseases and quality of life. More recently, the study of nutrigenomics has changed the direction of nutrition research from a broad focus on public health and development of dietary guidelines at a population level to a more targeted evaluation of the effects of genetic variation on dietary responses.

Research and extension priorities will include:

- increasing our understanding of how the host (animals, humans, plants, and insects) responds to environmental pressures
- reducing the incidence of foodborne illness and improving the safety of the food supply by discovering and eliminating causes of contamination
- mycotoxins and other potentially harmful fungi in crops, food, and the environment
- exploring gut health
- the microbiome
- the use of foods to help manage chronic disease
- one health
- research commercialization and industry engagement.

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

- Health-related problems can be politically sensitive, and programs need to be adaptable to changing interests and opportunities.
 - Our stakeholders and the progression of scientific knowledge drive this program's priorities and issues.
 - The topics in this planned program require multistate, multidisciplinary, and collaborative research and extension efforts.
 - The planned program is supported through research and extension.
 - Society needs the information generated and shared through this planned program to sustainably supply sufficient healthy food and further our understanding of infectious and lifestyle diseases, as well as diseases in livestock.
 - The call for animal products raised in more natural settings will increase.
 - Food safety regulations will increase.
 - People will be motivated to learn/change.
 - External funds and agents can serve as catalysts for change.
 - Staff can be recruited and hired with necessary skills and abilities.
 - Nutrition information leads to changes in food purchasing and/or preparation.
 - The global economy, global political stability, and water scarcity will play increasing roles in the health of the world's people.
 - Occurrences of diseases transferred among and between humans and animals will increase as world population increases.
 - Outbreaks of foodborne illness will increase as the increasing world population places greater pressure on agricultural resources.
 - Biosecurity management practices will become increasingly important to address natural (pests and diseases), accidental, and intentional threats.
 - Base federal funding will continue in support of research and staff on this program.
 - Extramural funds will be obtained to support this program, using the base federal funding as leverage.

2. Ultimate goal(s) of this Program

- Understand how infectious and beneficial microorganisms are transmitted, and how they evolve.
- Improve human health through behavioral and environmental changes. Study the mechanisms of action, spread, prevention, and treatment of food-contaminating fungi, mycotoxins, and bacteria.
 - Elucidate the mechanisms and factors at play in gut health, especially as it relates to food
 -
 - Explore how certain foods can be supplemented with health-promoting compounds to help manage chronic disease.
 - Improve biosecurity.
 - Comprehend the interrelationships among human, environment, and domestic and wild animal health.
 - Provide policy-makers with science-based recommendations for regulations and best practices in food safety, health, wellness, physical activity, livestock housing, and biosecurity.

- Provide leadership and/or participate in regional, national, and international research and 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
2017	8.7	0.0	14.1	0.0
2018	8.7	0.0	14.1	0.0
2019	8.7	0.0	14.1	0.0
2020	8.7	0.0	14.1	0.0
2021	8.7	0.0	14.1	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

The Penn State College of Agricultural Sciences will conduct research activities that can be translated into solutions for integrated health solutions on farms, in laboratories, and in community settings throughout Pennsylvania, the region, nationally, and internationally. Research and extension work will focus on significant livestock diseases, nutritional challenges, and the humane and efficient handling and housing of livestock. Among other things, the work will help elucidate the mechanisms of microbial and fungal pathogens and environmental toxins, and the importance of the microbiome. This planned program may move us closer to new therapeutics or prevention strategies.

Our faculty and staff will conduct appropriate levels of extension, education, and engagement work with stakeholders and colleagues at all levels. Extension programs will be developed and delivered based on need. Campus-based and county-based experts will collaborate to assess need for, plan, develop, implement, and evaluate relevant extension programming that brings about measurable enhancements. Extension work will be closely tied to research results, to transfer the latest information in a given field to on-the-ground practitioners.

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 (Webinars) 	<ul style="list-style-type: none"> • Newsletters • TV Media Programs • eXtension web sites • Web sites other than eXtension • Other 1 (On-Line Videos) • Other 2 (Publications and Guides)

3. Description of targeted audience

- agricultural producers/farmers/landowners
- agriculture services/businesses
- nonprofit associations/organizations
- business and industry
- community groups
- education
- general public
- government personnel
- local, regional, state, federal, and international agencies
- military
- non-governmental organizations
- nonprofit associations/organizations
- policy makers
- special populations (at-risk and underserved audiences)
- students/youth
- United Nations
- USDA
- volunteers/extension leaders
- World Health Organization

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 participants in extension education classes and workshops.
- Number of technology disclosures involving college faculty, staff, extension educators, and students.

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

V(I). State Defined Outcome

O. No	Outcome Name
1	Number of people trained in safe food handling techniques.
2	Change in knowledge related to humane or efficient livestock housing and handling.
3	Change in knowledge related to our understanding of a disease mechanism, diagnostic testing, prevention strategy, or treatment for a livestock and/or human disease.
4	Increased knowledge of livestock genomics to potentially enhance performance and increase efficiency.

Outcome # 1

1. Outcome Target

Number of people trained in safe food handling techniques.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 503 - Quality Maintenance in Storing and Marketing Food Products
- 504 - Home and Commercial Food Service
- 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

Change in knowledge related to humane or efficient livestock housing and handling.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 306 - Environmental Stress in Animals
- 307 - Animal Management Systems
- 315 - Animal Welfare/Well-Being and Protection
- 402 - Engineering Systems and Equipment
- 601 - Economics of Agricultural Production and Farm Management

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 3

1. Outcome Target

Change in knowledge related to our understanding of a disease mechanism, diagnostic testing, prevention strategy, or treatment for a livestock and/or human disease.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 311 - Animal Diseases
- 721 - Insects and Other Pests Affecting Humans
- 722 - Zoonotic Diseases and Parasites Affecting Humans

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 4

1. Outcome Target

Increased knowledge of livestock genomics to potentially enhance performance and increase efficiency.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 301 - Reproductive Performance of Animals
- 303 - Genetic Improvement of Animals
- 304 - Animal Genome
- 601 - Economics of Agricultural Production and Farm Management

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Natural Disasters (drought, weather extremes, etc.)
- 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

Natural disasters and weather extremes can fuel disease spread. Resources allocated to support research and extension education are stressed in a changing economy, and extramural funding becomes increasingly important. Public policy and appropriations changes affect the flow of extramural funding. Population changes continue to create new pest and disease concerns.

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

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Extension administration requests State Extension Teams (SET) to establish evaluation tools and collect impact data. This information will be reported through the Extension Program Activity System (EPAS) or collected on SharePoint. Each program team will use its own set of evaluation tools for program assessment. In addition, each SET will continue to establish or involve their respective external advisory team as a direct method of assessing whether the educational programs are on target and meeting the industry or audience needs. Customer satisfaction and needs assessment instruments (Salesforce and Atlas) will be implemented and will provide feedback on the quality and value that our programs provide.

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Positive Future for Youth, Families, and Communities

2. Brief summary about Planned Program

This planned program will focus on understanding factors that promote positive human development at all stages of the life course. Efforts to foster healthy individuals will cut across local, national, and global levels and require knowledge of how processes of individual, community, and regional development interact.

With leveraged funding, the Pennsylvania Women's Agricultural Network and related international programs (e.g., in Cambodia and Honduras) seek to improve health and empower women by promoting their production and marketing of high-value horticultural crops produced via sustainable intensification practices.

Our agricultural education program provides research into best practices in formal (in school) and informal (out of school) agricultural education and leadership development in youth, and in global competency in agricultural teacher candidates.

Recent research evaluated the effectiveness of regulations limiting juveniles' access to tobacco on youth smoking rates.

A fair amount of the college's research in this area is also highlighted in the Global Engagement (e.g., supporting women in agriculture locally and globally), Community Resilience and Capacity (e.g., assessing economic resilience of counties after the Great Recession; the changing face of addiction in the U.S.; farm profitability and sustainability; food system economics), and Environmental Resilience (e.g., Chesapeake Bay watershed management programs and economics; economics of responding to climate change) planned programs.

Extension will provide a wide range of evidence-based programming to support healthy families, build positive youth and healthy lifestyle skills, and strengthen intergenerational relationships within both rural and urban communities. Extension in the College of Agricultural Sciences is unique in providing one of the largest youth development programs in the nation. 4-H reaches more than 200,000 youth between the ages of 8 and 18 in Pennsylvania and more than 6 million nationwide. These programs will teach youth leadership skills and provide science, technology, engineering, and math (STEM) education. These programs can serve as an avenue to a viable career. Volunteers are critical to the success of 4-H. Volunteers will build skills for personal and professional development while aiding youth.

In addition to 4-H, extension will also work closely with the College of Health and Human Development on the PROSPER program, a youth and family resilience program designed to prevent development of negative behavior in children. Youth programs will provide opportunities for learning about healthy eating and physical activity and create a culture of leadership and community service among youth. We will 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 informal youth education efforts in contributing to STEM education should not be overlooked.

We will continue to be national leaders in farm safety research and education. Our scientists will study hazards such as hydrogen sulfide emission from gypsum bedding for cows and recommend safety

practices. Another research team in this area will study perceptions of tilt angles in tractors and of side rollover hazards in all-terrain vehicles, and educate users about the dangers and how to stay safe. Our Safety in Agriculture for Youth project serves as an umbrella for curricula, programs, activities, and expertise across the country, with an eye toward increasing safety and health knowledge and reducing hazard and risk exposure to youth on farms and ranches.

Non-youth-based programs will include Healthy Lifestyles, Strong Women/Growing Stronger, and Dining with Diabetes. All of these programs are interrelated and have major impacts on individual, family, and community health and resilience. We will also continue programming to support grandparents raising their grandchildren. This program has both research and extension components in developing and evaluating intergenerational initiatives in diverse settings.

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
607	Consumer Economics	5%		10%	
703	Nutrition Education and Behavior	12%		10%	
723	Hazards to Human Health and Safety	10%		20%	
724	Healthy Lifestyle	13%		10%	
801	Individual and Family Resource Management	10%		10%	
802	Human Development and Family Well-Being	10%		5%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	10%		10%	
805	Community Institutions and Social Services	10%		5%	
806	Youth Development	10%		10%	
903	Communication, Education, and Information Delivery	10%		10%	
	Total	100%		100%	

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

1. Situation and priorities

Our extension offerings in this planned program will span cradle to grave. The Better Kid Care program will help parents, caregivers, and early learning professionals develop the knowledge and skills necessary to

fulfill their roles in the healthy development of young children through online training modules.

4-H youth and volunteers will engage in community service projects that substantially benefit their communities. Projects will include community cleanups and providing emergency supplies and assistance in food banks and animal shelters, among other things. Our agricultural education research program informs in-school and informal education best practices by identifying strategies that build leadership skills and self-esteem.

As they reach the teenage years, youth often engage in risky behaviors. They may use illegal substances and get suspended from school, drop out of school, attack or assault others, or get arrested. They may fail to realize their full potential and may fail to learn the life skills necessary to positively contribute to their communities and society. Extension will address these issues by partnering with schools and communities to implement high quality evidence-based prevention programs. Our researchers address these issues by exploring, for example, patterns of drug addiction, effectiveness of youth cigarette sales controls, and strategies for engaging children and youth in military families.

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. About 40% of adults report no leisure-time physical activity. As children get older, participation in regular physical activity decreases dramatically. The program Everybody Walk Across Pennsylvania--intended to increase wellness and awareness of lifelong healthy habits--was pilot-tested in 2014 and will continue. We will also offer strength, wellness, and healthy lifestyle programs--such as Dining with Diabetes and Strong Women/Growing Stronger--targeted mainly at older adults. These programs will help promote continuing mental and physical health and can reduce health care expenditures.

Our strong interdisciplinary focus on expanding opportunities for women and underrepresented groups in agriculture builds diversity and capacity into the industry. The College will run a robust research and extension program addressing the unique needs of grandparents serving as primary caretakers for their grandchildren. A research group will develop and evaluate intergenerational initiatives in diverse settings.

For all ages, but especially for youth, we will have a nationally recognized program promoting farm safety. We will research and assess dangers on the farm, such as manure pits and machinery accidents and rollovers, and convey effective strategies to avoid or minimize these risks.

Research and extension priorities will include:

- helping Pennsylvanians develop lifelong healthy eating and physical activity habits
- helping Pennsylvania youth develop leadership and sound decision-making skills and self-confidence
- helping Pennsylvania's older adults meet the physical and emotional challenges they face
- building diversity in Pennsylvania's agricultural community.
- increasing awareness of farm safety risks, especially among youth.

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

- Social services programs can be politically sensitive, and programs need to be adaptable to changing interests and opportunities.
- Our stakeholders and the progression of scientific knowledge drive this program's priorities and issues.
- The topics in this planned program require multistate, multidisciplinary, and collaborative research and extension efforts.
- The planned program is supported through research and extension.
- Society needs the information generated and shared through this planned program to help Pennsylvanians and other develop healthy habits and reduce health care and social service costs.
- The tight economy and changing family and social dynamics mean that the need for programs to support development of personal empowerment, civic engagement, and leadership skills in youth will remain high.
- Financial support for these programs is always limited.
- The need for programs addressing seniors will continue to grow as the U.S. population ages.
- The number of grandparents raising their grandchildren will grow.
- Youth learn best in groups.
- People will be motivated to learn/change.
- External funds and agents can serve as catalysts for change.
- Staff can be recruited and hired with necessary skills and abilities.
- Nutrition information leads to changes in food purchasing and/or preparation.
- Obesity and associated chronic health issues and the widespread lack of physical activity 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 obesity prevention is energy balance: healthy eating behaviors and regular physical activity to achieve a healthy weight while protecting health and normal growth and development.
- Base federal funding will continue in support of research and staff on this program.
- Extramural funds will be obtained to support this program, using the base federal funding as leverage.

2. Ultimate goal(s) of this Program

- Increase healthy eating and physical activity opportunities for Pennsylvania residents of all ages.
- Increase the percentage of Pennsylvania residents who are at a healthy weight.
- Increase understanding of the sociological, biological, and economic causes of chronic health issues.
- Increase support for youth personal empowerment, civic engagement, and leadership skills development.
- Increase support for the challenges facing older Pennsylvanians.
- Enhance awareness of farm safety issues and accident prevention measures.
- Provide leadership and/or participate in regional, national, and international research and 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
2017	20.7	0.0	0.7	0.0
2018	20.7	0.0	0.7	0.0
2019	20.7	0.0	0.7	0.0
2020	20.7	0.0	0.7	0.0
2021	20.7	0.0	0.7	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

The Penn State College of Agricultural Sciences will conduct research activities that can be translated into solutions for youth, families, and communities in laboratories and community settings throughout Pennsylvania and the region. Research and extension work will build capacity for self-reliance, healthy eating, increased physical activity, farm safety, and youth leadership. Some examples of work in this area include exploration of changing patterns in addiction to prescription pain medications, the grandfamilies extension program, 4-H, PROSPER, Safety in Agriculture for Youth, and efforts to support women and underrepresented groups in agriculture.

Our extension programming in this planned program will focus on prevention education to a variety of audiences. Evidence-based educational programs and interactive physical activities will be delivered at schools, camps, and community and senior centers. Examples include the Strong Women program and Dining with Diabetes.

Our faculty and staff will conduct appropriate levels of extension, education, and engagement work with stakeholders and colleagues at all levels. Extension programs will be developed and delivered based on need. Campus-based and county-based experts will collaborate to assess need for, plan, develop, implement, and evaluate relevant extension programming that brings about measurable enhancements. Extension work will be closely tied to research results, to transfer the latest information in a given field to on-the-ground practitioners.

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 (Webinars) 	<ul style="list-style-type: none"> ● Newsletters ● TV Media Programs ● eXtension web sites ● Web sites other than eXtension ● Other 1 (On-Line Videos) ● Other 2 (Publications and Guides)

3. Description of targeted audience

- agricultural producers/farmers/landowners
- agriculture services/businesses
- nonprofit associations/organizations
- business and industry
- community groups
- education
- general public
- government personnel
- local, regional, state, and federal agencies
- military
- non-governmental organizations
- nonprofit associations/organizations
- policy makers
- special populations (at-risk and underserved audiences)
- students/youth
- USDA
- volunteers/extension leaders

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 participants in extension education classes and workshops.
- Number of technology disclosures involving college faculty, staff, extension educators, and students.

- 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	Additional way to educate about farm safety.
2	Participants will show improvement in one or more key health metrics.
3	Participants will show measurable changes in life skills.
4	Youth and families will illustrate skills in healthy lifestyles.

Outcome # 1

1. Outcome Target

Additional way to educate about farm safety.

2. Outcome Type : Change in Condition Outcome Measure

3. Associated Knowledge Area(s)

- 723 - Hazards to Human Health and Safety
- 903 - Communication, Education, and Information Delivery

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 2

1. Outcome Target

Participants will show improvement in one or more key health metrics.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 703 - Nutrition Education and Behavior
- 723 - Hazards to Human Health and Safety
- 724 - Healthy Lifestyle
- 802 - Human Development and Family Well-Being
- 805 - Community Institutions and Social Services

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 3

1. Outcome Target

Participants will show measurable changes in life skills.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 703 - Nutrition Education and Behavior
- 724 - Healthy Lifestyle
- 801 - Individual and Family Resource Management
- 802 - Human Development and Family Well-Being
- 803 - Sociological and Technological Change Affecting Individuals, Families, and Communities
- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 4

1. Outcome Target

Youth and families will illustrate skills in healthy lifestyles.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 724 - Healthy Lifestyle
- 802 - Human Development and Family Well-Being
- 806 - Youth Development

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
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

- Other (Extramural Funding)

Description

Natural disasters can destabilize families and communities, increasing the need for programming to build their self-reliance and recenter their behavior on a healthy lifestyle. 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 are all factors in healthy living. Lack of access to affordable, healthy food choices in neighborhood food markets can be a barrier to purchasing healthy foods, as can marketing of unhealthy processed foods to children. Busy parents who work may be less likely to provide adequate physical activity and healthy food for their children. The local environment--playgrounds, safe bike paths, swimming pools, lighting, sidewalks, and neighborhood safety--affects child and family physical activity. Economically challenged populations are more dramatically affected and may need to be addressed uniquely.

Other activities within this planned program face similar challenges. Natural disasters and the tight economy can lead to lapses in farm safety practices. They can also increase the need for grandparents to become primary caregivers to their grandchildren. The increasing prevalence of non-English speaking farm workers continues to drive the need for expansion in the farm safety program, and increasing populations of traditionally underserved groups in general necessitate the translation of more materials and programs into other languages.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Extension administration requests State Extension Teams (SET) to establish evaluation tools and collect impact data. This information will be reported through the Extension Program Activity System (EPAS) or collected on SharePoint. Each program team will use its own set of evaluation tools for program assessment. In addition, each SET will continue to establish or involve their respective external advisory team as a direct method of assessing whether the educational programs are on target and meeting the industry or audience needs. Customer satisfaction and needs assessment instruments (Salesforce and Atlas) will be implemented and will provide feedback on the quality and value that our programs provide.