

2007 Pennsylvania State University Combined Research and Extension Plan of Work

Brief Summary about Plan of Work

The College of Agricultural Sciences at Penn State University provides comprehensive service to the residents of Pennsylvania through the activities of the Pennsylvania Agricultural Experiment Station and Penn State Cooperative Extension. We pride ourselves on responsiveness 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 a myriad of other sources of support 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://www.cas.psu.edu/docs/StrategicPlanning/PDFs/StrategicPlanDraft05.pdf>), which was developed in 2005 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. We have derived the five planned programs described in this Plan of Work to build from the framework of this strategic planning effort 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. The need to better integrate activities through a food and fiber systems approach is best illustrated by the fact that Pennsylvania's food processing and manufacturing segment represents approximately five times (\$20B) the value of farm gate production (\$4B) of agricultural goods. Likewise, the wood products and paper industries of the Commonwealth account for over \$15 billion in sales annually (Source: Economic Census for Pennsylvania and Pennsylvania Agricultural Statistics). Pennsylvania is strategically situated relative to consumer markets and remains the leading food processing and manufacturing state in the region and one of the leading states in the nation. Similar competitive opportunities exist for wood products.

Pennsylvania possesses substantial natural resources. Our ability to sustainably and profitably manage these resources into the future dictates that we continue to seek and disseminate science-based solution sets to both existing and emerging challenges. For example, despite years of research on water resources, nutrient issues, and forest management, additional answers are still needed. The growth of Pennsylvania's human population, accompanied by a change in how that population is distributed, has created new challenges in land use that necessitate new information. The college will focus on assembling interdisciplinary teams to teach, conduct research, and solve problems in ecosystems.

Humans form socioeconomic systems that are outgrowths of and dependent upon the environment in which they live. Their consumption choices (e.g., food, clothing, and housing), health, education, employment, quality of life, and ability to cope economically vary depending on their sociodemographic characteristics and are affected by the communities in which they live. Communities in turn are strongly affected by socioeconomic forces that play out at the local, regional, and global levels. A socioeconomic system has three levels: individual and household, local community and regional economy, and the various levels of government where policies related to food, land use, and economic and social development are determined. With our substantial expertise in fundamental research and our extension capacity, we have the opportunity to strengthen all three levels of socioeconomic systems. This strengthening needs to occur at multiple levels and must involve faculty and educators working in the local, regional, national, and even international arenas.

Our planned programs capture the systems thinking articulated in our strategic plan and tie directly to key national emphasis areas identified by USDA-CSREES. 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; Environment; 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 to be budgeted for this plan.

Year	Extension		Research	
	1862	1890	1862	1890
2007	319.3	0.0	644.2	0.0
2008	319.3	0.0	644.2	0.0
2009	319.3	0.0	644.2	0.0
2010	319.3	0.0	644.2	0.0
2011	319.3	0.0	644.2	0.0

Merit Review Process

The merit review process that will be employed during the 5-Year Plan of Work cycle

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

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 Issue Team made up of field-based extension educators and faculty with split appointments in both extension and research efforts. Team members from the field were chosen to broadly represent all parts 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 team. All of the programs have been reviewed by research and/or extension administrators. Additionally, logic models were developed by each Issue Team 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 issues 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.

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 three-year strategic plan (<http://www.cas.psu.edu/docs/StrategicPlanning/PDFs/StrategicPlanDraft05.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 prospect of intentional disruption of the food and fiber supply has forced targeted research to understand the dynamics of disease transmission and to develop new diagnostic tools for diseases and other agents and has necessitated the development of new outreach programs to communicate how these tools can be employed and how stakeholders would respond to incidents. Research will lead to more effective means to anticipate and mitigate events and more rapid and accurate diagnosis of agents. Extension will help to deliver these tools to appropriate user communities, will provide feedback that will inform further research, and will implement response and recovery programs. Our focus on Pest Management parallels the priority issues of Agricultural and Food Biosecurity. The problems posed by an intentional attack on our food and fiber system differ from day-to-day pest management issues only in intent. We will address critical issues in pest management via the development of new diagnostic tools and the predictive ability to guide efficient and effective use of these tools.

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, is 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 couple 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. A critical issue is the creation and delivery of research-based knowledge on decision-making that will augment after-school programs and dovetail with state educational standards. The growing tension between the urban/suburban and rural lifestyles has led to direct conflict over farming practices and the viability of agriculture in some regions of the state. We will address this critical issue by providing research and extension programming in nutrient management practices that seek to minimize some of the key problem areas.

Pennsylvania is rich in natural resources, and the protection and management of these resources present some critical issues that require short-term answers. Research on tree regeneration, a long-term problem, is an area where our multidisciplinary approach is valuable, bringing together wildlife management, silviculture, air and water chemistry, and land use planning. We must also address the area of renewable energy through new research activities and dissemination of knowledge via extension.

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

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

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 and Food Biosecurity – New detection methods for mycotoxins in food and feed will be developed that can be adopted by private industry. We will contribute to development of risk assessment protocols by US and international policymakers around exposure to mycotoxins. Such contributions will address the intentional use of mycotoxins or their causative organisms as bioterrorism agents. Research on high-consequence pathogen and pest predictive models will lead to a platform for regulatory and homeland security agencies to better model response plans. Our work with soybean rust prediction is an example of how such a system can assist with policy creation, but also can be translated to practice through extension across a broad geographic range.

Agricultural Systems – Our multistate, joint research/extension effort in grape production and marketing provides an example of how we will address agricultural systems. We will assess needs from growers, conduct research on new pest management systems, horticultural practices, and market segments. This research, conducted in partnership with neighboring states, is delivered through extension programming to stakeholders. Enhanced knowledge of organic grape production methods and economic opportunities is an expected deliverable from this work. Rootstock assessment of pome- and stone-fruits represents a long-term investment in crop improvement that can only be done within the land grant system. A multistate protocol for evaluating tree fruit attributes yields consistent data that are then

translated to the user community (breeders, nurserymen, and growers) for implementation. We expect new varieties, better disease resistance (and, therefore, reduced pesticide use), and enhanced profitability from this program.

Families, Youth, and Communities – Programs such as the National 4-H Embryology program and other 4-H curriculum development processes at Penn State take research-based information and translate it into a format that positively impacts science literacy of our youth clientele. A healthy community derives from clear understanding of the food system, including access to local food supplies. Multistate work to increase knowledge of what local food sources are available for communities will lead to policies that facilitate effective use of these food sources. We expect that this will increase the linkage between local communities and agriculture, with the positive impact of creating a dialogue about the importance of maintaining production agriculture in an urbanizing environment.

Natural Resources and Environment – Wildlife damage is a key problem as human populations continue to expand into less managed environments. This multistate joint research/extension project will develop tools to evaluate the acceptance of deer and Canada goose populations in urban/suburban habitats. The level of acceptance determined by this project will influence policies taken by game agencies in managing these species. Carbon sequestration is a prominent issue in agriculture/energy balance; we are engaged in a project to quantify the impact of tillage practices on erosion and carbon balances. The impact of this study will be recommendations that enhance agricultural productivity and sound environmental policy.

Pest Management – The identification of alternatives to chemical pesticides for insect management will lead to reduced pesticide use in agriculture and the landscape environment and, ultimately, to more sustainable pest management systems. This project will identify new pathogens of known pests and develop novel application methods to deliver pathogens to control introduced and invasive pests. These research results, applicable across a broad geographic scale, are delivered through extension programming to agricultural producers and homeowners. The development of blight-resistant chestnuts represents an effort to correct the results of human-mediated ecosystem change in a sustainable manner. This project, which involves multiple stakeholder groups in defining and deriving benefit from the research, will lead to the restoration of a dominant plant species of the eastern deciduous forest.

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.

Stakeholder Input

1. Actions taken to seek stakeholder input that encourages their participation (Check all that apply)

- 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
- 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 (CASPAR). This tool, which is built on components of the logic model, is used to prepare the annual cooperative extension programs. Thus, stakeholder input is a key attribute of extension programming. This, in turn, provides input into our research agenda, especially through faculty who are jointly appointed on extension and research funding. In addition, extension 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 over 95 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, the Pennsylvania Christmas Tree Growers Association, and the 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, the Pennsylvania Department of Environmental Protection, and the 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
- Needs Assessments

Brief explanation.

A widely advertised web-based needs assessment survey was available to the general public, and extension educators in each county conducted focus groups to obtain stakeholder input concerning major programs to be conducted as part of the new Plan of Work. Special attention was 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. Penn State Agricultural Council meetings are publicly announced, and our broad representation is constantly reassessed to ensure that new and traditionally underserved audiences are included.

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

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Survey of traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals
- Survey of the general public
- Meeting 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
- Other (Focus Groups)

Brief explanation

College strategic planning, part of a broader Penn State cycle of strategic planning, served to formally collect input from a wide variety of sources. The strategic plan, which has served as a roadmap for broadly framing research and extension priorities, was widely discussed by the stakeholder group described previously. Furthermore, a comprehensive decision-making process was initiated to ensure that all relevant current and emerging issues were included as part of the planning process. The aim of Penn State Cooperative Extension is to engage both campus-based and field-based educators in programmatic leadership roles as co-chairs and team members for Issue Teams and programs. Due to the joint research-extension appointments of many faculty in our system, the input collected to inform extension programming also serves to drive the research agenda.

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.

1. Name of the Planned Program

Agricultural and Food Biosecurity

2. Program knowledge areas

- 311 13% Animal Diseases
- 212 18% Pathogens and Nematodes Affecting Plants
- 211 10% Insects, Mites, and Other Arthropods Affecting Plants
- 712 17% Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occuring Toxi
- 722 12% Zoonotic Diseases and Parasites Affecting Humans
- 501 10% New and Improved Food Processing Technologies
- 314 10% Toxic Chemicals, Poisonous Plants, Naturally Occuring Toxins, and Other Hazards Affecting Animals
- 723 10% Hazards to Human Health and Safety

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

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

5. Brief summary about Planned Program

Safe and secure food and fiber are the cornerstones of society. Long-standing concerns about the natural global movement of threats – especially diseases, insects, and toxins – are complicated by more recent concerns about the intentional movement of these threats to disrupt agricultural systems and global economies. We have historically conducted research on these topics as part of pest management, food safety, and other human health and safety related investigations. Research-based information on these topics has been provided to stakeholders – producers, processors, distributors, retailers, and consumers – through many means. The prospect of intentional disruption of the food and fiber supply has forced targeted research to understand the dynamics of disease transmission and to develop new diagnostic tools for diseases and other agents and has necessitated the development of new outreach programs to communicate how these tools can be employed and how stakeholders would respond to incidents. Research will lead to more effective means to anticipate and mitigate events and more rapid and accurate diagnosis of agents. Extension will help to deliver these tools to appropriate user communities, will provide feedback that will inform further research, and will implement response and recovery programs. Action agencies need these tools to better predict and respond to events. Producers, processors, distributors, and retailers will benefit indirectly and directly from new tools resulting from this research. Extension facilitates community development activities to assist local decision makers in identifying threats, identifying and prioritizing local critical services, developing continuity of critical services, and succession planning, including the identification and education of a core of volunteers for local communities, minimizes the risk of local catastrophe. Consumers will benefit indirectly through this preparation of the food and fiber chain, and they will benefit directly from programs prepared by and delivered via extension if a biosecurity event occurs. We have invested heavily in the development of diagnostic tools, both conventional and molecular, for monitoring the environment for agents or for quick identification of a threat if an event occurs. Our expertise in spatial analysis and modeling facilitates the analysis of events to predict the likely spread and impact. This is a particularly critical component of an effective biosecurity system, as insufficient resources exist to monitor all possible threats, so any predictive capacity permits a targeted response. We have established connections with key agencies, organizations, and industry partners as a credible source of information, which will allow us to deliver effective response and recovery programs in case of an event. Key approaches to explore include continued development of diagnostic tools, with emphasis on increased accuracy, ease of use, and throughput, development of improved models to process field data and generate actionable predictions, and enhanced integration of the field data from diagnostic tools into the spatially referenced model systems. Failure to develop these tools will lead to less effective response and recovery plans, with consequent negative impacts upon consumers (lack of safe food, exposure to disease agents and toxins) and negative financial implications for the food and fiber sector.

6. Situation and priorities

Pennsylvania faces challenges in readiness to agrosecurity incidents. The Pennsylvania experience with addressing low pathogenic avian influenza on multiple occasions and plum pox virus in the late 1990's has led Penn State scientists to a higher level understanding of emergency response demands than has been experienced in many other states. We recognize the broad stakeholder range – from producers to the distribution and processing community to governmental agency partners to, ultimately, the consumer and local resident – that expect a variety of different answers and programs in an emergency situation. Our extension experience in dealing with these stakeholders has also revealed the necessity of new tools for diagnosis, response, and recovery, tools that are often unavailable during an emergency situation. AES research will focus on the discovery and deployment of molecular diagnostic tools for threat identification, the development of more sophisticated geospatially referenced modeling methods, and the integration of molecular diagnostics and spatial references into sensor systems that integrate with predictive models. These tools are needed at the farm level, but also throughout the processing and distribution phases of the food system and all the way to the consumer. Action agencies and, through them, stakeholders from producers to consumers, will benefit from this research and its deployment through extension programming. The safety and security of the food and fiber system is enhanced because of efforts to strengthen partnerships with key agencies.

Preparedness and response plans for the State Department of Agriculture, the State Department of Health, the State Emergency Management Agency, and other critical service providers have been improved through multi agency activity including planning, training and exercising. Research and extension efforts in this area will be useful for natural pest and pathogen introductions, even if intentional disruption of the food and fiber supply does not occur.

7. Assumptions made for the Program

Funding will remain constant or increase in support of this planned program. High consequence threats can be identified as research targets. Partnerships will be required with governmental authorities and private industry to implement programs.

8. Ultimate goal(s) of this Program

Develop a geospatially referenced database of agricultural production, processing, and distribution resources in Pennsylvania. Build and refine predictive modeling capacity that can be adapted to accommodate the particular biological characteristics of multiple threats (e.g., dispersal, vector requirements, host associations, virulence, available treatments). Develop molecular diagnostic tools for high consequence threats to Pennsylvania agriculture. Fuse diagnostic tools with advances in information technology to develop novel sensor systems of value from the farm to the retail/consumer level. Employ appropriate technologies in emergency plans developed and distributed through extension programming, including appropriate proactive response training. Expand stakeholder groups and refine information and data sharing. Further utilize state and national resources through the EDEN system.

9. Scope of Program

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

Inputs for the Program

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

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

Year	Extension		Research	
	1862	1890	1862	1890
2007	8.7	0.0	186.2	0.0
2008	8.7	0.0	186.2	0.0
2009	8.7	0.0	186.2	0.0
2010	8.7	0.0	186.2	0.0
2011	8.7	0.0	186.2	0.0

Outputs for the Program

13. Activity (What will be done?)

conduct research experiments on diagnostic tools for plant and animal pathogens; conduct research experiments on predictive models for high consequence threats; conduct research experiments to develop novel biosensors; conduct educational workshops and meetings on agricultural and food biosecurity; provide training on emergency response; develop curricula and resources for emergency responders; partner with state agencies on biosecurity preparation; increase collaboration within and among organizations and institutions

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

Extension	
Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations 	<ul style="list-style-type: none"> ● Public Service Announcement ● Newsletters ● TV Media Programs ● Web sites

15. Description of targeted audience

agricultural producers, food processors, food retailers, policy makers, emergency responders, action agencies, extension educators

16. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2007	18000	0	0	0
2008	18000	0	0	0
2009	18000	0	0	0
2010	18000	0	0	0
2011	18000	0	0	0

17. (Standard Research Target) Number of Patents

Expected Patents

2007 : 0 2008 : 0 2009 : 0 2010 : 1 2011 : 1

18. Output measures

Output Target

Number of invention disclosures

2007 : 5 2008 : 5 2009 : 5 2010 : 5 2011 : 5

Output Target

Number of participants (contacts) in programs related to agricultural and food biosecurity systems

2007 : 9800 2008 : 9800 2009 : 9800 2010 : 9800 2011 : 9800

Output Target

Number of research projects completed on agricultural and food biosecurity

2007 : 16 2008 : 16 2009 : 16 2010 : 16 2011 : 16

Outcomes for the Program

19. Outcome measures

Outcome Text: Awareness created

Outcome Target

Number of participants who were evaluated and demonstrated increased knowledge and skills related to agricultural and food biosecurity issues

Outcome Type: Short

2007: 6500 2008: 6500 2009: 6500 2010: 6500 2011: 6500

Outcome Target

Number of participants who were evaluated in a follow up and who implement/adopt practices related to agricultural and food biosecurity issues

Outcome Type: Medium

2007: 2100 2008: 2100 2009: 2100 2010: 2100 2011: 2100

Outcome Target

Number of decision support tools adopted based upon predictive modeling research

Outcome Type: Long

2007: 1 2008: 0 2009: 1 2010: 0 2011: 1

Outcome Target

Number of diagnostic tools implemented or adopted for threat identification

Outcome Type: Long

2007: 1 2008: 1 2009: 1 2010: 1 2011: 1

20. External factors which may affect outcomes

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

Description

The unexpected departure of county/regional educators or discipline based extension faculty, changing county level priorities, unexpected issues that would require redirection of human resources, and/or the inability to acquire external support to implement the program could affect the outcome of this program.

21. 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 (Post Program Follow Up)

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>.

22. 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>

1. Name of the Planned Program

Agricultural Systems

2. Program knowledge areas

- 604 10% Marketing and Distribution Practices
- 302 10% Nutrient Utilization in Animals
- 301 10% Reproductive Performance of Animals
- 201 10% Plant Genome, Genetics, and Genetic Mechanisms
- 601 10% Economics of Agricultural Production and Farm Management
- 205 10% Plant Management Systems
- 502 10% New and Improved Food Products
- 307 10% Animal Management Systems
- 306 10% Environmental Stress in Animals
- 602 10% Business Management, Finance, and Taxation

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

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

5. 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.

6. 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.

7. 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.

8. 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.

9. Scope of Program

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

Inputs for the Program

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

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

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

Year	Extension		Research	
	1862	1890	1862	1890
2007	105.5	0.0	220.9	0.0
2008	105.5	0.0	220.9	0.0
2009	105.5	0.0	220.9	0.0
2010	105.5	0.0	220.9	0.0
2011	105.5	0.0	220.9	0.0

Outputs for the Program

13. Activity (What will be done?)

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

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

Extension	
Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations 	<ul style="list-style-type: none"> ● Public Service Announcement ● Newsletters ● TV Media Programs ● Web sites

15. Description of targeted audience

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

16. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2007	204000	0	0	0
2008	204000	0	0	0
2009	204000	0	0	0
2010	204000	0	0	0
2011	204000	0	0	0

17. (Standard Research Target) Number of Patents

Expected Patents

2007 : 0 2008 : 0 2009 : 1 2010 : 0 2011 : 1

18. Output measures

Output Target

Number of invention disclosures

2007 : 6 2008 : 6 2009 : 6 2010 : 6 2011 : 6

Output Target

Number of participants (contacts) in programs related to agricultural production, profitability, and sustainability

2007 : 198000 2008 : 198000 2009 : 198000 2010 : 198000 2011 : 198000

Output Target

Number of research projects completed on agricultural systems

2007 : 41 2008 : 41 2009 : 41 2010 : 41 2011 : 41

Outcomes for the Program

19. Outcome measures

Outcome Text: Awareness created

Outcome Target

Number of participants who were evaluated and demonstrated increased knowledge and skills related to improving agricultural production, profitability, and sustainability

Outcome Type: Short

2007: 25000	2008: 25000	2009: 25000	2010: 25000	2011: 25000
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Outcome Target

Number of participants who were evaluated in a follow up and who implement/adopt practices related to improving agricultural production, profitability, and sustainability

Outcome Type: Medium

2007: 3000	2008: 3000	2009: 3000	2010: 3000	2011: 3000
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20. 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.)

Description

The unexpected departure of county/regional educators or discipline based extension faculty, changing county level priorities, unexpected issues that would require redirection of human resources, and/or the inability to acquire external support to implement the program could affect the outcome of this program.

21. 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 (Post Program Follow Up)

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>.

22. 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>

1. Name of the Planned Program

Families, Youth, and Communities

2. Program knowledge areas

- 610 10% Domestic Policy Analysis
- 802 10% Human Development and Family Well-Being
- 724 10% Healthy Lifestyle
- 607 10% Consumer Economics
- 805 10% Community Institutions, Health, and Social Services
- 803 10% Sociological and Technological Change Affecting Individuals, Families and Communities
- 801 10% Individual and Family Resource Management
- 703 10% Nutrition Education and Behavior
- 806 10% Youth Development
- 608 10% Community Resource Planning and Development

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

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

5. 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.

6. 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.

7. 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.

8. 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.

9. Scope of Program

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

Inputs for the Program

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

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

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

Year	Extension		Research	
	1862	1890	1862	1890
2007	174.4	0.0	37.8	0.0
2008	174.4	0.0	37.8	0.0
2009	174.4	0.0	37.8	0.0
2010	174.4	0.0	37.8	0.0
2011	174.4	0.0	37.8	0.0

Outputs for the Program

13. Activity (What will be done?)

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

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

Extension	
Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations 	<ul style="list-style-type: none"> ● Public Service Announcement ● Newsletters ● TV Media Programs ● Web sites

15. Description of targeted audience

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

16. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2007	180000	0	220000	0
2008	180000	0	220000	0
2009	180000	0	220000	0
2010	180000	0	220000	0
2011	180000	0	220000	0

17. (Standard Research Target) Number of Patents

Expected Patents

2007 : 0 2008 : 0 2009 : 0 2010 : 0 2011 : 0

18. Output measures

Output Target

Number of participants (contacts) in programs related to families, youth, and communities and to the nutrition and health of adults and youth

2007 : 320000 2008 : 320000 2009 : 320000 2010 : 320000 2011 : 320000

Output Target

Number of research projects completed on families, youth, and communities

2007 : 6 2008 : 6 2009 : 6 2010 : 6 2011 : 6

Outcomes for the Program

19. Outcome measures

Outcome Text: Awareness created

Outcome Target

Number of participants who were evaluated and demonstrated increased knowledge and skills related to strengthening families, youth, communities and improving nutrition and health

Outcome Type: Short

2007: 95000	2008: 95000	2009: 95000	2010: 95000	2011: 95000
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Outcome Target

Number of participants who were evaluated in a follow up and who implement/adopt practices related to strengthening families, youth, communities and improving nutrition and health

Outcome Type: Medium

2007: 36000	2008: 36000	2009: 36000	2010: 36000	2011: 36000
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20. External factors which may affect outcomes

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

Description

The unexpected departure of county/regional educators or discipline based extension faculty, changing county level priorities, unexpected issues that would require redirection of human resources, and/or the inability to acquire external support to implement the program could affect the outcome of this program.

21. 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 (Post Program Follow Up)

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>.

22. 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>.

1. Name of the Planned Program

Natural Resources and Environment

2. Program knowledge areas

- 112 10% Watershed Protection and Management
- 133 10% Pollution Prevention and Mitigation
- 511 10% New and Improved Non-Food Products and Processes
- 403 10% Waste Disposal, Recycling, and Reuse
- 605 10% Natural Resource and Environmental Economics
- 135 10% Aquatic and Terrestrial Wildlife
- 101 10% Appraisal of Soil Resources
- 123 10% Management and Sustainability of Forest Resources
- 102 10% Soil, Plant, Water, Nutrient Relationships
- 131 10% Alternative Uses of Land

3. Program existence : Mature (More than five years)**4. Program duration :** Long-Term (More than five years)**5. 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.

6. 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.

7. 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.

8. 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.

9. Scope of Program

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

Inputs for the Program

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

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

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

Year	Extension		Research	
	1862	1890	1862	1890
2007	20.9	0.0	123.8	0.0
2008	20.9	0.0	123.8	0.0
2009	20.9	0.0	123.8	0.0
2010	20.9	0.0	123.8	0.0
2011	20.9	0.0	123.8	0.0

Outputs for the Program

13. Activity (What will be done?)

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

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

Extension	
Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations 	<ul style="list-style-type: none"> ● Public Service Announcement ● Newsletters ● TV Media Programs ● Web sites

15. 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

16. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2007	54000	0	0	0
2008	54000	0	0	0
2009	54000	0	0	0
2010	54000	0	0	0
2011	54000	0	0	0

17. (Standard Research Target) Number of Patents

Expected Patents

2007 : 0 2008 : 0 2009 : 0 2010 : 0 2011 : 1

18. Output measures

Output Target

Number of invention disclosures

2007: 1 2008: 1 2009: 1 2010: 1 2011: 1

Output Target

Number of participants (contacts) in programs related to watershed management and forest management

2007: 50000 2008: 50000 2009: 50000 2010: 50000 2011: 50000

Output Target

Number of research projects completed on natural resources and environmental issues

2007: 21 2008: 21 2009: 21 2010: 21 2011: 21

Outcomes for the Program

19. Outcome measures

Outcome Text: Awareness created

Outcome Target

Number of participants who were evaluated and demonstrated increased knowledge and skills related to enhancing water quality and sustainability of private forest lands

Outcome Type: Short

2007: 4000 2008: 4000 2009: 4000 2010: 4000 2011: 4000

Outcome Target

Number of participants who were evaluated in a follow up and who implement/adopt practices related to enhancing water quality and sustainability of private forest lands

Outcome Type: Medium

2007: 2000 2008: 2000 2009: 2000 2010: 2000 2011: 2000

20. External factors which may affect outcomes

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

Description

The unexpected departure of county/regional educators or discipline based extension faculty, changing county level priorities, unexpected issues that would require redirection of human resources, and/or the inability to acquire external support to implement the program could affect the outcome of this program.

21. 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 (Post Program Follow Up)

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>.

22. 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>.

1. Name of the Planned Program

Pest Management

2. Program knowledge areas

- 215 10% Biological Control of Pests Affecting Plants
- 213 10% Weeds Affecting Plants
- 216 40% Integrated Pest Management Systems
- 211 20% Insects, Mites, and Other Arthropods Affecting Plants
- 212 20% Pathogens and Nematodes Affecting Plants

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

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

5. 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.

6. 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.

7. 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.

8. 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.

9. Scope of Program

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

Inputs for the Program

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

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

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

Year	Extension		Research	
	1862	1890	1862	1890
2007	9.9	0.0	75.5	0.0
2008	9.9	0.0	75.5	0.0
2009	9.9	0.0	75.5	0.0
2010	9.9	0.0	75.5	0.0
2011	9.9	0.0	75.5	0.0

Outputs for the Program

13. Activity (What will be done?)

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

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

Extension	
Direct Methods	Indirect Methods
<ul style="list-style-type: none"> ● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention 	<ul style="list-style-type: none"> ● Public Service Announcement ● Newsletters ● TV Media Programs ● Web sites

● Demonstrations	
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15. Description of targeted audience

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

16. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2007	24000	0	0	0
2008	24000	0	0	0
2009	24000	0	0	0
2010	24000	0	0	0
2011	24000	0	0	0

17. (Standard Research Target) Number of Patents**Expected Patents**

2007 : 0 2008 : 0 2009 : 0 2010 : 0 2011 : 0

18. Output measures**Output Target**

Number of invention disclosures

2007 : 0 2008 : 1 2009 : 0 2010 : 1 2011 : 0

Output Target

Number of research projects completed on pest management

2007 : 16 2008 : 16 2009 : 16 2010 : 16 2011 : 16

Output Target

Number of participants (contacts) in programs related to pest management

2007 : 21000 2008 : 21000 2009 : 21000 2010 : 21000 2011 : 21000

Outcomes for the Program**19. Outcome measures****Outcome Text: Awareness created****Outcome Target**

Number of participants who were evaluated and demonstrated increased knowledge and skills related to managing pests in safer, more effective ways

Outcome Type: Short

2007: 16000 2008: 16000 2009: 16000 2010: 16000 2011: 16000

Outcome Target

Number of decision support tools adopted based upon predictive modeling research

Outcome Type: Long

2007: 1 2008: 0 2009: 1 2010: 0 2011: 1

Outcome Target

Number of diagnostic tools implemented or adopted for pest identification

Outcome Type: Long

2007: 1 2008: 1 2009: 1 2010: 1 2011: 1

20. External factors which may affect outcomes

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

Description

The unexpected departure of county/regional educators or discipline based extension faculty, changing county level priorities, unexpected issues that would require redirection of human resources, and/or the inability to acquire external support to implement the program could affect the outcome of this program.

21. 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 (Post Program Follow Up)

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>.

22. 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>.