2011 Pennsylvania State University Combined Research and Extension Plan of Work

Status: Submitted

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I. Plan Overview

1. Brief Summary about Plan Of Work

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

The college's current strategic plan (http://strategicplanning.cas.psu.edu/2008_2013/PDFs/CAS_2008-2013_Strategic_Plan.pdf), which was developed in 2008 following a broad (internal and external) stakeholder-driven process, provides a useful backdrop to our joint research-extension Plan of Work. To achieve our vision, we recognize that the college must move toward an approach where research, resident education, and extension/outreach activities are organized around three dominant and interrelated systems -- food and fiber, ecosystems, and socioeconomic systems. Within these three systems, we have identified five strategic initiatives -- entrepreneurship, energy, water, pest prediction & response, and food, diet, & health. We are now in the process of implementation -- tempered by budget realities -- of these initiatives. The nine planned programs described in this Plan of Work build from the framework of this strategic plan and the systems approach that we have identified as a key element for generating impact.

Historically, the college has had considerable strength in teaching, research, and extension programming in the production and processing of food and wood products. Over time, U.S. agriculture has evolved from a producer-driven system to a decidedly consumer-driven system. We will continue to provide science-based research and educational materials to the producers of agricultural and food commodities. However, we recognize significant opportunities to serve our long-standing stakeholders by better serving the consumers of agricultural products, whether through providing nutrition education, by assisting local governments with land-use decisions, or by helping producers develop and find new markets for value-added products. Demographics of agriculture in Pennsylvania indicate emerging trends. Small farms and female farm operators are two growing segments of the agricultural sector (Source: 2007 Census of Agriculture - http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_1_State_Level/Pennsylvania/index.asp). A recent USDA survey indicates that Pennsylvania is ranked third nationally in value of organic production (Source: 2008 Organic Survey - http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/Organics/index.asp). These data suggest new directions for our programming, both research to support needs of these audiences and educational programs to reach them with our science-based information.

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

Our planned programs capture the systems thinking articulated in our strategic plan and tie directly to key national emphasis areas identified by USDA-NIFA. Our programs cut across disciplines and unite our research efforts with our extension education capacity. Penn State has the good fortune of providing an environment that encourages interdisciplinary work and values outreach to stakeholders. The University has built a framework of university-wide consortia and institutes (Life Sciences; Energy and Environment; Social Sciences - Children, Youth, and Families; Materials), and the College of Agricultural Sciences plays an integral role in these organizations. This interdisciplinary philosophy has reinforced the natural

tendency of our faculty and extension educators to work cooperatively to solve problems. Coupled with the joint research-extension appointments of many of our College faculty, our work, as represented in this Plan of Work, effectively unites fundamental knowledge with practical solutions delivered to stakeholders. The net result is a tangible benefit in economic prosperity and quality of life for Pennsylvania citizens.

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

Year	Extension		Research	
	1862	1890	1862	1890
2011	274.6	0.0	298.5	0.0
2012	274.6	0.0	298.5	0.0
2013	274.6	0.0	298.5	0.0
2014	274.6	0.0	298.5	0.0
2015	0.0	0.0	0.0	0.0

II. Merit Review Process

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

- Internal University Panel
- External 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 cooperative extension and agricultural experiment station programs undergo very thorough and comprehensive review processes.

As discussed in the "Stakeholder Input Process" section, all cooperative extension state planning efforts are thoroughly grounded in the needs identified during our statewide needs assessment process (http://www.extension.psu.edu/internal/FocusPOW.pdf). After the needs assessment and program identification process was completed, each of the identified programmatic issues was assigned to an integrated, multidisciplinary Natural Work Groups (NWGs) composed of field-based extension educators and faculty with joint appointments in both extension and research efforts. Team members from field operations were chosen to broadly represent all regions of the Commonwealth, and faculty members were chosen to represent the research and extension perspectives of all relevant disciplines. Regional and state administrators and academic unit leaders serve in liaison roles to each NWG. All of the programs have been reviewed by research and/or extension administrators. Additionally, logic models were developed by each NWG to guide the programming efforts of field-based educators and faculty members with extension appointments, and they contribute to applied research priorities.

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

As new Penn State extension programmatic NWGs or agricultural experiment station projects are implemented, stakeholder groups and/or county advisory groups will provide ongoing review of the educational and research programs to ensure that programs are focusing on priority needs as identified by key advisory groups in the college. All

reviewers' critiques and comments provide us with mechanisms for enriching and improving our educational and research programs. Ag Council and PCCEA members and other stakeholders are being considered to serve in an advisory capacity for extension teams.

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

III. Evaluation of Multis & Joint Activities

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

The planned multi and joint activities conducted at Penn State address issues that have been identified through the planning process and through needs assessments in collaboration with cooperative extension, the agricultural experiment station, and/or resident education faculty and audiences. In addition, multi and joint activities are conducted within the framework of the College of Agricultural Sciences five-year strategic plan (http://strategicplanning.cas.psu.edu/2008_2013/PDFs/CAS_2008-2013_Strategic_Plan.pdf), which identifies areas of critical needs at the state level. The college strategic priorities determine our faculty hires and program fund allocations for each of these issue areas and faculty develop their educational and research programs on the basis of these critical issues.

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

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

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

2. How will the planned programs address the needs of under-served and under-represented populations of the

Focus on underserved populations has long been a specific goal of our extension and research programs. An assessment of underserved groups will also guide the program planning process. Programs that meet the needs of underserved groups across the state are of continuing importance, and the issue of diversity is one that crosses all planned program issue areas. Our College's Diversity and Civil Rights page can be viewed at http://diversity.cas.psu.edu/Default.html.

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

Examples of specific needs of underserved and underrepresented populations in Pennsylvania include research and extension programming on women in agriculture, cultural differences in the agricultural workplace involving the

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

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

Each planned program included in this Plan of Work will include expected outcomes and impacts. Progress toward the anticipated outcomes is guided by the logic models and will be reported under the respective planned program. Some specific directions from multistate and joint research/extension programs follow.

Agricultural Systems -- The systems approach that underlies our College's strategic plan is a perfect description of agricultural systems. Our focus on reducing inputs into agricultural production relies on new research data and translation of those data to practice in the production regions of Pennsylvania. Our work on the specialty crops that characterize much of Pennsylvania agriculture provides an excellent example of several years of AES-supported research in the basic biology of tree fruit and grape pests eventually yielding recommendations to growers that not only produce high quality fruit but also significantly reduce pesticide inputs and costs to growers. Our dairy production requires collaboration among nutritionists, reproductive biologists, agronomists, economists, and marketing specialists, to name a few. We expect reduced input costs, improved efficiencies of operation, and, among some producers, selection of value-added options to increase revenues.

Families, Youth, and Communities -- We will continue to develop our 4-H youth program as a manifestation of science, technology, engineering, and math (STEM) education through informal delivery systems. The leadership, community responsibility, and team-building skills that accompany the technical education of 4-H programs lead into a focus on family and community. Our focus on rural Pennsylvania to help one half of the state adapt to natural gas extraction from Marcellus Shale deposits began as a stakeholder-driven Cooperative Extension approach, but has now grown to a joint research-extension enterprise as gaps are identified in our current knowledge of how best to help shape the financial windfall that rural communities are experiencing into sustainable growth in those communities.

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

Pest Management -- Reduced inputs without compromising agricultural product quality is closely related to Agricultural Systems and the work that we conduct under that program. We are continuing to refine our predictive models, using the science of the crop and pests to develop tools that can guide decisions in the field. Our goals here are to see increased reference to pest prediction tools, expecting that biologically-based pest management will result in reduced pesticide inputs. We also continue to focus on invasive species in forest and agronomic systems.

Global Food Security & Hunger -- This program is, in large measure, a capstone of many of the other planned programs. In the end, global food security drives the food security for us all. Part of the solution is to encourage Pennsylvania producers to be globally competitive in their commodity and value-added production. Another important contribution will be to continue to discover and develop new genetic resources (biotech and conventional) and production practices that can be transferred to food insecure populations. Finally, the transfer of these resources and practices must be accomplished in a sociological framework, so we will engage our social scientists in developing new tools to measure acceptance of new crop varieties and integration into local food systems.

Climate Change -- Climate change issues arise in many contexts relative to agricultural production. We are continuing to work across research and extension objectives to establish science-based methods to evaluate the role of agriculture in greenhouse gas production. There is substantial interest in carbon credits and the like among our Pennsylvania stakeholders, but the implementation of these concepts is still in early stages, and science is needed to underlie the development of tools, the establishment of policy, and the education of the public to implement these

practices. We expect to have an impact on Pennsylvania policy development relative to region-specific approaches to mitigate climate change.

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

Childhood Obesity -- Our extension programming in this program area will focus on prevention education to a variety of appropriate audiences. Evidence-based programs will be delivered to schools, camps and communities; an interdisciplinary approach will work to establish healthy populations based upon a combination of diet, exercise, and self image.

Food Safety -- Our food safety portfolio extends from the farm to the fork, with work on-farm to assess foodborne pathogen loads and establish Good Agricultural Practices (GAPs), research and extension in processing and distribution to reduce risks to consumers, and extension programs at the consumer level to increase understanding of how they can influence the vast majority of food safety incidents. We will assess our contributions to the science behind GAPs and our ability to deliver these tools to Pennsylvania commodities. Our HAACP training is another key outcome that has been demonstrated to have direct positive impact on consumer food safety.

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

The measures used to determine the impact of joint and multi program activities will demonstrate the effectiveness of planned programs. Much of our research and the delivery is conducted in direct response to needs expressed by stakeholders through cooperative extension. In turn, the delivery of research efforts occurs through cooperative extension programming. Additionally, the Issue teams "...found the logic model process to be a useful tool for organizing, planning, and prioritizing multi-disciplinary activities to accomplish their goals more effectively (p. 71)." Specific examples of this effectiveness are described in the planned programs sections of this Plan of Work.

Corbin, M., Kiernan, N.E., Koble, M.A., Watson, J., and Jackson, D. 2004. "Using the Logic Model to Plan Extension and Outreach Program Development and Scholarship," Journal of Higher Education Outreach and Engagement, Vol. 10, No. 1, pp. 61-77.

IV. Stakeholder Input

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

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

Brief explanation.

Stakeholder input is actively sought to help set the course for cooperative extension and AES programs. Our primary stakeholder input is received through cooperative extension. CE engages in periodic statewide needs assessments, and the results of these assessments are incorporated into our College of Agricultural Sciences Planning and Reporting system. Our State Programs are based on stakeholder input and continued engagement

with our stakeholders. Thus, stakeholder input is a key attribute of extension programming. This, in turn, provides input into our research agenda, especially through faculty who are jointly appointed on extension and research funding. In addition, extension personnel in each county confer with their local advisory groups as they determine the local focus of their educational programs. College administration and faculty advisory groups confer regularly with key stakeholder groups. The Penn State Agricultural Council (http://agcouncil.cas.psu.edu) provides us with direct contact to nearly 100 member organizations and groups representing the agricultural industry across Pennsylvania. In addition, we meet multiple times per year with stakeholder groups including, but not limited to, the Pennsylvania Farm Bureau, PennAg Industries, State Horticultural Association of Pennsylvania, Pennsylvania Agronomic Education Society, Pennsylvania Association for Sustainable Agriculture, Pennsylvania Council of Cooperative Extension Associations, Pennsylvania Christmas Tree Growers Association, and Pennsylvania Floral Industry Association. Through direct faculty and extension educator contacts, we have regular contact with the private sector to assess their specific needs. Penn State has a well-developed organizational structure for interacting with industry; our Industrial Research Office serves as a liaison to specific industrial partners. Also in our stakeholder base are state and federal partners; we have regularly scheduled meetings with agencies such as the Pennsylvania Department of Agriculture, Pennsylvania Department of Environmental Protection, Pennsylvania Department of Health, and U.S. Department of Agriculture's Agricultural Research Service and Animal and Plant Health Inspection Service. These stakeholder meetings provide feedback on programming for Hatch, McIntire-Stennis, Smith Lever, and Animal Health funds.

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

1. Method to identify individuals and groups

- Use Advisory Committees
- Use Internal Focus Groups
- Use External Focus Groups
- Open Listening Sessions
- Needs Assessments
- Use Surveys

Brief explanation.

Special attention is paid to assessing the needs of groups who might be considered "underserved" in locations across the state. County, regional, and state advisory committees continue their role in providing valuable information on extension programming needs; these groups have minority representation where appropriate. Penn State Agricultural Council meetings are publicly announced, and our broad representation is constantly reassessed to ensure that new and traditionally underserved audiences are included. Surveys of County Commissioner are conducted periodically to collect information on their constituent's needs.

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
- Meeting with the general public (open meeting advertised to all)
- Survey of the general public
- Meeting specifically with non-traditional groups
- 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
- Survey of selected individuals from the general public

- Other (Focus Groups)

Brief explanation.

Extension was restructured into 19 Natural Work Groups (NWG) in 2009, with programming to begin on July 1, 2010. Each NWG is responsible for soliciting stakeholder input on key issues for program development. Multiple methods are used by the NWGs, including one-on-one discussions, focus groups, and surveys. In 2009, a survey of the Agricultural Council was conducted to identify their key issues. As the NWGs were forming, a survey of County Commissioners was also conducted.

3. A statement of how the input will be considered

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

Brief explanation.

Stakeholder concerns and opinions are useful in annual budget planning and requests. Emerging issues and refocusing of priorities are part of the dynamics of an adaptive organization. We have greatest success when we combine leadership into new program areas with an acknowledgment of the needs of our stakeholders. The stakeholders defined previously play an important role in helping us set priorities and make transitions in our research and extension agendas. Of particular importance are formal presentations by administrators, faculty, and extension educators to groups such as the Pennsylvania Council of Cooperative Extension Associations, the Penn State Agricultural Council, and county extension advisory groups that highlight our current and planned activities, but, of greater importance, specifically address the close connection between our ongoing research and the extension programming that translates this research into practice. While stakeholders are not directly involved with the hiring process, input into key focus areas is an important component of our staffing plan.

V. Planned Program Table of Content

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Agricultural Systems

2. Brief summary about Planned Program

The agricultural sector is a complex enterprise that spans a range from genomic studies on plants and animals to marketing and distribution of products on a global scale. The AES and extension challenge is not only to examine each component in sufficient depth to provide new discoveries and insights, but also to integrate these disparate fields into a systems approach that reveals new understanding to maximize the environmental and economic health of food and fiber production. Agricultural producers seek new varieties with improved characteristics and science-based recommendations on cultural practices that maximize return on input. Pennsylvania retains a balance of livestock- and crop-based agriculture and while dairy dwarfs other sources of income from livestock, our plant-based agriculture is largely a collection of so-called minor crops. We are national leaders in many agricultural categories, and Pennsylvania producers rely on Penn State for research and extension programming on most of the commodities that constitute significant Pennsylvania production. Pennsylvania is also home to significant food processing capacity, and this industry looks to us for leadership in new product development. Pennsylvania agriculture's position at all levels in the ag product value chain also means that we play a critical role in marketing and finance decisions, providing a variety of tools and programs that help farmers, local government, and agricultural industries make the best possible choices for profitability. Some key demands in the plant-based agricultural sector include crop varieties adapted to local conditions, varieties with value-added traits, and varieties that can be used in complex pest management systems (see Pest Management planned program). Cultivation practices to maximize yield with reduced nutrient and pesticide inputs are needed. In the livestock industry, information on nutrition to maximize product production while reducing nutrient load (for reasons of environmental health and profitability) is key. Reproductive efficiency is a high priority in the dairy industry. The food processing industry requires our collaboration in bringing food chemistry and physics from the laboratory to the processing plant in the form of new products. Nutrition will be a high priority focus area in food product development. In the final analysis, advances in production and processing are valuable only if they are profitable. Our economics expertise, from local farm management tools to analysis of market opportunities to the impact of local taxation decisions on business growth in the agricultural sector, will be a central part of a systems approach to the agricultural enterprise. In all of these endeavors, the combination of research that identifies new knowledge and develops it into tools coupled with extension programming to deliver these tools to the audiences that need them will be the hallmark of the Penn State approach.

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

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

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

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

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
201	Plant Genome, Genetics, and Genetic Mechanisms	9%		9%	
204	Plant Product Quality and Utility (Preharvest)	5%		5%	
205	Plant Management Systems	9%		8%	
206	Basic Plant Biology	3%		8%	
301	Reproductive Performance of Animals	9%		5%	
302	Nutrient Utilization in Animals	7%		5%	
303	Genetic Improvement of Animals	5%		3%	
304	Animal Genome	4%		4%	
305	Animal Physiological Processes	3%		7%	
307	Animal Production Management Systems	9%		3%	
308	Improved Animal Products (Before Harvest)	3%		1%	
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals	6%		2%	
402	Engineering Systems and Equipment	3%		3%	
501	New and Improved Food Processing Technologies	6%		6%	
502	New and Improved Food Products	3%		7%	
601	Economics of Agricultural Production and Farm Management	3%		6%	
602	Business Management, Finance, and Taxation	6%		5%	
603	Market Economics	3%		3%	
604	Marketing and Distribution Practices	2%		7%	
610	Domestic Policy Analysis	2%		3%	
	Total	100%		100%	

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

1. Situation and priorities

Pennsylvania faces significant barriers to maintaining agricultural viability. Our livestock operations, a major economic driver in Pennsylvania agriculture, are under pressure from changes in land use within the state. Plant-based agriculture in Pennsylvania is not, in large measure, driven by commodity production, but rather by focus on a series of niche products. Those crops that compete in a global commodity market (e.g., apples) are under pressure from changes in international production and marketing strategies. These pressures are both a challenge and an opportunity. New, systems-based solutions are required to preserve Pennsylvania agricultural profitability. The same land development that threatens agricultural production also signals the availability of a new, local market for products. To take advantage of this proximity to

direct markets, new business models and new crops are needed. Penn State research and extension will partner to help producers assess the opportunities and identify methods to capitalize on these opportunities. By joining economic decisions with the biological, physical, and environmental science components of ag production, we can help Pennsylvania producers and processors make science-based decisions to increase the profitability of their operations.

2. Scope of the Program

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

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

1. Assumptions made for the Program

Funding will remain constant or increase in support of this planned program. Local markets, specialty crops and animal products, and new business models will be embraced by producers attempting to maintain their agricultural lifestyles, and these products will be sought after by consumers. The food industry will seek assistance in development of new value-added products, including products with enhanced nutritional and health characteristics. Local governments will require assistance in addressing competing land use and economic issues involving agriculture.

2. Ultimate goal(s) of this Program

Identify new products, both at the farm and processor level, with potential for profitability in Pennsylvania. Develop and disseminate production practices for livestock and plant-based agriculture that maximize production while minimizing environmental and economic costs. Provide economic tools to producers and to government for decision support.

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
2011	70.0	0.0	75.0	0.0
2012	70.0	0.0	75.0	0.0
2013	70.0	0.0	75.0	0.0
2014	70.0	0.0	75.0	0.0
2015	70.0	0.0	75.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

conduct research experiments on efficient livestock production; conduct research experiments on new crops for Pennsylvania; conduct research on new market opportunities for Pennsylvania agricultural products; conduct research on

alternative land uses; conduct educational workshops and meetings on crop and livestock production methods, pest management, marketing of commodities, finance, environmental stewardship, etc.; provide training on these topics; develop curricula and resources to support these programs

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

Extension

Direct Methods	Indirect Methods
● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations	● Public Service Announcement ● Newsletters ● TV Media Programs ● Web sites

3. Description of targeted audience

agricultural producers, agricultural industries, policy makers and local government officials, extension educators

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	122000	758000	0	0
2012	122000	758000	0	0
2013	122000	758000	0	0
2014	122000	758000	0	0
2015	122000	758000	0	0

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

2011:8 **2012:**12 **2013:**10 **2014:**10 **2015:**8

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	0	0	400
2012	0	0	400
2013	0	0	400
2014	0	0	400

Year	Research Target	Extension Target	Total
2015	0	0	400

V(H). State Defined Outputs

1. Output Target

- Number of invention disclosures submitted.

2011:4 **2012:**2 **2013:**2 **2014:**2 **2015:**2

- Number of people enrolled and/or registered in programs.

2011:104000 **2012:**104000 **2013:**104000 **2014:**104000 **2015:**104000

V(I). State Defined Outcome

O. No.	Outcome Name
1	Number of participants who were evaluated and demonstrated increased knowledge and skills.
2	Number of participants who were evaluated in a follow-up and who implemented/adopted practices.
3	Number of volunteers that helped with program leadership or delivery.

Outcome # 1

1. Outcome Target

Number of participants who were evaluated and demonstrated increased knowledge and skills.

2. Outcome Type : Change in Knowledge Outcome Measure

2011:4400	**2012:**4400	**2013:**4400	**2014:**4400	**2015:**4400

3. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms
- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems
- 206 - Basic Plant Biology
- 301 - Reproductive Performance of Animals
- 302 - Nutrient Utilization in Animals
- 303 - Genetic Improvement of Animals
- 304 - Animal Genome
- 305 - Animal Physiological Processes
- 307 - Animal Production Management Systems
- 308 - Improved Animal Products (Before Harvest)
- 314 - Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals
- 402 - Engineering Systems and Equipment
- 501 - New and Improved Food Processing Technologies
- 502 - New and Improved Food Products
- 601 - Economics of Agricultural Production and Farm Management
- 602 - Business Management, Finance, and Taxation
- 603 - Market Economics
- 604 - Marketing and Distribution Practices
- 610 - Domestic Policy Analysis

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 2

1. Outcome Target

Number of participants who were evaluated in a follow-up and who implemented/adopted practices.

2. Outcome Type : Change in Action Outcome Measure

2011:2500	**2012:**2500	**2013:**2500	**2014:**2500	**2015:**2500

3. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms
- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems
- 206 - Basic Plant Biology
- 301 - Reproductive Performance of Animals
- 302 - Nutrient Utilization in Animals
- 303 - Genetic Improvement of Animals
- 304 - Animal Genome
- 305 - Animal Physiological Processes
- 307 - Animal Production Management Systems
- 308 - Improved Animal Products (Before Harvest)
- 314 - Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals
- 402 - Engineering Systems and Equipment
- 501 - New and Improved Food Processing Technologies
- 502 - New and Improved Food Products
- 601 - Economics of Agricultural Production and Farm Management
- 602 - Business Management, Finance, and Taxation
- 603 - Market Economics
- 604 - Marketing and Distribution Practices
- 610 - Domestic Policy Analysis

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 3

1. Outcome Target

Number of volunteers that helped with program leadership or delivery.

2. Outcome Type : Change in Action Outcome Measure

2011:1900	**2012:**1900	**2013:**1900	**2014:**1900	**2015:**1900

3. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms
- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems
- 206 - Basic Plant Biology
- 301 - Reproductive Performance of Animals

- 302 - Nutrient Utilization in Animals
- 303 - Genetic Improvement of Animals
- 304 - Animal Genome
- 305 - Animal Physiological Processes
- 307 - Animal Production Management Systems
- 308 - Improved Animal Products (Before Harvest)
- 314 - Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals
- 402 - Engineering Systems and Equipment
- 501 - New and Improved Food Processing Technologies
- 502 - New and Improved Food Products
- 601 - Economics of Agricultural Production and Farm Management
- 602 - Business Management, Finance, and Taxation
- 603 - Market Economics
- 604 - Marketing and Distribution Practices
- 610 - Domestic Policy Analysis

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
- Populations changes (immigration,new cultural groupings,etc.)
- Other (Extramural Funding)

Description

A variety of factors influence potential outcomes in Agricultural Systems. Competing public priorities and unpredictable natural disasters (e.g, drought, flooding) have significant impacts on both research plans and extension programming. New policies and priorities around renewable energy are changing many research and extension programs as these priorities emerge. Appropriations are a driver of research underlying the development of translational products and could have impact (positive or negative) on recruiting and retention of AES and CES personnel.

It is our hope that key programs will continue to grow in future years, but the challenge of reduced federal funding for agricultural research and extension dictate that we anticipate maintaining current levels of output.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- After Only (post program)
- Retrospective (post program)
- Before-After (before and after program)
- During (during program)
- Case Study
- Comparisons between program participants (individuals,group,organizations) and non-participants
- Other (Direct Observation)

Description

The evaluation of programs will follow the KASI method of measuring changes in knowledge, attitude, skills and impact, along with changes in behavior as outlined in the Logic Model. Specific methods will depend on the type of changes and impact measures needed. Evaluation instruments will be selected from alternatives available at http://www.extension.psu.edu/evaluation/Questions.html.

2. Data Collection Methods

- Sampling
- Whole population
- Mail
- Telephone
- On-Site
- Structured
- Case Study
- Observation
- Other (Focus Groups)

Description

Data collection methods will depend on the needs of the issue team. Issue teams are charged with the development of evaluation methods. Again, the appropriate evaluation method will be identified and implemented using selections from the http://www.extension.psu.edu/evaluation/Questions.html

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Families, Youth, and Communities

2. Brief summary about Planned Program

Strong communities are built upon the foundation of resilient individuals and families. These foundations, however, are being stressed by globalization of our economy resulting in a displaced work force and the changing demographics of our citizens. Penn State demonstrates commitment to the citizens of the Commonwealth through a diverse array of research and extension programs that address long-standing and emerging issues. Nutrition, personal economics, and lifestyle choices continue to be important targets for Penn State programs. Youth development, primarily through 4-H, is another educational mechanism that remains relevant as we adapt our educational message to reach the next generation of young people. Our efforts extend beyond the traditional 4-H club structure to influence in-school lessons that address state educational standards and to offer program ideas to non-4-H after school programs and youth sports. We continue to develop programs -- validated by research -- that impart civic responsibility, interpersonal relationships, and leadership lessons to youth. These latter lessons do not end with our youth populations. Many of our research efforts in this planned program address civic engagement and effective community institutions to provide residents and businesses with a healthy environment in which to exist. This research is delivered via extension programming in a variety of forms including work with local governments and non-governmental organizations, advice to businesses new and old, and facilitation of community strategic planning and visioning. Experiences gained during our first 150 years now must be adapted to apply to a changed and continually changing environment. In the early days of our research and extension programs, we focused primarily on a rural audience, and Pennsylvania, although still rural in nature, now is a much more tightly woven patchwork of communities. Many regions that are key agricultural production zones are also now preferred residential locales. This mix creates a variety of tensions that can be resolved only through creative translation of the latest social science and agricultural research into programs that help to provide solutions for previously unknown problems. A current example of rural-urban interface tensions is the definition of "customary agricultural practices." Such definitions were unnecessary in the recent past, but now are key for crafting sensible solutions to conflicting pressures on land use. Our contributions to these and other community-based conflicts are central for ensuring a high quality of life for Pennsylvania residents.

3. Program existence : Mature (More then 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
134	Outdoor Recreation	1%		3%	
503	Quality Maintenance in Storing and Marketing Food Products	1%		5%	
504	Home and Commercial Food Service	5%		1%	
512	Quality Maintenance in Storing and Marketing Non-Food Products	1%		0%	
607	Consumer Economics	3%		8%	
608	Community Resource Planning and Development	10%		20%	
701	Nutrient Composition of Food	2%		1%	
702	Requirements and Function of Nutrients and Other Food Components	4%		4%	
704	Nutrition and Hunger in the Population	10%		0%	
721	Insects and Other Pests Affecting Humans	6%		5%	
723	Hazards to Human Health and Safety	5%		15%	
801	Individual and Family Resource Management	3%		1%	
803	Sociological and Technological Change Affecting Individuals, Families and Communities	1%		16%	
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures	0%		1%	
805	Community Institutions, Health, and Social Services	0%		9%	
806	Youth Development	47%		5%	
903	Communication, Education, and Information Delivery	1%		6%	
	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, and the diversity of the Commonwealth's population is shifting. These changes require a shift from some of our traditional research and extension focal areas to areas that permit us to address emerging issues. As the human landscape changes within the state, our civic structure struggles to cope with this change. State and local governments need research and advice on how to adapt regulations and policies (e.g., zoning, taxes) to situations different from those in place when the regulations were adopted. Changes in communities lead to other stresses. Communities that were relatively isolated and closed have opened, both physically through population shifts and virtually through information technology. A focus on rural issues is no longer sufficient or desirable -- we must adapt to the needs of stakeholders that are new to us by addressing situations that are also new to us, such as grandparents raising grandchildren because the parents are incarcerated for drug abuse. The need for research-based programs that have a positive influence on community vitality is greater than it has ever been. Changes in communities mirror changes in family dynamics. Our work on healthy families, both by addressing the family unit itself and contributions to individual health and well-being, remains timely. In many parts of the state, our extension programming,

underpinned by research, represents one of the major influences on nutrition, overall health, and economic decisions. We influence the next generation through our 4-H and youth programming, but we also provide guidance on a multigenerational scale. With increasing focus on the health benefits of foods, we have an opportunity to expand our long-standing work in nutrition advice to consumers. Many Pennsylvania residents are reliant upon multiple income sources to support their families, and we work in this arena to provide programs that help families achieve financial stability. We have more and more opportunities to work with local social service organizations, both as partners in program delivery and as a source of research-based ideas for new approaches to family and community problems.

2. Scope of the Program

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

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

1. Assumptions made for the Program

Funding will remain constant or increase in support of this planned program. The nature of Pennsylvania communities will continue to shift, creating more rural-urban interfaces with the problems and opportunities that they bring. New tensions in these changing communities will demand a population interested in positive civic engagement, and this population will require a deep understanding of issues relevant to both rural and non-rural citizens. Individual need for education on health, nutrition, and economic topics will continue to exist.

2. Ultimate goal(s) of this Program

The ultimate goals of the Family, Youth and Community research and extension programs are to help communities remain economically and socially healthy, so that residents of the communities can also experience safe and healthy lives. These goals will be achieved through our extension programs in adult development and aging, child care, family and youth resiliency, parenting skills, financial and resource management, diversity education, 4-H/youth development, character and civic education, health education, leadership and volunteerism, nutrition and food safety, workforce development, community capacity building and decision making, place-based economic development, and community-based agricultural development and supporting research programs. Ultimately, we are addressing concerns articulated in a recent Brooking Institution report that Pennsylvania is facing declining inter-city infrastructure, expanding urban areas that outpace our population growth rate, declining job opportunities and a youth migration out of the state. Our goal is to help reverse these trends.

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
2011	185.0	0.0	28.0	0.0
2012	185.0	0.0	28.0	0.0
2013	185.0	0.0	28.0	0.0
2014	185.0	0.0	28.0	0.0
2015	185.0	0.0	28.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

conduct research on civic engagement; conduct educational workshops and meetings on strengthening families, youth, and communities; conduct educational workshops and meetings on improved nutrition and health; develop and implement science-based 4H and school curricula; conduct research on effective educational programs for youth-at-risk

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

Extension

Direct Methods	Indirect Methods
● Education Class	● Public Service Announcement
● Workshop	● Newsletters
● Group Discussion	● TV Media Programs
● One-on-One Intervention	● Web sites
● Demonstrations	

3. Description of targeted audience

extension educators, school teachers, youth, general public, agencies and organizations, families

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	244000	900000	0	0
2012	244000	900000	0	0
2013	244000	900000	0	0
2014	244000	900000	0	0
2015	244000	900000	0	0

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

2011:2 **2012:**4 **2013:**4 **2014:**2 **2015:**2

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	0	0	100
2012	0	0	100

Year	Research Target	Extension Target	Total
2013	0	0	100
2014	0	0	100
2015	0	0	100

V(H). State Defined Outputs

1. Output Target

- Number of invention disclosures submitted.

2011:1 **2012:**0 **2013:**1 **2014:**0 **2015:**0

- Number of people enrolled and/or registered in programs.

2011:176000 **2012:**176000 **2013:**176000 **2014:**176000 **2015:**176000

V(I). State Defined Outcome

O. No.	Outcome Name
1	Number of participants who were evaluated and demonstrated increased knowledge and skills.
2	Number of participants who were evaluated in a follow-up and who implemented/adopted practices.
3	Number of volunteers that helped with program leadership or delivery.

Outcome # 1

1. Outcome Target

Number of participants who were evaluated and demonstrated increased knowledge and skills.

2. Outcome Type : Change in Knowledge Outcome Measure

2011:20900	**2012:**20900	**2013:**20900	**2014:**20900	**2015:**20900

3. Associated Knowledge Area(s)

- 134 - Outdoor Recreation
- 503 - Quality Maintenance in Storing and Marketing Food Products
- 504 - Home and Commercial Food Service
- 512 - Quality Maintenance in Storing and Marketing Non-Food Products
- 607 - Consumer Economics
- 608 - Community Resource Planning and Development
- 701 - Nutrient Composition of Food
- 702 - Requirements and Function of Nutrients and Other Food Components
- 704 - Nutrition and Hunger in the Population
- 721 - Insects and Other Pests Affecting Humans
- 723 - Hazards to Human Health and Safety
- 801 - Individual and Family Resource Management
- 803 - Sociological and Technological Change Affecting Individuals, Families and Communities
- 804 - Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures
- 805 - Community Institutions, Health, and Social Services
- 806 - Youth Development
- 903 - Communication, Education, and Information Delivery

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 2

1. Outcome Target

Number of participants who were evaluated in a follow-up and who implemented/adopted practices.

2. Outcome Type : Change in Action Outcome Measure

2011:8200	**2012:**8200	**2013:**8200	**2014:**8200	**2015:**8200

3. Associated Knowledge Area(s)

- 134 - Outdoor Recreation
- 503 - Quality Maintenance in Storing and Marketing Food Products
- 504 - Home and Commercial Food Service
- 512 - Quality Maintenance in Storing and Marketing Non-Food Products

- 607 - Consumer Economics
- 608 - Community Resource Planning and Development
- 701 - Nutrient Composition of Food
- 702 - Requirements and Function of Nutrients and Other Food Components
- 704 - Nutrition and Hunger in the Population
- 721 - Insects and Other Pests Affecting Humans
- 723 - Hazards to Human Health and Safety
- 801 - Individual and Family Resource Management
- 803 - Sociological and Technological Change Affecting Individuals, Families and Communities
- 804 - Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures
- 805 - Community Institutions, Health, and Social Services
- 806 - Youth Development
- 903 - Communication, Education, and Information Delivery

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 3

1. Outcome Target

Number of volunteers that helped with program leadership or delivery.

2. Outcome Type : Change in Action Outcome Measure

2011:9600	**2012:**9600	**2013:**9600	**2014:**9600	**2015:**9600

3. Associated Knowledge Area(s)

- 134 - Outdoor Recreation
- 503 - Quality Maintenance in Storing and Marketing Food Products
- 504 - Home and Commercial Food Service
- 512 - Quality Maintenance in Storing and Marketing Non-Food Products
- 607 - Consumer Economics
- 608 - Community Resource Planning and Development
- 701 - Nutrient Composition of Food
- 702 - Requirements and Function of Nutrients and Other Food Components
- 704 - Nutrition and Hunger in the Population
- 721 - Insects and Other Pests Affecting Humans
- 723 - Hazards to Human Health and Safety
- 801 - Individual and Family Resource Management
- 803 - Sociological and Technological Change Affecting Individuals, Families and Communities
- 804 - Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures
- 805 - Community Institutions, Health, and Social Services
- 806 - Youth Development

- 903 - Communication, Education, and Information Delivery

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

A variety of factors influence potential outcomes in Families, Youth, and Communities. This is an area where public policy and regulations can influence the research needs and the delivery of research results to stakeholders through Cooperative Extension. Population changes are of particular importance in both priority setting for research and extension and for availability of funding to conduct that work. Appropriations could have impact (positive or negative) on recruiting and retention of AES and CES personnel.

It is our hope that key programs will continue to grow in future years, but the challenge of reduced federal funding for agricultural research and extension dictate that we anticipate maintaining current levels of output.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- After Only (post program)
- Retrospective (post program)
- Before-After (before and after program)
- During (during program)
- Case Study
- Comparisons between program participants (individuals,group,organizations) and non-participants
- Other (Direct Observation and Contact)

Description

The evaluation of programs will follow the KASI method of measuring changes in knowledge, attitude, skills and impact, along with changes in behavior as outlined in the Logic Model. Specific methods will depend on the type of changes and impact measures needed. Evaluation instruments will be selected from alternatives available at http://www.extension.psu.edu/evaluation/Questions.html.

2. Data Collection Methods

- Sampling
- Whole population

- Mail
- Telephone
- On-Site
- Structured
- Case Study
- Observation
- Tests
- Other (Focus Groups)

Description

Data collection methods will depend on the needs of the issue team. Issue teams are charged with the development of evaluation methods. Again, the appropriate evaluation method will be identified and implemented using selections from the http://www.extension.psu.edu/evaluation/Questions.html.

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Natural Resources and Environment

2. Brief summary about Planned Program

Protection of environmental resources has long been the purview of Penn State's AES and Cooperative Extension enterprises. Environmental quality affects and is affected by agricultural production, forest resource management, wildlife and fisheries management, land use decisions, recreation, and many other variables. This planned program consolidates key activities supported by our AES and extension resources by addressing their collective impacts on natural resources and the environment. The stakeholders for this planned program are numerous and diverse. In the agricultural sector, producers must manage soil resources, nutrient balance, and air quality with production efficiencies. Pennsylvania has significant forest resources, and much of the forest acreage is under private landowner control (although state, federal, and industry management are all important). The economics of land use, balancing timber production with recreation, wildlife management, and environmental degradation, and land development pressure are all important issues facing forest landowners in the state. Local and state governments are attempting to develop and implement policies based upon sound science for the effective management of natural resources and protection of the environment. An array of non-governmental organizations has similar interests in this arena. Each of these stakeholder groups are seeking input from Penn State that will support necessary decisions; our combination of research and extension provides this information and, through a feedback process, identifies unmet research and information needs. Key demands for research and extension programming include nutrient management, odor and gaseous emissions from livestock operations, tillage practices and effects on water quality, forest management for timber production, recreation, and wildlife management, economics of natural resource management practices, and land use decision-making. This is also an area where emerging needs in biobased materials, including biofuels, will demand basic and applied research and new extension programming.

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

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

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

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

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources	10%		7%	
102	Soil, Plant, Water, Nutrient Relationships	15%		18%	
104	Protect Soil from Harmful Effects of Natural Elements	8%		1%	
112	Watershed Protection and Management	10%		17%	
121	Management of Range Resources	5%		0%	
122	Management and Control of Forest and Range Fires	8%		2%	
123	Management and Sustainability of Forest Resources	15%		17%	
124	Urban Forestry	10%		3%	
135	Aquatic and Terrestrial Wildlife	3%		10%	
136	Conservation of Biological Diversity	4%		9%	
141	Air Resource Protection and Management	5%		2%	
403	Waste Disposal, Recycling, and Reuse	5%		6%	
511	New and Improved Non-Food Products and Processes	2%		8%	
	Total	100%		100%	

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

1. Situation and priorities

Pennsylvania exhibits a significant wealth of natural resources, but also sits at a crossroads with regard to environmental issues surrounding both the management of those natural resources and the maintenance of a vibrant agricultural economy. The questions being posed to our research and extension professionals are both production issues and policy issues. This planned program provides clear opportunities for research and outreach that will have impact. Nutrient management is a perfect example of the nature of the problems that Pennsylvania faces. Livestock agriculture is the major contributor to agricultural income in the state. However, the nutrient load produced by livestock is concentrated in areas that are prone to development for new housing and associated activities, and the production areas threaten important watersheds. Continued viability of livestock agriculture relies on solutions that balance production efficiencies, neighbor perceptions (odor is a major driver in this regard), and environmental quality. Research by AES scientists is addressing animal nutrition to minimize nutrient feed-through, odor mitigation, and alternative waste handling (including generation of value-added energy). This research is translated to programs that can be implemented by producers, and science-based information is shared with stakeholders, including non-governmental agencies and policy-makers in government, to help guide decisions. A second complex system that requires our input is in the management of forest resources. The balance of forest harvest practices, forest regeneration, air-borne pollution, and deer populations is ultimately responsible for successful forest management. Each of these variables is complex in itself, but a need continues to exist not only for research on the individual variables, but also for system-level research and outreach on the intersection of these variables. Furthermore, the value of the forest being managed is a function of the wood products generated. This industry has been under significant pressure from foreign competition, and new products are needed to revitalize the industry and create new value from our forests. Necessary research encompasses topics like materials research, nanotechnology, bio-based product and bio-derived energy options, and manufacturing techniques to maximize use of the raw material. Water quality and quantity is likely to be a critical agricultural and societal issue in the future; in Pennsylvania, we face issues from quality of private well supplies to the condition of the Chesapeake Bay. The economics of alternative natural resource and environmental decisions must be

examined and optimized. This planned program comprises a set of goals that are very similar to the perspective employed in the agricultural systems planned program -- each individual topic can be taken back to the stakeholders only in the context of the remaining topics.

2. Scope of the Program

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

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

1. Assumptions made for the Program

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

2. Ultimate goal(s) of this Program

Define new value-added, bio-derived products from sources such as wood and manure, and provide economic analyses of the generation of these products as potential business opportunities in Pennsylvania. Develop and implement new odor and nutrient management methods to facilitate the coexistence of animal agriculture, good environmental quality, and land development. 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.

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
2011	31.0	0.0	38.0	0.0
2012	31.0	0.0	38.0	0.0
2013	31.0	0.0	38.0	0.0
2014	31.0	0.0	38.0	0.0
2015	31.0	0.0	38.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

conduct research experiments on odor and nutrient management; conduct research experiments on biobased products and biofuels; conduct research experiments on forest regeneration; conduct educational workshops and meetings on natural resources and environmental issues; develop curricula and resources for natural resources and environmental issues

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

Extension

Direct Methods	Indirect Methods
● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations	● Public Service Announcement ● Newsletters ● TV Media Programs ● Web sites

3. Description of targeted audience

agricultural producers; natural resources managers; policy makers; extension educators; non-governmental organizations; local, state, and federal government agencies; private forest landowners; wood products producers

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	18000	120000	0	0
2012	18000	120000	0	0
2013	18000	120000	0	0
2014	18000	120000	0	0
2015	18000	120000	0	0

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

2011:1 **2012:**1 **2013:**0 **2014:**1 **2015:**0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	0	0	200
2012	0	0	200
2013	0	0	200
2014	0	0	200
2015	0	0	200

V(H). State Defined Outputs

1. Output Target

- Number of invention disclosures submitted.

2011:2	**2012:**1	**2013:**3	**2014:**2	**2015:**2

- Number of people enrolled and/or registered in programs.

2011:15000	**2012:**15000	**2013:**15000	**2014:**15000	**2015:**15000

V(I). State Defined Outcome

O. No.	Outcome Name
1	Number of participants who were evaluated and demonstrated increased knowledge and skills.
2	Number of participants who were evaluated in a follow-up and who implemented/adopted practices.
3	Number of volunteers that helped with program leadership or delivery.

Outcome # 1

1. Outcome Target

Number of participants who were evaluated and demonstrated increased knowledge and skills.

2. Outcome Type : Change in Knowledge Outcome Measure

2011:10000	**2012:**10000	**2013:**10000	**2014:**10000	**2015:**10000

3. Associated Knowledge Area(s)

- 101 - Appraisal of Soil Resources
- 102 - Soil, Plant, Water, Nutrient Relationships
- 104 - Protect Soil from Harmful Effects of Natural Elements
- 112 - Watershed Protection and Management
- 121 - Management of Range Resources
- 122 - Management and Control of Forest and Range Fires
- 123 - Management and Sustainability of Forest Resources
- 124 - Urban Forestry
- 135 - Aquatic and Terrestrial Wildlife
- 136 - Conservation of Biological Diversity
- 141 - Air Resource Protection and Management
- 403 - Waste Disposal, Recycling, and Reuse
- 511 - New and Improved Non-Food Products and Processes

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 2

1. Outcome Target

Number of participants who were evaluated in a follow-up and who implemented/adopted practices.

2. Outcome Type : Change in Action Outcome Measure

2011:9000	**2012:**9000	**2013:**9000	**2014:**9000	**2015:**9000

3. Associated Knowledge Area(s)

- 101 - Appraisal of Soil Resources
- 102 - Soil, Plant, Water, Nutrient Relationships
- 104 - Protect Soil from Harmful Effects of Natural Elements
- 112 - Watershed Protection and Management
- 121 - Management of Range Resources
- 122 - Management and Control of Forest and Range Fires
- 123 - Management and Sustainability of Forest Resources
- 124 - Urban Forestry

- 135 - Aquatic and Terrestrial Wildlife
- 136 - Conservation of Biological Diversity
- 141 - Air Resource Protection and Management
- 403 - Waste Disposal, Recycling, and Reuse
- 511 - New and Improved Non-Food Products and Processes

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 3

1. Outcome Target

Number of volunteers that helped with program leadership or delivery.

2. Outcome Type : Change in Action Outcome Measure

2011:1000	**2012:**1000	**2013:**1000	**2014:**1000	**2015:**1000

3. Associated Knowledge Area(s)

- 101 - Appraisal of Soil Resources
- 102 - Soil, Plant, Water, Nutrient Relationships
- 104 - Protect Soil from Harmful Effects of Natural Elements
- 112 - Watershed Protection and Management
- 121 - Management of Range Resources
- 122 - Management and Control of Forest and Range Fires
- 123 - Management and Sustainability of Forest Resources
- 124 - Urban Forestry
- 135 - Aquatic and Terrestrial Wildlife
- 136 - Conservation of Biological Diversity
- 141 - Air Resource Protection and Management
- 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
- Populations changes (immigration,new cultural groupings,etc.)
- Other (Extramural Funding)

Description

A variety of factors influence potential outcomes in Natural Resources and Environment. This is an area where public policy and regulations can influence the research needs and the delivery of research results to stakeholders through Cooperative Extension. Focus on renewable energy has a profound impact on identification of priorities and action on those priorities. Unexpected natural climate variation continues to influence priority identification. Changing demographics and land use decisions are key drivers for natural resource management. Appropriations could have impact (positive or negative) on recruiting and retention of AES and CES personnel.

It is our hope that key programs will continue to grow in future years, but the challenge of reduced federal funding for agricultural research and extension dictate that we anticipate maintaining current levels of output.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- After Only (post program)
- Retrospective (post program)
- Before-After (before and after program)
- During (during program)
- Case Study
- Comparisons between program participants (individuals,group,organizations) and non-participants
- Other (Direct Observation)

Description

The evaluation of programs will follow the KASI method of measuring changes in knowledge, attitude, skills and impact, along with changes in behavior as outlined in the Logic Model. Specific methods will depend on the type of changes and impact measures needed. Evaluation instruments will be selected from alternatives available at http://www.extension.psu.edu/evaluation/Questions.html.

2. Data Collection Methods

- Sampling
- Whole population
- Mail
- Telephone
- On-Site
- Structured
- Case Study
- Observation
- Other (Focus Groups)

Description

Data collection methods will depend on the needs of the issue team. Issue teams are charged with the development of evaluation methods. Again, the appropriate evaluation method will be identified and implemented using selections from the http://www.extension.psu.edu/evaluation/Questions.html.

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Pest Management

2. Brief summary about Planned Program

Effective pest management strategies have been at the heart of Penn State excellence for many years. As new pests emerge, as our crop portfolio shifts, and as environmental knowledge and rules change, we are faced with the continued need to devise new strategies that acknowledge these changes and take advantage of emerging technologies. Production of high quality, pest-free agricultural products while minimizing the use of pesticides is a continuing challenge. Penn State focuses on integrated pest management, attempting to treat pest management from a systems approach. Stakeholders in this planned program are primarily agricultural producers and agricultural support industries. An increasingly important group of stakeholders is the general public, both as consumers of agricultural products (e.g., interest in healthy products produced with minimal pesticides) and through pest management decisions in school, business, and residential environments. Our work, both the research base and the related extension programs, also inform government agency policies and programs. This planned program is closely related to activities in all of our other planned programs, but the agricultural and food biosecurity and agricultural systems programs are especially connected. The development of monitoring and predictive tools to assess pest presence and spread, the accurate diagnosis of pest species, and the integration of pest control into other management decisions are all key areas that are synergized by other planned programs in our AES and extension portfolios. Many of our pest management activities are organized around regional or statewide multidisciplinary, multifunctional teams (as appropriate for specific commodities). This is also a planned program that works in a multistate environment, as many of the pest/crop combinations are regional or national in scope. Key focus areas for research include alternative biologically-based pest control strategies, development of monitoring tools to better identify and track movement of pests, geospatially-referenced predictive models for anticipating management needs, and area-wide approaches to replace local management decisions. These research efforts will support producers interested in organic and sustainable agricultural production, a growing segment of our farm population. All of this research can be translated into practice almost immediately through our extension programming, and data gaps are revealed by interactions with producers in real time.

3. Program existence : Mature (More then 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
211	Insects, Mites, and Other Arthropods Affecting Plants	8%		23%	
212	Pathogens and Nematodes Affecting Plants	13%		21%	
213	Weeds Affecting Plants	7%		7%	
214	Vertebrates, Mollusks, and Other Pests Affecting Plants	7%		0%	
215	Biological Control of Pests Affecting Plants	12%		7%	
216	Integrated Pest Management Systems	28%		20%	
311	Animal Diseases	8%		16%	
404	Instrumentation and Control Systems	2%		2%	
901	Program and Project Design, and Statistics	8%		2%	
902	Administration of Projects and Programs	7%		2%	
	Total	100%		100%	

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

1. Situation and priorities

Crop production in Pennsylvania is extremely diverse, creating challenges for research and extension to provide effective pest management advice. New pests appear regularly, and existing pests evolve resistance to current management practices. Pressure to develop integrated and biologically-based pest management strategies is driven by these facts and the wishes of our stakeholders to have blemish-free produce with a minimum of pesticide exposure. Much of our ability to recommend alternative control measures and reduced pesticide applications derives from prompt, accurate recognition of pests (diagnosis and scouting) and a good understanding of geographic and temporal distributions of the pests (population dynamics). Thus, Pennsylvania AES scientists need to work with extension professionals and stakeholders to build a better knowledge of the biology of key pests. Research knowledge needs to be translated into decision support tools and new control measures. Our past work in integrated pest management provides an important baseline for these efforts, but the changing face of agricultural production and concomitant changes in pest profiles mean that new challenges await us. Success in this planned program will be closely tied to managing Pennsylvania agriculture as a system, and many of the approaches needed to manage routine pest pressure in crops are identical to the tools that will address agricultural and food biosecurity. New stakeholders in the urbanizing environment are interested in the same outcomes (new reduced-pesticide strategies) for the home, school, and workplace, and we will continue to reach out to them as new customers for our science-based recommendations.

2. Scope of the Program

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

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

1. Assumptions made for the Program

Funding will remain constant or increase in support of this planned program. The suite of pests for which new management strategies are needed will continue to expand as pest introductions occur, as new crops are added by Pennsylvania producers, and as resistance and regulations reduce the breadth of available pest control alternatives. An integrated approach that considers the biology of the pest and the environment in which the pest must be managed (e.g., farm vs. forest vs. dwelling) will be the most rational choice of pest management strategies. Producers seeking low-input pest management strategies will become a larger segment of our clientele.

2. Ultimate goal(s) of this Program

Develop a geospatially referenced predictive modeling capacity that can be adapted to accommodate the particular biological characteristics of multiple pests, and refine these general models to provide decision support to agricultural producers and other pest management professionals. Develop molecular and classical diagnostic tools for pests to Pennsylvania agriculture, and more effectively link this diagnostic capacity with local audiences through extension professionals. Deliver this research base to end users through multifunctional, multidisciplinary teams that operate with a systems approach to pest management.

V(E). Planned Program (Inputs)

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

Year	Extension		Research	
	1862	1890	1862	1890
2011	40.0	0.0	70.0	0.0
2012	40.0	0.0	70.0	0.0
2013	40.0	0.0	70.0	0.0
2014	40.0	0.0	70.0	0.0
2015	40.0	0.0	70.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

conduct research experiments on diagnostic tools for plant pathogens; conduct research experiments on predictive models; conduct research experiments on plant pests; conduct educational workshops and meetings on pest management; develop curricula and resources for effective pest management; partner with state agencies on integrated pest management

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

Extension

Direct Methods	Indirect Methods
● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations	● Public Service Announcement ● Newsletters ● TV Media Programs ● Web sites

3. Description of targeted audience

agricultural producers, policy makers, state agencies, extension educators, crop consultants, teachers

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	31000	34000	0	0
2012	31000	34000	0	0
2013	31000	34000	0	0
2014	31000	34000	0	0
2015	31000	34000	0	0

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

2011:5 **2012:**5 **2013:**5 **2014:**5 **2015:**5

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	0	0	200
2012	0	0	200
2013	0	0	200
2014	0	0	200
2015	0	0	200

V(H). State Defined Outputs

1. Output Target

- Number of invention disclosures submitted.

  2011:2 **2012:**1 **2013:**2 **2014:**1 **2015:**2

- Number of people enrolled and/or registered in programs.

  2011:32000 **2012:**32000 **2013:**32000 **2014:**32000 **2015:**32000

V(I). State Defined Outcome

O. No.	Outcome Name
1	Number of participants who were evaluated and demonstrated increased knowledge and skills.
2	Number of participants who were evaluated in a follow-up and who implemented/adopted practices.
3	Number of volunteers that helped with program leadership or delivery.
4	Number of decision support tools adopted based upon predictive modeling research.
5	Number of diagnostic tools implemented or adopted for pest identification.

Outcome # 1

1. Outcome Target

Number of participants who were evaluated and demonstrated increased knowledge and skills.

2. Outcome Type : Change in Action Outcome Measure

2011:1000	**2012:**1000	**2013:**1000	**2014:**1000	**2015:**1000

3. Associated Knowledge Area(s)

- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Pathogens and Nematodes Affecting Plants
- 213 - Weeds Affecting Plants
- 214 - Vertebrates, Mollusks, and Other Pests Affecting Plants
- 215 - Biological Control of Pests Affecting Plants
- 216 - Integrated Pest Management Systems
- 311 - Animal Diseases
- 404 - Instrumentation and Control Systems
- 901 - Program and Project Design, and Statistics
- 902 - Administration of Projects and Programs

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 2

1. Outcome Target

Number of participants who were evaluated in a follow-up and who implemented/adopted practices.

2. Outcome Type : Change in Action Outcome Measure

2011:50	**2012:**50	**2013:**50	**2014:**50	**2015:**50

3. Associated Knowledge Area(s)

- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Pathogens and Nematodes Affecting Plants
- 213 - Weeds Affecting Plants
- 214 - Vertebrates, Mollusks, and Other Pests Affecting Plants
- 215 - Biological Control of Pests Affecting Plants
- 216 - Integrated Pest Management Systems
- 311 - Animal Diseases
- 404 - Instrumentation and Control Systems
- 901 - Program and Project Design, and Statistics
- 902 - Administration of Projects and Programs

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 3

1. Outcome Target

Number of volunteers that helped with program leadership or delivery.

2. Outcome Type : Change in Action Outcome Measure

2011:60	**2012:**60	**2013:**60	**2014:**60	**2015:**60

3. Associated Knowledge Area(s)

- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Pathogens and Nematodes Affecting Plants
- 213 - Weeds Affecting Plants
- 214 - Vertebrates, Mollusks, and Other Pests Affecting Plants
- 215 - Biological Control of Pests Affecting Plants
- 216 - Integrated Pest Management Systems
- 311 - Animal Diseases
- 404 - Instrumentation and Control Systems
- 901 - Program and Project Design, and Statistics
- 902 - Administration of Projects and Programs

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 4

1. Outcome Target

Number of decision support tools adopted based upon predictive modeling research.

2. Outcome Type : Change in Condition Outcome Measure

2011:1	**2012:**1	**2013:**1	**2014:**1	**2015:**1

3. Associated Knowledge Area(s)

- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Pathogens and Nematodes Affecting Plants
- 213 - Weeds Affecting Plants
- 214 - Vertebrates, Mollusks, and Other Pests Affecting Plants
- 215 - Biological Control of Pests Affecting Plants
- 216 - Integrated Pest Management Systems
- 311 - Animal Diseases

- 404 - Instrumentation and Control Systems
- 901 - Program and Project Design, and Statistics
- 902 - Administration of Projects and Programs

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 5

1. Outcome Target

Number of diagnostic tools implemented or adopted for pest identification.

2. Outcome Type : Change in Condition Outcome Measure

2011:1	**2012:**1	**2013:**1	**2014:**1	**2015:**1

3. Associated Knowledge Area(s)

- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Pathogens and Nematodes Affecting Plants
- 213 - Weeds Affecting Plants
- 214 - Vertebrates, Mollusks, and Other Pests Affecting Plants
- 215 - Biological Control of Pests Affecting Plants
- 216 - Integrated Pest Management Systems
- 311 - Animal Diseases
- 404 - Instrumentation and Control Systems
- 901 - Program and Project Design, and Statistics
- 902 - Administration of Projects and Programs

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

A variety of factors influence potential outcomes in Pest Management. Public policy and regulations can influence the research needs and the delivery of research results to stakeholders through Cooperative Extension and technology transfer. Natural disasters (e.g., drought and floods) impact research work and occasionally dictate Cooperative Extension programming priorities. Appropriations could have impact (positive or negative) on recruiting and retention of AES and CES personnel.

It is our hope that key programs will continue to grow in future years, but the challenge of reduced federal funding for agricultural research and extension dictate that we anticipate maintaining current levels of output.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- After Only (post program)
- Retrospective (post program)
- Before-After (before and after program)
- During (during program)
- Case Study
- Comparisons between program participants (individuals,group,organizations) and non-participants
- Other (Direct Observation)

Description

The evaluation of programs will follow the KASI method of measuring changes in knowledge, attitude, skills and impact, along with changes in behavior as outlined in the Logic Model. Specific methods will depend on the type of changes and impact measures needed. Evaluation instruments will be selected from alternatives available at http://www.extension.psu.edu/evaluation/Questions.html.

2. Data Collection Methods

- Sampling
- Whole population
- Mail
- Telephone
- On-Site
- Structured
- Case Study
- Observation
- Tests
- Other (Focus Groups)

Description

Data collection methods will depend on the needs of the issue team. Issue teams are charged with the development of evaluation methods. Again, the appropriate evaluation method will be identified and implemented using selections from the http://www.extension.psu.edu/evaluation/Questions.html.

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Global Food Security and Hunger

2. Brief summary about Planned Program

This priority science area and new program reporting area will focus and capture the efforts of multidisciplinary program teams across the system. No program focuses exclusively on new science and outreach to boost U.S. agricultural production, improve global capacity to meet the growing food demand, and foster innovation in fighting hunger by addressing food security for everyone. However, multiple areas of research and extension programs contribute to this area. We will refocus and redirect existing research and extension activities that can be captured within this priority area. Programs areas that will contribute to this new focus will include but not be limited to existing and new research and extension programs addressing agriculture productivity. Programs will not only help producers increase production but also improve sustainability. New discoveries in biotechnology will add value as exports to developing nations. Hunger experienced by specific local, regional, or national, populations can be the effect of climate and weather conditions for a specific geographic area and by incidents such as a natural disaster or political unrest. Food shortages and hunger for special populations can be alleviated by planning and implementing strategic educational initiatives to address the uncertainty of the events of the future. Assuring an adequate and safe food supply for local and world populations begins at the most local level; the farm. Research and extension will continue to provide growers with the science-based information to enhance production without negative environmental impact. Enhanced local and regional food systems will reduce environmental impact including a reduced carbon footprint. As world populations increase, U.S. food production capability will become instrumental in addressing the need for more food. Penn State developed technology and modern science based resources can be a solution to help solve world hunger when exported and adopted by food producing nations around the world. Hunger is real, but can be minimized if not eliminated by adoption of sustainable food production methods based on research and extension programs that focus on efficiently increased production with a sustainability and environmental stewardship focus.

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

3. Program existence : New (One year or less)

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
606	International Trade and Development	35%		36%	
611	Foreign Policy and Programs	25%		46%	
722	Zoonotic Diseases and Parasites Affecting Humans	40%		18%	
	Total	100%		100%	

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

1. Situation and priorities

The world population is growing. Some populations are currently undernourished. The global economy is increasingly affected by political decisions, weather variations, and factors that cannot be affected by individuals. For stable economies and more developed nations, there is increasing expectations to assist in feeding the hungry. United States food production is a world leader in efficiency and productivity. Pennsylvania is one of the national leaders in the production of numerous commodities. The competitive yet sustainable level of production in Pennsylvania and the United States will be expected to produce more food for local, regional, national, and international populations. It is imperative that the producers of agriculture food commodities adopt science-based production methods to remain a leader in food production. Penn State research and extension will provide the information to assist producers, food processors and manufacturers, distributors and retailers with adequate supplies of safe, wholesome food for a world market.

Priorities for research and extension will be to maintain or enhance productivity while reducing inputs. Environmental factors such as air, water, and soil quality will be improved. The energy needed to produce more food will be reduced. The carbon and nitrogen footprint from food production will be lessened. Plant and animal breeding will increase productivity and feed efficiency. The world food production nations will use science based research and education discovered and developed for practical application at Penn State. The effect of lower production from pest and diseases will be minimized or reduced by the adoption of research discoveries from Penn State scientists. Pennsylvania food producers and processors will be competitive in local, regional, national, and world markets.

2. Scope of the Program

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

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

1. Assumptions made for the Program

Programs will be dependent upon: enhanced competitive grant success; multi-state, multi-disciplined task force approach; holistic approach to solve multiple problems simultaneously which will require integrated research in both basic and applied research and then translated to extension programs across several disciplines; research and extension will need to work together to identify issues and efforts to solve problems not symptoms; enhanced local community interaction with partners and collaborators; and environmental regulations and policies.

2. Ultimate goal(s) of this Program

The ultimate goals for research and extension activities in Global Food Security and Hunger are:

1. To keep Pennsylvania and United States agriculture competitive while reducing global food insecurity.

2. Agriculture producers will adopt production practices that are economically and environmentally favorable that will allow them to maintain a sustainable and competitive position in the world market. Foci will be on sustainable practices, enhanced control of greater numbers of diseases and pests with minimal economic, environmental and social impact, reduction in real and perceived risks associated with the use of genetically modified varieties and species, antibiotics, pesticides, increased productivity with fewer inputs, and increased expertise and technology that can be exported globally.

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
2011	9.0	0.0	7.0	0.0
2012	9.0	0.0	7.0	0.0
2013	9.0	0.0	7.0	0.0
2014	9.0	0.0	7.0	0.0
2015	9.0	0.0	7.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

AES and CES will partner to identify the changing needs of individuals, families, businesses, communities, and larger populations. Increased market analysis and needs assessment will determine the critical questions and needs of various populations that can be addressed and solved through the land-grant mission. Program advisory groups and other government and non-government stakeholder groups will be encouraged to work collaboratively across disciplines. Extension's NWGs will take a trans-disciplinary team approach in order to take a more global approach to problems that affect global food security and hunger. There will be an effort to help society understand the interconnectiveness and complexity of the food and agriculture system and how the decisions and actions of a single individual may affect others down-stream, down-wind, across the community, or on the other side of the globe. As a more global community, research and extension programs must focus on educating our audiences about the complex food and agriculture system. At the local level, research and extension programs will help producers increase yields and improve the sustainability of production agriculture. Consumer education will result in a population that is more capable of making food purchasing decisions that will provide a more nutritious, safer, economical, and healthy diet. Processors will be educated to improve quality control management. A variety of educational methodologies will be deployed including one-on-one, group education, conference and workshops, published information, web-based information, and web-based interaction. Teams of scientists, educators, and industry and agency representatives will collaborate to provide a more comprehensive approach than what can be accomplished by any one entity. Market enhancement at the local, regional, and world levels will be a priority.

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

Extension

Direct Methods	Indirect Methods

● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Other 1 (multi-discipline teams)	● Newsletters ● Web sites

3. Description of targeted audience

The Food and Agriculture sector audience is very diverse and complex and includes a wide range of producers to consumers. Targeted audiences will include farmers who raise small fruit, tree fruit, vegetables, or agronomic crops used for human food; agronomic crops used for animal feed, dairy producers, livestock producers, poultry producers, aquaculture producers, and other specialty crop and unique food product producers; commodity organizations that represent the various crop and animal food products and the distribution of these products; companies that process and manufacture food from the raw materials; and local, state, and federal agencies who have interest or responsibility for the safety and security of food products. Within the food service area, restaurant, institutional food preparation, grocery stores, and food serving entities are a targeted audience specifically for safe food handling and preparation education from extension. The consuming public, every person, is also a target audience, including resource limited individuals and families. Educational programs teach individuals about diet, nutrition and healthy eating, food budgeting, and food safety. Global populations, developing and stressed nations, and the agriculture commodity producers and consumers world-wide will be a new audience that will benefit from research of discovery and outreach of education.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	2000	2000	0	0
2012	2000	2000	0	0
2013	2000	2000	0	0
2014	2000	2000	0	0
2015	2000	2000	0	0

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

2011:1 **2012:**1 **2013:**1 **2014:**1 **2015:**1

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	0	0	20
2012	0	0	20
2013	0	0	20

Year	Research Target	Extension Target	Total
2014	0	0	20
2015	0	0	20

V(H). State Defined Outputs

1. Output Target

- Number of invention disclosures submitted.

2011:1 **2012:**0 **2013:**1 **2014:**0 **2015:**1

- Number of people enrolled and/or registered in programs.

2011:1800 **2012:**1800 **2013:**1800 **2014:**1800 **2015:**1800

V(I). State Defined Outcome

O. No.	Outcome Name
1	Number of participants who were evaluated and demonstrated increased knowledge and skills.
2	Number of participants who were evaluated in a follow-up and who implemented/adopted practices.
3	Number of volunteers that helped with program leadership or delivery.

Outcome # 1

1. Outcome Target

Number of participants who were evaluated and demonstrated increased knowledge and skills.

2. Outcome Type : Change in Knowledge Outcome Measure

2011:50	**2012:**50	**2013:**50	**2014:**50	**2015:**50

3. Associated Knowledge Area(s)

- 606 - International Trade and Development
- 611 - Foreign Policy and Programs
- 722 - Zoonotic Diseases and Parasites Affecting Humans

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 2

1. Outcome Target

Number of participants who were evaluated in a follow-up and who implemented/adopted practices.

2. Outcome Type : Change in Action Outcome Measure

2011:50	**2012:**50	**2013:**50	**2014:**50	**2015:**50

3. Associated Knowledge Area(s)

- 606 - International Trade and Development
- 611 - Foreign Policy and Programs
- 722 - Zoonotic Diseases and Parasites Affecting Humans

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 3

1. Outcome Target

Number of volunteers that helped with program leadership or delivery.

2. Outcome Type : Change in Action Outcome Measure

2011:70	**2012:**70	**2013:**70	**2014:**70	**2015:**70

3. Associated Knowledge Area(s)

- 606 - International Trade and Development
- 611 - Foreign Policy and Programs

- 722 - Zoonotic Diseases and Parasites Affecting Humans

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

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

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Retrospective (post program)
- Before-After (before and after program)
- During (during program)
- Comparisons between program participants (individuals,group,organizations) and non-participants

Description

Qualitative and quantitative measurement will be needed to assess the impact from scientific discovery and application of science-based solutions to problems affecting individuals, families, businesses, and communities. Specific methods of evaluation will include retrospective, before and after, during and comparisons between different groups of individuals of program participants experiencing different levels of program intensity. Evaluations will measure outcomes to improved health, improved economic situation, more sustainable businesses, more resilient communities, more localized food systems, less risk to the food system, improved safeguards to the food and agriculture system, increased yields, lower or steady cost of production, improved

environmental conditions, and improved water quality. Scientific predictive modeling will provide measurement of the effectiveness of educational intervention for the improved surveillance and detection for pests and diseases.

2. Data Collection Methods

- Sampling
- On-Site
- Structured
- Unstructured
- Observation
- Tests
- Other (Small Group Intervention)

Description

With increased emphasis on solving problems, the philosophy to evaluation and data collection will need to migrate more towards practice change and adoption of best management practices which can be documented by a positive impact. Numbers of contacts, improved knowledge, and improved attitudes about problems facing society will be important, but the true measure of effectiveness and the documentation of a positive return on investment in resources will need to be measured by positive impact--how the adoption of science-based answers to real questions from the public; results in positive economic gain; increased yield; and a more nutritious, safer, and affordable food to a more diverse and more widely distributed population. With increased capabilities to scan larger numbers of samples with more precise analysis, food, water, and air quality standards can continue to improve. Post delivery (follow-up) assessment will provide a more accurate assessment of mid and longer term impact for educational intervention. Pre and post assessment will provide short term perceived impact of educational intervention, but to significantly have a positive impact on solving global food security and hunger problems, there will need to be longer term assessment of impacts. Longer term interaction with clientele will provide documentation for trends that occur as the result of education.

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Climate Change

2. Brief summary about Planned Program

Programs will address the full breath of climate change sciences spanning physical-, biological-, and social uncertainties, risks, and responses, those that are underway as well as those on the frontier. Robust research and extension will foster interdisciplinary, multi-functional teams and approaches that will link multiple institutions and span, connect, and garner resources that can measure, forecast, and specify the complexities of climate change in context to priority sectors including water quality and quantity, air quality (greenhouse gas emissions, carbon sequestration in working lands), risk assessment, and decision making as well as the emerging paradigms for sustainable agriculture and forestry. Research and extension will support carbon sequestration, mitigation of greenhouse gases, and development of science informed policies for supporting management of multi-functional working lands with enhancement of the ecosystems services they can provide. Furthermore, the stresses of change on biodiversity from the molecular through population levels will be critically addressed within this approach. Interdisciplinary, multifunctional teams are essential to the identification of critical gaps and for addressing the emerging frontiers within climate change that will enable the integrated approaches necessary for addressing the complexities of climate change.

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

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

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

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

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

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
103	Management of Saline and Sodic Soils and Salinity	15%		2%	
111	Conservation and Efficient Use of Water	15%		6%	
132	Weather and Climate	13%		6%	
133	Pollution Prevention and Mitigation	15%		33%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	15%		25%	
306	Environmental Stress in Animals	15%		6%	
605	Natural Resource and Environmental Economics	12%		22%	
	Total	100%		100%	

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

1. Situation and priorities

A multi-disciplinary, integrated team of researchers led by the Penn State College of Agricultural Sciences Environment and Natural Resources Institute (ENRI) is working with the Commonwealth of Pennsylvania in response to Pennsylvania's Act 70 of 2008 which mandated a specific analysis of the potential impact to multiple sectors in response to climate change. In partnership with the Pennsylvania Department of Environmental Protection and the state's Climate Change Advisory Committee, researchers developed the Pennsylvania Climate Impact Assessment (June 2009) which inventories the potential impacts of global climate change on Pennsylvania's climate, human health, the economy and management of economic risk, forests, wildlife, fisheries, recreation, energy, agriculture, and tourism. The assessment comprehensively identifies both the opportunities and barriers created by the need for alternative sources of energy, climate-related technologies, services and strategies, carbon sequestration technologies, capture and utilization of fugitive greenhouse gas emissions, and other mitigation strategies. The assessment used a mixture of approaches including integrated quantitative modeling of sectors and extensive stakeholder engagement. While the findings are based on readily available data, literature, and preliminary quantitative analyses, a more in depth analysis is required because of the currently limited scientific literature addressing the impacts of projected climate change in Pennsylvania. The primary findings under selected warming scenarios include: 1) annual precipitation is expected to increase between six and ten percent, 2) warming will lead to longer growing seasons with corresponding frost day decreases, 3) precipitation will become more extreme with longer dry periods and greater intensity of precipitation and 4) there is substantial uncertainty relative to future tropic and extra-tropical cyclones for the state (including suggestions of fewer storms with increased intensity). Research and extension expected to stem from the assessment address all aspects of adaptive management, risk communication, and sector specific responses. Extension has established a program team within the Renewable Natural Resources group titled "Climate Change and Renewable Natural Resources" which is focused on translating models for incorporation at the forest manager level given that 70% of Pennsylvania forests are under private ownership providing extensive need and opportunity for implementation of adaptive management strategies that will increase the likelihood of sound science based land use decisions.

2. Scope of the Program

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

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

1. Assumptions made for the Program

The assumptions made for this program focus largely on Pennsylvania specific research and extension as assessed for Pennsylvania audiences, decision makers, and sectors. However, development of research and extension approaches for climate change sciences will be applicable across the Mid-Atlantic region, within the Chesapeake Bay-, Great Lakes-, and Ohio/Mississippi River watersheds. Climate change studies necessitate scaling from the local stream reaches and local water quality/quantity impacts up to the watershed-, regional-, and estuary/bay levels. Research focused on place-based adaptive management strategies will result in scalable approaches for informing decision making at higher order physiographic scales. Penn State has demonstrated through its leadership for CARA (Consortium for Atlantic Regional Assessment "...anticipating and planning for changes in land cover and climate -- regionally and locally" that it effectively facilitates multi-institutional research and delivery approaches. Over the past year, and in response to the NOAA/Department of Energy's Regional Integrated Sciences and Assessments (RISA) for the Susquehanna/Mid-Atlantic/Northeastern area, Penn State College of Agricultural Sciences coordinated development of two separate proposals collaborating across Northeastern and Mid-Atlantic universities including Cornell, Maryland, and Virginia Tech. A continued emphasis on building multi-institutional approaches will be a high priority for addressing regional to global research and Extension questions that will inform stakeholder groups and sectors on adaptive strategies.

2. Ultimate goal(s) of this Program

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

V(E). Planned Program (Inputs)

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

Year	Extension		Research	
	1862	1890	1862	1890
2011	3.0	0.0	21.0	0.0
2012	3.0	0.0	21.0	0.0
2013	3.0	0.0	21.0	0.0
2014	3.0	0.0	21.0	0.0
2015	3.0	0.0	21.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

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

In addition to the renewable natural resource Extension webinar series, an on-going delivery mechanism that targets practitioners working with Pennsylvania producers will continue to feature whole farm systems approaches to greenhouse gas (GHG) reduction and mitigation. This program is delivered through webinars and incorporates research and Extension on best practices for air and water quality protection including best management practices (BMPs) that reduce emissions of GHGs. Researchers in Dairy and Animal Sciences, Poultry Sciences, Crop and Soil Sciences, Agricultural and Biological Engineering, and Agricultural Economics and Rural Sociology serve as the content specialists for framing the Extension messages for whole farm emissions reduction and GHG mitigation.

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

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

Extension

Direct Methods	Indirect Methods

● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations	● Newsletters ● TV Media Programs ● Web sites

3. Description of targeted audience

The targeted audience focus includes working land managers (agriculture and forests), local-, regional-, and state governments, nongovernmental organizations (environmental and agriculture) and the other public and private sector practitioners who work in support of them.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	10000	6000	0	0
2012	10000	6000	0	0
2013	10000	6000	0	0
2014	10000	6000	0	0
2015	10000	6000	0	0

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

2011:1 **2012:**0 **2013:**1 **2014:**0 **2015:**1

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	0	0	100
2012	0	0	100
2013	0	0	100
2014	0	0	100
2015	0	0	100

V(H). State Defined Outputs

1. Output Target

- Number of invention disclosures submitted.

2011:0	**2012:**1	**2013:**0	**2014:**1	**2015:**0

- Number of people enrolled and/or registered in programs.

2011:8400	**2012:**8400	**2013:**8400	**2014:**8400	**2015:**8400

V(I). State Defined Outcome

O. No.	Outcome Name
1	Number of participants who were evaluated and demonstrated increased knowledge and skills.
2	Number of participants who were evaluated in a follow-up and who implemented/adopted practices.
3	Number of volunteers that helped with program leadership or delivery.

Outcome # 1

1. Outcome Target

Number of participants who were evaluated and demonstrated increased knowledge and skills.

2. Outcome Type : Change in Knowledge Outcome Measure

2011:500	**2012:**500	**2013:**500	**2014:**500	**2015:**500

3. Associated Knowledge Area(s)

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

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 2

1. Outcome Target

Number of participants who were evaluated in a follow-up and who implemented/adopted practices.

2. Outcome Type : Change in Action Outcome Measure

2011:200	**2012:**200	**2013:**200	**2014:**200	**2015:**200

3. Associated Knowledge Area(s)

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

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 3

1. Outcome Target

Number of volunteers that helped with program leadership or delivery.

2. Outcome Type : Change in Action Outcome Measure

2011:400	**2012:**400	**2013:**400	**2014:**400	**2015:**400

3. Associated Knowledge Area(s)

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

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

Extramural funding for the research gaps identified is paramount and will continue to be sought on a competitive basis.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- After Only (post program)
- Before-After (before and after program)
- Case Study
- Comparisons between program participants (individuals,group,organizations) and non-participants

Description

Extension programs will be evaluated through application of pre- and post program survey instruments including online-based, interview, and comparative studies.

2. Data Collection Methods

- Sampling
- On-Site
- Unstructured
- Case Study

Description

Data collection consists of sampling of program participants, on-site surveys, and interviews. Additional methods will continue to be developed and applied for increasing robustness of collection and evaluation.

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Sustainable Energy

2. Brief summary about Planned Program

The development of sustainable, domestic energy supplies is critical for continued economic growth, reductions of carbon emissions, and reduced dependence on foreign oil supplies. Sustainable energy development, however, is a function of federal, state, and local policies. Penn State is a key player in the development of sustainable energy strategies throughout the mid-Atlantic region. A major initiative relates to the sizeable Marcellus Shale natural gas resource currently under development throughout the state. The Penn State Marcellus Education Team helps individuals, families, businesses, public officials, and communities throughout Pennsylvania better understand and act upon the opportunities and challenges arising from Marcellus Shale and its development. We are committed to providing unbiased, research-based information. This program addresses a multitude of issues associated with the development of the Marcellus resource including leasing considerations, exploration technology, tax implications, potential impacts on water quality, community development issues, and management of royalty income. Another major initiative is focused on the development of renewable energy resources and includes both research and extension initiatives. Research initiatives in the AES involve the development of various woody biomass, waste, crop residue, and bioenergy crop development activities. Our programs focus on the sustainable development of these resources, by developing an understanding of the feedstock resource and its potential contribution to the alternative energy marketplace, the development of harvesting technologies that minimize environmental impact, and the development of utilization technologies that maximize energy efficiency and minimize air emissions. Our faculty partner with local communities, feedstock producers, and renewable energy developers to develop appropriate strategies for the development of alternative energy strategies. Outreach efforts in this area have focused on engaging communities and partners. Current collaborative projects underway include the development of a community based heat and power facility based on local woody biomass, the development of a biomass based heat system for a school building complex, and a biomass co-firing project in conjunction with a state penitentiary. Another key extension objective is to help clientele understand and utilize environment credits associated with renewable energy projects. These include renewable energy credits, nutrient trading credits, and carbon credits. Another key focus of our sustainable energy outreach is energy efficiency for consumers and agricultural enterprises, which is especially critical this year as electricity rates in the state are being deregulated and expected to rise by 30 to 50% in some areas. Our educational programs in this area are coordinated with utilities and state and federal agencies to maximize our effectiveness. Tactics such as managing demand, selecting a lower cost supplier, maximizing energy efficiency, and employing low cost energy conservation strategies can help clientele minimize the impacts of rising electric rates.

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

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

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

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

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
125	Agroforestry	40%		19%	
131	Alternative Uses of Land	20%		62%	
202	Plant Genetic Resources and Biodiversity	40%		19%	
	Total	100%		100%	

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

1. Situation and priorities

A rapidly changing situation in the sustainable energy issue has caused the AES to rapidly adapt to needs of our clientele base. The discovery of a significant Marcellus Natural Gas resource has generated an unprecedented need for information on wide range of topics for a diverse clientele ranging from landowners, local government officials, concerned citizens. Initially the interest focused on the potential of the resource and potential economic considerations, but rapidly evolved into environmental, community impacts, and financial management issues. Since 2004, state and federal initiatives have encouraged the development of alternative energy resources in the state. At the federal level, the Renewable Fuel Standard has provided mandates for alternative fuels such as ethanol and biodiesel and has recently been updated to include advanced biofuels from a wider array of feedstocks and processing technologies. Federal tax credits for biofuels have resulted in a rapid expansion of the industry in Pennsylvania with ethanol production capacity in the state now exceeding 100 million gallons/year and biodiesel capacity at over 50 million gallons per year. At the state level, renewable power standards have stimulated the development of solar, wind, biomass, and other renewable energy production tactics. Stimulus funding has helped to spur the development of many renewable energy projects throughout the state, providing examples of potential technologies that can be further exploited in the future. Volatile oil prices have stimulated investment in combustion technologies that can help to reduce the states dependence on fuel oil as a heating source.

2. Scope of the Program

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

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

1. Assumptions made for the Program

Funding will remain constant or increase in support of this planned program. Marcellus development will continue in the state and our programs will evolve to meet the needs of clientele. Development will likely expand across the state and experiences from initial lease and drilling will provide a basis for future programming. Clientele and local governments will likely continue to require educational programs as drilling intensifies in the state as tax and environmental policies evolve around this issue. Similarly, as renewable energy technologies evolve and mandates for increased levels of renewable and alternative energy are implemented, there will be a continued need for research and outreach associated with the development of these technologies and government policies.

2. Ultimate goal(s) of this Program

The ultimate goal of the sustainable energy program is to help society develop sustainable energy resources from traditional sources such as natural gas and also from renewable resources such as wind, solar, waste, woody biomass or energy crops in the state. As part of this goal our institution can provide a research and development role for some of these technologies and provide and voice in the science based development of effective state and local policies surrounding these energy resources. Our goal is also to create an informed clientele through our educational programs who make informed decisions regarding energy development that lead to a more sustainable future for our state and nation.

V(E). Planned Program (Inputs)

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

Year	Extension		Research	
	1862	1890	1862	1890
2011	10.0	0.0	2.0	0.0
2012	10.0	0.0	2.0	0.0
2013	10.0	0.0	2.0	0.0
2014	10.0	0.0	2.0	0.0
2015	10.0	0.0	2.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

The outreach portions of the Marcellus Shale and Renewable Energy programs will consist of the development of specialized extension program teams focused on these efforts. These teams will develop a series of educational events targeted at identified clientele needs. Based on the recent programming, these will include conferences, tours, webinars, local meetings, newsletters, publications, on-line resource materials, and new technologies such as videos and other web technologies. We will also be engaged in local project development and monitoring and the development of case studies from these experiences. We have developed a workshop series for our research staff and will continue to develop an array of field and laboratory studies targeted at understanding ways to develop new sustainable feedstock resources for renewable energy production.

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

Extension

Direct Methods	Indirect Methods
● Education Class	● Newsletters
● Workshop	● TV Media Programs
● Group Discussion	● Web sites
● One-on-One Intervention	● Other 1 (Press Releases)
● Demonstrations	

3. Description of targeted audience

Landowners, energy project developers, state and federal agency personnel, extension educators, community leaders, and the general public.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	1900	5700	0	0
2012	1900	5700	0	0
2013	1900	5700	0	0
2014	1900	5700	0	0
2015	1900	5700	0	0

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

2011:1 **2012:**0 **2013:**1 **2014:**0 **2015:**1

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	0	0	40
2012	0	0	40
2013	0	0	40
2014	0	0	40
2015	0	0	40

V(H). State Defined Outputs

1. Output Target

- Number of invention disclosures submitted.

  2011:1 **2012:**0 **2013:**1 **2014:**0 **2015:**1

- Number of people enrolled and/or registered in programs.

  2011:1700 **2012:**1700 **2013:**1700 **2014:**1700 **2015:**1700

V(I). State Defined Outcome

O. No.	Outcome Name
1	Number of participants who were evaluated and demonstrated increased knowledge and skills.
2	Number of participants who were evaluated in a follow-up and who implemented/adopted practices.
3	Number of volunteers that helped with program leadership or delivery.

Outcome # 1

1. Outcome Target

Number of participants who were evaluated and demonstrated increased knowledge and skills.

2. Outcome Type : Change in Knowledge Outcome Measure

2011:200	**2012:**200	**2013:**200	**2014:**200	**2015:**200

3. Associated Knowledge Area(s)

- 125 - Agroforestry
- 131 - Alternative Uses of Land
- 202 - Plant Genetic Resources and Biodiversity

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 2

1. Outcome Target

Number of participants who were evaluated in a follow-up and who implemented/adopted practices.

2. Outcome Type : Change in Action Outcome Measure

2011:5	**2012:**5	**2013:**5	**2014:**5	**2015:**5

3. Associated Knowledge Area(s)

- 125 - Agroforestry
- 131 - Alternative Uses of Land
- 202 - Plant Genetic Resources and Biodiversity

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 3

1. Outcome Target

Number of volunteers that helped with program leadership or delivery.

2. Outcome Type : Change in Action Outcome Measure

2011:10	**2012:**10	**2013:**10	**2014:**10	**2015:**10

3. Associated Knowledge Area(s)

- 125 - Agroforestry
- 131 - Alternative Uses of Land

- 202 - Plant Genetic Resources and Biodiversity

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Economy
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

Description

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

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- After Only (post program)
- Retrospective (post program)
- During (during program)
- Case Study

Description

The evaluation of programs will follow the KASI method of measuring changes in knowledge, attitude, skills and impact, along with changes in behavior as outlined in the Logic Model. Specific methods will depend on the type of changes and impact measures needed. Evaluation instruments will be selected from alternatives available at: http//www.extension.psu.edu/evaluation/questions.html.

2. Data Collection Methods

- Sampling
- Whole population
- Mail
- Telephone
- On-Site
- Structured
- Case Study
- Observation
- Tests
- Other (Focus Groups)

Description

Data collection methods will depend on the needs of the issue team. Issue teams are charged with the development of evaluation methods. Again the appropriate evaluation method will be identified and implemented using selection from the http//www.extension.psu.edu/questions.html.

V(A). Planned Program (Summary)

Program # 8

1. Name of the Planned Program

Childhood Obesity

2. Brief summary about Planned Program

Research and teaching in family nutrition and eating behaviors are the foundation to extension programs targeting childhood obesity. Families are a crucial link in teaching healthy behaviors. It is important that those behaviors involve good nutrition and physical activity as the cornerstone of preventing obesity in children and adolescents. Often, families are challenged both by time constraints and economic barriers to provide or prepare solid, balanced, and nutritionally viable meals to their children. Extension programs will use innovative interdisciplinary approaches to discover, translate, and apply how nutrition and physical activity can prevent disease, promote good health, and overall well-being. Programs will reach out to economically stressed and underrepresented families. Programs will use the socio-ecological model as a framework to address multiple factors that influence an individual's ability to change. Youth organizations, such as 4-H, will offer programs that help young people understand the importance of healthy eating and offer opportunities to improve healthy eating and physical activity.

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

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

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

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

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
703	Nutrition Education and Behavior	85%		53%	
724	Healthy Lifestyle	10%		7%	
802	Human Development and Family Well-Being	5%		40%	
	Total	100%		100%	

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

1. Situation and priorities

Childhood obesity rates are escalating. Prevention education is the most effective approach to reverse this trend of overweight children. Research shows that the majority of overweight children will become overweight adults. The most recent statistics indicate that 67% of the population in the United States is considered overweight or obese. Pennsylvania ranks 29th in the nation. BMI statistics were released for Pennsylvania in late 2008 indicating that over two-thirds of the counties have youth in kindergarten through sixth grade at or above the 85th percentile BMI. Overweight and its risks and complications affect both urban and rural Pennsylvania, low-income, and minority groups of African-American and Hispanic. Another factor, that can contribute to obesity, is the lack of physical activity. Among youth, measured activity provides information on younger children that highlights the decline in activity from childhood to adolescence. For example, 42 percent of children age 6-11 obtain the recommended 60 minutes per day of physical activity, whereas only 8 percent of adolescents achieve this goal. As children get older, participation in regular physical activity decreases dramatically. An end result of obesity is its cost to society. On average, people who are considered obese pay $1,429 (42 percent) more in health care costs than normal-weight individuals. Extension programs focus on helping families learn how to eat healthier and ways to motivate families to use family time through physical activity.

2. Scope of the Program

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

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

1. Assumptions made for the Program

It is anticipated that funding will increase to support the planned program as there is more national and state recognition that childhood obesity is a significant problem. Community/school based and environmental interventions are recommended as the most feasible ways to support healthy lifestyles for the greatest number of children and their families.

2. Ultimate goal(s) of this Program

1. Increase healthy eating and physical activity opportunities for Pennsylvania families.
2. Increase the percentage of youth who are at a healthy weight.
3. Increase the percentage of youth who consume a healthy diet.
4. Increase the percentage of adults and children who participate in the recommended amounts of physical activity.

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
2011	14.0	0.0	3.0	0.0
2012	14.0	0.0	3.0	0.0
2013	14.0	0.0	3.0	0.0
2014	14.0	0.0	3.0	0.0
2015	14.0	0.0	3.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Educational programs, interactive physical activity, and activities designed to attract youth will be conducted in schools, in out-of-school locations, in camps, and in communities. Evidenced-based practices will be utilized to assure that the programs will be effective and produce positive results. Program partnerships will be strengthened with collaborators within the university, the counties, communities, and state. A health-centered approach that focuses on the whole child (physically, mental, and social well-being) will be used rather than a weight-centered approach. The emphasis is on living actively, eating in normal and healthy ways, and creating a nurturing environment that helps children recognize their own worth, and that respects cultural foodways and family traditions. A series of educational events and activities will be utilized to reinforce educational information and appropriate behavior practices. Parental and leader involvement will be included as an integral part of the programs, which is highly encouraged and supported.

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

Extension

Direct Methods	Indirect Methods
● Education Class ● Workshop	● Newsletters ● Web sites

3. Description of targeted audience

Youth: Ages K-5 grades; Middle School: 6th-8th grades; Teens: 9th-12th grades; youth with parents in the military; and 4-H'ers.

Adults working as after-school staff, family and consumer science, physical education and science teachers working in collaboration with school nurses and community volunteers, community recreation directors, day care staff, sports directors, and parents and caregivers with children in grades 3-5.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	20000	57000	0	0
2012	20000	57000	0	0
2013	20000	57000	0	0
2014	20000	57000	0	0
2015	20000	57000	0	0

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

2011:1 **2012:**0 **2013:**1 **2014:**0 **2015:**1

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	0	0	40
2012	0	0	40
2013	0	0	40
2014	0	0	40
2015	0	0	40

V(H). State Defined Outputs

1. Output Target

- Number of invention disclosures submitted.

2011:1	**2012:**0	**2013:**1	**2014:**0	**2015:**1

- Number of people enrolled and/or registered in programs.

2011:30000	**2012:**30000	**2013:**30000	**2014:**30000	**2015:**30000

V(I). State Defined Outcome

O. No.	Outcome Name
1	Number of participants who were evaluated and demonstrated increased knowledge and skills.
2	Number of participants who were evaluated in a follow-up and who implemented/adopted practices.
3	Number of volunteers that helped with program leadership or delivery.

Outcome # 1

1. Outcome Target

Number of participants who were evaluated and demonstrated increased knowledge and skills.

2. Outcome Type : Change in Knowledge Outcome Measure

2011:2700	**2012:**2700	**2013:**2700	**2014:**2700	**2015:**2700

3. Associated Knowledge Area(s)

- 703 - Nutrition Education and Behavior
- 724 - Healthy Lifestyle
- 802 - Human Development and Family Well-Being

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 2

1. Outcome Target

Number of participants who were evaluated in a follow-up and who implemented/adopted practices.

2. Outcome Type : Change in Action Outcome Measure

2011:1700	**2012:**1700	**2013:**1700	**2014:**1700	**2015:**1700

3. Associated Knowledge Area(s)

- 703 - Nutrition Education and Behavior
- 724 - Healthy Lifestyle
- 802 - Human Development and Family Well-Being

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 3

1. Outcome Target

Number of volunteers that helped with program leadership or delivery.

2. Outcome Type : Change in Action Outcome Measure

2011:100	**2012:**100	**2013:**100	**2014:**100	**2015:**100

3. Associated Knowledge Area(s)

- 703 - Nutrition Education and Behavior
- 724 - Healthy Lifestyle

- 802 - Human Development and Family Well-Being

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Economy
- Government Regulations
- Competing Public priorities

Description

Home, child care, school, and community environments can influence children's behaviors related to food intake and physical activity. Factors affecting program outcomes may include unemployment of parents, government policies toward families, inflation, transportation, and food availability. Parents who find themselves unemployed may not have resources to purchase fresh or healthy food; government policies related to limited income families programs have guidelines for resource uses; changing public priorities will shift program importance to new issues; working parents may not pay as much attention to providing adequate physical activity for their children or healthy food for their children and resort to prepackaged, processed, and fast foods. The local environment also affects family physical activity such as having access to playgrounds, safe bike paths, lighting, sidewalks, and safe neighborhoods. Lack of access to affordable, healthy food choices in a local market or fresh food markets during the growing season can be a barrier to purchasing healthy foods.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Before-After (before and after program)

Description

Baseline data on BMI percentile taken at beginning and six month post course will be taken. Goal-setting, change in knowledge, and behavior change pre program and at the end of the course evaluation with selected six month follow up sites will be conducted.

2. Data Collection Methods

- On-Site

Description

Participants surveys and body measurements are analyzed to determine significant change. Data is compiled using a Survey Monkey evaluation tool and summarized at three levels - site, county and state.

V(A). Planned Program (Summary)

Program # 9

1. Name of the Planned Program

Food Safety

2. Brief summary about Planned Program

Development of new research-based tools to detect and monitor food-borne microbes are needed. Of particular importance is the effect of the food production environment through the remainder of the food supply chain. We will examine the prevalence of microorganisms in different production systems and look at intervention methods to reduce pathogen loads, providing a safer food supply as it enters into the processing and distribution system.

National interest in Good Agricultural Practices (GAPs) is leading to research and extension programs in the science behind these on-farm food safety methods. The breadth of crops and cropping systems means that "one size fits all" simply cannot apply, and the tools, delivered and supported through extension, must be science-based.

The Extension program will address food safety issues with consumers, producers, and the processing industry by providing training for certifications and informing the public and industry of food safety guidelines, policies, and recommendations.

Collaboration with industry partners to mitigate the risks of unintentional contamination is an important driver of food science and related research. The proposed plan of work will conduct programs and research on interrelated aspects of the food system with the network of scientists and communicators with strengths in plant and animal sciences, food science, animal and human nutrition, veterinary medicine, economics, and business. This approach will enhance Pennsylvania's role as a reliable producer and supplier of high quality, safe, and nutritious food and food products and will aid in ensuring Pennsylvania's economic future.

3. Program existence : Mature (More then 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
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources.	40%		8%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	60%		92%	
	Total	100%		100%	

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

1. Situation and priorities

Awareness of the critical nature of the safety of our food supply from farm to table has increased dramatically in recent years. It is estimated that over 76 million foodborne illnesses, 325,000 hospitalizations, and 5,000 deaths occur in the United States each year (Mead et al., 1999). The economic impact of foodborne illness, in terms of medical care, lost wages and

associated costs, is estimated to be in the billions of dollars per year. Legislation impacting PA food businesses is the Food Employee Certification Act (1999), which requires one supervisory employee from for-profit facilities that carry a Pennsylvania Department of Agriculture license to be certified. Penn State Extension provides training and testing for employee food safety certification. In addition, Extension programs train volunteers how to safely prepare and serve food to large crowds; this is critical to prevent and control the risk of foodborne illness outbreaks.

Another emerging food safety issue is the consumption of raw fruits and vegetables; recently more people have become sick after eating raw fruits and vegetables contaminated with harmful microorganisms. Most of the outbreaks have been traced to crops grown in other parts of the U.S. or in other countries. But microbial contamination of fresh produce can happen anywhere. As consumer demand continues to shift away from heat processed fruits and vegetables and toward fresh, ready-to-eat produce, Pennsylvania growers need to keep the food supply safe. Food safety has become a critical issue throughout the fresh produce industry as food service and retail buyers increasingly require growers and packers to develop and implement food safety plans. Research and extension programs are helping producers grow and market safe products which open up markets to local vendors.

Research and extension programs in animal agriculture is critical to the safe production of products from producers who are knowledgeable about, and implement quality assurance practices. The market value of high quality animal products is a positive incentive for producers. Public confidence in plant and animal products is bolstered. Increased systems of improved scientific detection of antibiotics, residues, disease, and inferior quality animal and plant products can ensure the safest food possible.

2. Scope of the Program

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

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

1. Assumptions made for the Program

Food safety risks will continue to be present regardless of the source of the food with globalization intensifying the potential for worldwide outbreaks, intentional contamination, and new pathogens. It is assumed that the global climate change will further exacerbate the situation. Contamination of foods by biological, chemical, and/or physical hazards throughout the food continuum will be present regardless of the agronomic or animal management practices used to produce foods. New and improved methods to assess and control these new or established hazards will be required.

2. Ultimate goal(s) of this Program

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

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

V(E). Planned Program (Inputs)

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

Year	Extension		Research	
	1862	1890	1862	1890
2011	12.0	0.0	7.0	0.0
2012	12.0	0.0	7.0	0.0
2013	12.0	0.0	7.0	0.0
2014	12.0	0.0	7.0	0.0
2015	12.0	0.0	7.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

High priority will be placed on conducting research to identify pathogens. Rapid detection of pathogens combined with an information network to trace the problem to the source is critical for timely intervention. Ensuring the health of Pennsylvania food animals will be an important activity. Novel processes for food safety and for production and bioprocessing of bio-based value added products will be studied as well as methods to improve the shelf life of processed foods. Dissemination of these research findings as new or continuing extension programming will provide a means for individuals, industry, and communities to learn and change.

Workshops will address food safety for producers and processors. They include: Introductory HACCP and Advanced HACCP Workshops to cover reassessment of Shiga-toxin producing E. coli (including E. coli 0157:H7) or Listeria monocytogenes in meat establishments and intervention strategies to control the pathogens; Food Defense Workshop covers the fundamentals of assessing and managing the risk associated with intentional contamination in food manufacturing facilities; Food Microbiology Short Course provides insight into the most recent developments of food-borne pathogens, toxins, and contaminants that may occur in a food plant environment; Better Process Control School (BPCS) certifies supervisors of thermal processing systems, acidification, and container closure evaluation programs for low-acid and acidified canned foods.

Extension programs will be focused on providing the food system with practical and timely training and recommendations on how to manage the risks with emphasis on prevention and preparedness. The Penn State Food Safety website will serve as a portal for educational information on workshops, seminars, and newsletters that are directed toward specific target audiences for the purposes of education, information sharing, and networking. Maintaining an open dialogue with food professionals in the private food industry will help to focus and emphasize which diet, food, nutrition, and food safety issues should be current priorities. From the industry perspective, the main protector of our food supply is not regulatory authorities, but the food industry itself. Opportunities provided by extension, which include topics such as Good Agricultural Practices for local producers, HACCP training for food and animal products processors and foodservices, ServSafe® for retail food, and extensive consumer education will be conducted.

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

Extension

Direct Methods	Indirect Methods
● Education Class	● Newsletters
● Workshop	● Web sites

3. Description of targeted audience

Owners/operators of food establishments licensed in the state of Pennsylvania are required under the Food Employee Certification Act to have at least one staff member certified through a Pennsylvania Department of

Agriculture approved food safety certification course. These establishments/operations include: restaurants, caterers, grocery stores/convenience stores, vending operations, organizations running festival and fair food booths, educational institutions, hospitals, nursing homes and other organizations or facilities that provide food services. Additionally, volunteers involved in preparing and serving food as part of fundraisers or civic events for nonprofit organizations. This includes individuals from the following organizations which serve food to the public: volunteer fire companies; religious organizations; school organizations such as PTO's and Booster Clubs; sports organizations such as Little League, youth basketball leagues; youth organizations such as 4H Clubs, Boy and Girl Scouts, summer camps; fraternal and service organizations such as Lions, Rotary, sportsman clubs, personal care homes, Meals on Wheels; and other organizations serving food to the public that are exempt from the Pennsylvania Department of Agriculture Food Employee Certification Act requirement.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	9000	41000	0	0
2012	9000	41000	0	0
2013	9000	41000	0	0
2014	9000	41000	0	0
2015	9000	41000	0	0

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

2011:2 **2012:**2 **2013:**2 **2014:**2 **2015:**2

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	0	0	40
2012	0	0	40
2013	0	0	40
2014	0	0	40
2015	0	0	40

V(H). State Defined Outputs

1. Output Target

- Number of invention disclosures submitted.

2011:1	**2012:**1	**2013:**1	**2014:**1	**2015:**1

- Number of people enrolled and/or registered in programs.

2011:8000	**2012:**8000	**2013:**8000	**2014:**8000	**2015:**8000

V(I). State Defined Outcome

O. No.	Outcome Name
1	Number of participants who were evaluated and demonstrated increased knowledge and skills.
2	Number of participants who were evaluated in a follow-up and who implemented/adopted practices.
3	Number of volunteers that helped with program leadership or delivery.

Outcome # 1

1. Outcome Target

Number of participants who were evaluated and demonstrated increased knowledge and skills.

2. Outcome Type : Change in Knowledge Outcome Measure

2011:400	**2012:**400	**2013:**400	**2014:**400	**2015:**400

3. Associated Knowledge Area(s)

- 711 - Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources.
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 2

1. Outcome Target

Number of participants who were evaluated in a follow-up and who implemented/adopted practices.

2. Outcome Type : Change in Action Outcome Measure

2011:5800	**2012:**5800	**2013:**5800	**2014:**5800	**2015:**5800

3. Associated Knowledge Area(s)

- 711 - Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources.
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 3

1. Outcome Target

Number of volunteers that helped with program leadership or delivery.

2. Outcome Type : Change in Action Outcome Measure

2011:80	**2012:**80	**2013:**80	**2014:**80	**2015:**80

3. Associated Knowledge Area(s)

- 711 - Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources.

- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Economy
- Public Policy changes
- Government Regulations

Description

Food safety is recognized as a human health, national security, and a major economic issue. Changing government regulations for profit, non-profit, and producers could impact programs. Economic stresses of individuals, communities, and producers are all factors in outcomes. Emergence of new organisms or organisms that respond differently to current processes can create challenges. Scientific discovery and more precise capability to monitor and detect potential contaminants may result in changing regulations to ensure food safety. Organizational changes, such as shifts in what foods are monitored by which organizations, can result in changes in the current food safety procedures. Increased political emphasis for food safety will create additional expectation for food and agriculture safety and quality assurance. Increasingly larger amounts of processed and manufactured food, ready to heat-and-eat, and increasingly larger amounts of uninspected local fresh food, can create challenges for limited inspection capability. Greater amounts of imported food and food products entering the food chain can add to an already stressed inspection system.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- After Only (post program)
- Before-After (before and after program)

Description

Programs will be evaluated using a combination of measurement procedures. Pre-post program evaluation will be used to determine increase in knowledge or skills for a particular educational event. Retrospective post event evaluations will be used to determine changes in food safety practices implementation of best management practices. Achieving a passing exam scores will be used to measure program effectiveness for participants required to take certification exam. Indication of intent to adopt best management practices, and a six month follow up questionnaire will measure practice change for long term impact.

2. Data Collection Methods

- On-Site
- Observation
- Other (Small Group Interaction)

Description

Survey methods will be used in the pre-post, post, retrospective evaluations; observations will be used to assess changes in practices or implementation of new practices for participants in selected programs. Improvement in quality of food ingredients, agriculture commodities, and processed foods will be monitored to help evaluate the long term effectiveness of research and educational intervention and will be evident by quality premiums for commodities; reduced incidence of contamination, inferior quality, or rejected raw food products; and reduction in food recalls for processed food. Ultimately,

data indicating fewer human health incidents as the result of food borne illnesses and a healthier population is the long term goal for food safety research and education.