2009 Pennsylvania State University Combined Research and Extension Annual Report of Accomplishments and Results

Status: Accepted

Date Accepted: 05/28/2010

I. Report Overview

1. Executive Summary

Penn State's Agricultural Experiment Station (AES) and Cooperative Extension Service (CES) operate in concert within the College of Agricultural Sciences to address present and future needs in agriculture at local, national, and international scales. The College operates on the basis of shared decision-making regarding investment of AES and CES resources. During 2009, the College--including AES and CES--has engaged in developing implementation strategies for our current strategic plan to move forward an agenda around our five strategic initiatives: entrepreneurship, energy, water, pest prediction and response, and food, diet, and health.

Research and extension are integrated largely through joint appointments in the College of Agricultural Sciences. Of 614 administrators, faculty and staff at University Park, 230 have a combination of research and extension funds supporting their positions. During the past year, we have completed a reframing exercise within PA CES that has identified 19 overarching issues and created natural work groups (NWGs) to focus on each of these issues. The NWGs serve to unite faculty and county-based educators in a common goal of generating new knowledge, offering high quality, focused extension education programs on stakeholder-identified subjects, and identifying and addressing science gaps on the basis of feedback from these educational programs. We connect in research with resources across campus through the Penn State Institute system (Life Sciences, Materials, Social Science, Environment and Energy), and the CES NWGs also provide a mechanism to connect with and leverage research expertise outside the AES purview from across campus.

New federal focus on water quality in the Chesapeake Bay has been a major issue area for Pennsylvania during 2009. While our AES and CES efforts are ongoing and will continue well into the future on water quality, both in the Chesapeake watershed and more broadly, this renewed focus has led to a number of programs from which we anticipate significant impacts in translating the science of our AES work into practice through CES education. We have built very strong partnerships with local, state, and federal agencies, non-governmental organizations, and the private sector to develop the Conewago Creek Collaborative Conservation Initiative in central Pennsylvania. This initiative, leveraging AES and CES resources with more than $2.3M in competitive federal and state funding, will improve adoption of Best Management Practices to reduce nitrogen, phosphorous, and sediment loads in the Bay, implement core conservation practices along with innovative practices just emerging from research programs, establish a sustainable monitoring program to facilitate assessment of progress toward environmental goals, and provide impetus to catalog ecosystem services provided by the landscape. Part of the resources leveraged in this initiative will support youth training through 4-H science, engineering, and technology (SET) programming; training the next generation in the science and values of this initiative is a key component of ensuring the sustainability of this and similar efforts.

As a follow-on to the 2008 PA Report of Accomplishments and Results, Marcellus shale natural gas issues have remained a critical issue in Pennsylvania. Some industry estimates suggest that, over the next 50 years, royalty payments alone on extracted natural gas could easily exceed $200 billion of new revenue to primarily rural Pennsylvania residents. Exploitation of this natural resource has huge implications for agriculture, environmental quality, and rural community resiliency. PA CES has 19 individuals engaged in various aspects of response to Marcellus-related programming. The need for science-based data on implications of the money (lease value, local and migrant employment, royalty value as gas begins to flow) accruing in rural PA communities has been addressed by investment of money in research on these social science and community development questions. The ongoing importance of questions about extraction and transport (topics not supported by AES research expertise) and environmental impact (topics with AES support, but also more broadly examined across Penn State) has led us to invest CES resources into the College of Earth and Mineral Sciences to establish a Cooperative Extension presence that expands the research base of our educational programs. This co-investment has leveraged funds from the Penn State Institutes of Energy and the Environment and Penn State's Social Science Research Institute, both of which are contributing to new research initiatives that will partner AES/CES personnel with other expertise across the Penn State system.

This overview of just two emerging issues in Pennsylvania demonstrates how PA AES and CES must be responsive to new societal needs, investing our federal funds in a manner that furthers national agricultural goals but also addressing the local implications of those national priorities. They illustrate how we are synergizing our federal AES and CES investments with partnerships inside and outside the university as we generate and disseminate new knowledge.

A few explanatory notes are necessary regarding the report that follows. First, PA CES does not currently have a mechanism in place for capturing youth contact data. The direct and indirect contact grids throughout the report have been completed only with data we currently collect. Discussions are ongoing on how to capture and report these data for subsequent reports but will not be in place until FY 2010. Second, PA CES captures data on contacts (direct and indirect)

and participants. We consider participants to be the number of individuals who attend our programs that we offer. Our contact numbers are derived from the number of people each of our extension educators and/or faculty have contacted. Direct contact numbers are only those from face-to-face meetings; indirect contacts are through email, telephone conversations, and Adobe Connect sessions, etc. For instance, if three extension educators talk to a group of 10 farmers at a meeting, this event would reflect 30 contacts but only 10 participants. We have revised our future Plans of Work to capture "number of people enrolled or registered in program" rather than participants. Lastly, we have adopted, starting with FY 2009, an internal administrative system to account for Extension FTE commitments. This has caused our actual numbers to be higher than those previously planned and reported, however we feel confident that this new system provides accurate data and that these numbers reflect all of our professional FTEs (extension faculty, educators, and associates). This new system will allow us to pull accurate numbers consistently from year to year.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	274.6	0.0	278.9	0.0
Actual	422.4	0.0	269.3	0.0

II. Merit Review Process

1. The Merit Review Process that was Employed for this year

- Internal University Panel
- External University Panel
- External Non-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 Group (NWG) 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 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 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.

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

funding sources and the peer review process associated with that funding.

III. Stakeholder Input

1. Actions taken to seek stakeholder input that encouraged 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
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Survey specifically with non-traditional groups
- Survey specifically with non-traditional individuals

Brief explanation.

Stakeholder input is actively sought to help set the course for CES and AES programs. Our primary stakeholder input is received through cooperative extension. CE engages in periodic statewide needs assessments, and the results of these assessments were 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 nearly 100 member organizations and groups representing the agricultural industry across Pennsylvania. Also part of the Ag Council membership are such organizations as the Chesapeake Bay Foundation and the County Commissioners Association of Pennsylvania--we seek input for all sectors representing the interest of Pennsylvania citizens. 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. For example the following groups provide valuable feedback--Pennsylvania Nutrition Education Network, the Intergenerational Initiatives Advisory Group, the StrongWomen program leaders, the PROSPER program collaborators, and the PA Office of Financial Education. Penn State has a well-developed organizational structure for interacting with industry; our Industrial Research Office serves as a liaison to specific industrial partners. Also in our stakeholder base are state and federal partners; we have regularly scheduled meetings with agencies such as the Pennsylvania Department of Agriculture, the Pennsylvania Department of Environmental Protection, the Pennsylvania Department of Health, and the US Department of Agriculture's Agricultural Research Service and Animal and Plant Health Inspection Service. These stakeholder meetings provide feedback on programming for Hatch, McIntire-Stennis, Smith Lever, and Animal Health funds.

2(A). A brief statement of the process that was 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.

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

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

2(B). A brief statement of the process that was 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 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
- Other (Focus Groups)

Brief explanation.

To collect stakeholder input, educators or faculty met with advisory committees, individuals, or solicit input at educational meetings. During and after extension educational programs, program participants request additional programs, updates, or make suggestions on new topics where an educational program would be helpful to them. This input may be verbal only or collected in meeting survey instruments. To collect more detailed information from traditional and non-traditional stakeholders, sophisticated survey instruments or focus group meetings are implemented and the data collected were summarized The request of information from county extension offices through telephone calls is also a measure regarding needs of clientele. If similar information is requested repeatedly, that is a sign that an issue is of concern to the public.

3. A statement of how the input will be considered

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

Brief explanation.

Information collected from stakeholders was used to adjust issue areas that determined Cooperative Extension programming. These stakeholder priorities also directly influenced applied research activity through local decisions about research priorities, availability of funding from certain extramural funding sources including stakeholder groups such as industry associations, and hiring decisions for faculty and extension educators. Stakeholder input not only informs planning, but also influences resource allocations. Stakeholder feedback also indicates where

volunteers and donors would be interested in assisting with the program.

As part of the implementation plan for our current strategic plan, we have engaged representatives of the Penn State Agricultural Council as key team members on our internal implementation teams. This serves to inform our programs on the real-world demands for new information and programs.

Both Ag Council and Pennsylvania Council of Cooperative Extension Associations (PCCEA) members are looking to serve in an advisory capacity to new natural work groups structure implemented in CES; advisory committees for NWGs will seek membership from a large stakeholder base.

Brief Explanation of what you learned from your Stakeholders

Stakeholders provide grassroots view of what is important. Marcellus Shale public meetings continued to have high attendance; many meetings extended to other issues related to this emerging issue such as water resources and forest management. Stakeholders statewide are concerned about water quality and quantity and the long range effect the natural gas drilling will have on PA natural resources. Extension aided many county governments to form County Marcellus Task Forces; these efforts were through extension work at the state organization of County Commissioner's Association of Pennsylvania (CCAP). Most popular programs continue to be in 4-H youth development and horticulture and green industry; both programs engage volunteers in their delivery, therefore larger participant numbers. Other programs with high participation are agronomic production, agricultural profitability, animal production, strengthen and supporting families and diet nutrition and health. Programs that are growing are related to renewable resources, agricultural profitability and diet, nutrition and health. Stakeholders in agricultural programs continued to be focused on the safe production of food and profitability of such enterprises; new Good Agricultural Practices (GAP) regulations in edible horticulture production is key for producers' profitability; diet, nutrition and health programs are focused on childhood obesity, diabetes and older women's health, all key public health issues. Extension continues to strategically work with diverse audiences in many programs. Minorities serve on extension boards and advisory committees and are key to helping market extension programs in their communities.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
9847402	0	6650119	0

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	9628265	0	6230019	0
Actual Matching	26376643	0	32137883	0
Actual All Other	19812141	0	33733763	0
Total Actual Expended	55817049	0	72101665	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from				
Carryover	815876	0	2764055	0

V. Planned Program Table of Content

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Agricultural and Food Biosecurity

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
723	Hazards to Human Health and Safety				
	Total				

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	16.0	0.0	68.3	0.0
Actual	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

V(D). Planned Program (Activity)

1. Brief description of the Activity

The Inputs, Activity, Target Audience, Outputs, and Outcomes previously reported under Pennsylvania's Agricultural and Food Biosecurity portion of our Annual Reports has now been moved to the new emphasis areas required by Dr. Beachy (December 2009). Internal adjustments have been made to allow for the five new emphasis areas and we are reporting all our efforts and resources in the remaining nine areas. Our Agricultural and Food Biosecurity emphasis area will be eliminated in future Plans of Work.

2. Brief description of the target audience

The Inputs, Activity, Target Audience, Outputs, and Outcomes previously reported under Pennsylvania's Agricultural and Food Biosecurity portion of our Annual Reports has now been moved to the new emphasis areas required by Dr. Beachy (December 2009). Internal adjustments have been made to allow for the five new emphasis areas and we are reporting all our efforts and resources in the remaining nine areas. Our Agricultural and Food Biosecurity emphasis area will be eliminated in

future Plans of Work.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	25000	54000	0	0
Actual	0	0	0	0

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

Year: 2009
Plan: 0
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	0	
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of invention disclosures
  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Number of participants in programs related to agricultural and food biosecurity

Year	Target	Actual
2009	25000	0

Output #3

Output Measure

- Number of research projects completed on agricultural and food biosecurity
  Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of participants who were evaluated and demonstrated increased knowledge and skills related to agricultural and food biosecurity
2	Number of participants who were evaluated in a follow up and who implement/adopt practices related to agricultural and food biosecurity
3	Number of decision support tools adopted based upon predictive modeling research
4	Number of diagnostic tools implemented or adopted for threat identification
5	Number of volunteers that helped with program leadership or program delivery.

Outcome #1

1. **Outcome Measures**

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

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

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

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Number of decision support tools adopted based upon predictive modeling research

Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

Number of diagnostic tools implemented or adopted for threat identification

Not Reporting on this Outcome Measure

Outcome #5

1. **Outcome Measures**

Number of volunteers that helped with program leadership or program delivery.

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Government Regulations
- Competing Public priorities

Brief Explanation

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

1. Evaluation Studies Planned

    - Other ()

Evaluation Results

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Agricultural Systems

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 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 (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	69.8	0.0	75.5	0.0
Actual	115.6	0.0	89.5	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
3874676	0	2683167	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
9506225	0	13319140	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
3561020	0	10400977	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The agricultural sector is a complex enterprise that spans the range from genomic studies on plants and animals to marketing and distribution of products on a global scale. Pennsylvania agriculture is a balance of livestock and cropping systems, but dairy production remains the leading economic driver in the state at nearly 50% of farm gate agricultural value. Our agricultural research and extension education programs must not only focus on specific elements of different commodities and points in the supply chain but also must take a system approach to help stakeholders understand environmental and economic sustainability in food and fiber production. Producers rely on Penn State for research and extension programming on most of the commodities that constitute significant production and in support of our substantial food processing sector. The systems approaches require research that integrates individual production practices with larger scale economic and environmental implications. We conducted research that examined the implications of corn-based ethanol production for PA agriculture; given that PA is a corn-deficit state and the current limited market for dried distillers grains, PA is unlikely to compete effectively with other states. Our research with female farm operators (one of PA's fastest growing demographics) through our Women's Agricultural Network reveals perceived lack of access to research information, particularly for environmentally sustainable production practices. This research, conducted through a series of focus groups across the state, resulted in more than 40 workshops that took research results out to end-users on such topics as business planning, cheese-making, soil quality, integrated pest management, and poultry processing. Economic analysis of reduced insecticide tree fruit pest management (reported under Pest Management emphasis area) is another example of a systems approach to evaluate technologies and place them in a context that enables agricultural producers to make decisions about adoption. Our continued work on colony collapse disorder (CCD) in honey bees illustrates this systems thinking perfectly-research on an insect problem flows all the way into consequences for the foods available in groceries and restaurants. Sixty-one different variables have been compared between control and CCD colonies. CCD colonies have higher pathogen loads, suggesting compromised immunity. These data have led to recommendations to beekeepers that they should not reuse old equipment without sterilization to reduce pathogen load. Pesticide analysis revealed the presence of more than 120 different pesticides and metabolites from nearly 900 samples. Presence of elevated levels of miticides has led to recommendations for routine comb replacement and reduction in use of miticides. Research on honey bee queen pheromone production has revealed a potential biomarker for queen (and colony) health. PA AES research is delivered to commercial beekeepers, hobby beekeepers, general public, and youth audiences by PA CES. This research had led to Master Gardner programs on establishment of pollinator gardens.

2. Brief description of the target audience

Audience consists of agricultural producers, farm laborers, farm managers, youth, processors, and distributors of agricultural products.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	114000	498000	0	0
Actual	122013	758193	0	0

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

Year: 2009
Plan: 1
Actual: 12

Patents listed
Serial No.: 61/226,536; Filed: 07/17/09; Title: Process for Compact Packaging of Waste Plastic
Serial No.: PCT/US2009/037410; Filed: 03/17/09; Title: Highly Lycopene Content Tomato Plants and Markers for Use in Breeding for Same
Serial No.: 12/405,572; Filed: 03/17/09; Title: High Lycopene Content Tomato Plants and Markers for Use in Breeding for Same
Serial No.: 61/226,536; Filed: 07/17/09; Title: Process for Compact Packaging of Waste Plastic
Serial No.: 61/220,867; Filed: 06/26/09; Title: Devices for Preventing Intromission and Methods of Use Thereof
Serial No.: 12/502,677; Filed: 07/14/09; Title: Phytonutrient Compositions from Mushrooms or Filamentous Fungi and Methods of Use
Serial No.: PCT/US2009/041516; Filed: 04/23/09; Title: Methods and Compositions for Improving the Nutritional Content of Mushrooms and Fungi
Serial No.: 12/386,810; Filed: 04/23/09; Title: Methods and Compositions for Improving the Nutritional Content of Mushrooms and Fungi
Serial No.: PCT/US2009/037410; Filed: 03/17/09; Title: Highly Lycopene Content Tomato Plants and Markers for Use in Breeding for Same
Serial No.: 12/405,572; Filed: 03/17/09; Title: High Lycopene Content Tomato Plants and Markers for Use in Breeding for Same
Serial No.: 2,659,979; Filed: 02/03/09; Title: Reversible Inhibition of Sperm Receptor Synthesis for Contraception
Serial No.: 61/233,997; Filed: 08/14/09; Title: Fluorescence-Based Cholesterol Efflux Assay

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	0	
Actual	0	0	433

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of invention disclosures

Year	Target	Actual
2009	4	7

Output #2

Output Measure

- Number of participants in programs related to agricultural systems

Year	Target	Actual
2009	104000	104370

Output #3

Output Measure

- Number of research projects completed on agricultural systems

Year	Target	Actual
2009	22	34

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of participants who were evaluated and demonstrated increased knowledge and skills related to agricultural systems
2	Number of participants who were evaluated in a follow up and who implement/adopt practices related to agricultural systems
3	Number of volunteers that helped with program leadership or program delivery.

Outcome #1

1. Outcome Measures

Number of participants who were evaluated and demonstrated increased knowledge and skills related to agricultural systems

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	4400	4403

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The dairy industry is a complex business operation; dairy producers must operate their dairy farm as a business, an integrated business that may include the following: dairy cow and heifer management, crop production, facilities management, labor management, and marketing. The dairy producer must be able to make on-farm decisions that keep the farm profitable and be able to respond to the changes in the market over which he has little or no control, i.e. price of milk, feed costs, consultants or other products necessary for farm operations.

What has been done
Extension educators and faculty offer a number of educational workshops, demonstrations, farm visits, and use resource teams (referred to as dairy profit or target teams). The team's approach is to help farmers make better decisions or to trouble-shoot a problem area that can lead to enhanced performance, and greater likelihood of profitability. Extension dairy "drill down" tools have been developed for use in trouble-shooting various dairy operations.

Results
Reproductive Drill-Down Workshops: participants learned to evaluate and identify specific areas of management that limited reproductive performance using the Reproductive Drill-Down Assessment Tool; new concepts in reproductive management, synchronization systems, and herd health were explored; "Dairy Foot Health Workshop" participants (n=12) showed increase knowledge in: 100% in the anatomy and pathology of a hoof, 71% in diseases and importance of hygiene and foot baths; "Natural Rendering: Composting Livestock": 99 participants attended from 6 counties; of respondents (n=42) 89% plan to implement the use of carcass composting on their farm and 47% were already carcass composting, 90% indicated a better understanding on how to properly build a composting pile; two "Accounting for Progressive Dairies" workshops had 26 attendees: 50-60% indicated increased knowledge of proper accounting principles and practices; an online Profit Team training program was used to train new Profit Teams; 748 site visits were recorded.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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 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

Outcome #2

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	2300	2557

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Pennsylvania's animal agricultural production industry is massive in size and increasingly challenged by the competitive national and global food marketplace. Businesses are adopting various alternative production strategies to meet the demands of the consumer, and almost all of the state's animal production businesses are seeking to adopt new technologies to maintain profits or provide superior products to consumers. In addition, youth show a strong interest in animal production programs.

What has been done

Extension educators and faculty offer a number of educational workshops, demonstrations, farm visits, and distance education to deliver information. 4-H clubs are a major venture used to teach young people about animal agriculture. On-line education involved home study courses in sheep, meat goat, and beef.

Results
On-line beef, sheep and meat goat study course (n=135): 96% of respondents to a follow up survey (n=25) indicated they made three or more changes to their management practices, 84% to their record keeping system, 68% analyzed feeds for nutrient content, 84% to feed rations, 80% to grouping of animals for feeding purposes, 80% to their vaccination program, 85% to their deworming program, 76% to their breeding season(s), 61% to their animal evaluation techniques, 84% to their marketing options, 96% to the financial analysis of their operation, 4 people stated they improved their profitability because they saw either an increase in the value of the animals they marketed or they decreased the costs associated with producing their animals.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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 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

Outcome #3

1. Outcome Measures

Number of volunteers that helped with program leadership or program delivery.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	1983

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Having an adequate number of volunteers who are qualified to teach subject matter disciplines to youth is essential to learning and skill development of youth engaged in the 4-H animal sciences program.

What has been done
Volunteer and leadership education occurs at the county, regional, and state levels. Volunteers have access to information on the web as well as an online volunteer orientation program. Within the disciplines, volunteers are provided with subject matter and youth development training in the forms of workshops, leader guides, demonstrations, mentoring, distance education, and observation. Effective volunteers equates to youth learning and developing new skills.

Results
Beaver County: 45 volunteers indicated increased knowledge in group management, creating a budget, planning trip details, fundraising, and managing medical issues; Lancaster County: 90% (n=59) of leaders reported that the 4-H volunteer workshops taught them information, techniques, and ideas to improve 4-H members animal knowledge skills; Washington County: Youth (n=52) attending fair clinic indicated increased knowledge: 46% in animal health and diseases, 44% in proper watering, feeding skills, 98% in antibiotic withdrawal time needed for safely selling the animal, 90% were able to list two signs of stress or ill health of their animal. In a 4-H horse program survey of club families, 49 families reported increased knowledge in horse safety standards (71%), equine health issues (68%), and increased skills in record keeping (70%), in working with others (82%), in horseback riding (83%), ground handling (74%), 4-H enabled them to communicate ideas effectively (78%).

4. Associated Knowledge Areas

KA Code	Knowledge Area
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 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

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

Competing program challenges and public priorities were challenging in some parts of the Commonwealth this year. The increased program demands made by the Marcellus Shale program took significant educator resources to address this emerging issue, which potentially impacts many farmers. The continued economic crisis in the state challenges resources for programs at the state and local levels as budget cuts created shifts in how programs were conducted; more distance learning and Web 2.0 technologies were used to deliver education and information.

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

1. Evaluation Studies Planned

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

Evaluation Results

The most germane aspects of the evaluation results are shown in the results sections as number of participants increasing knowledge or implementing new practices or methods.

Key Items of Evaluation

Beef, sheep, and meat goat producers made management changes in their operations that resulted in profitability; the Reproductive Drill-Down tool helped farmers evaluate and identify specific areas of management that limited reproductive performance; volunteer leaders who extend education to 4-Hers increased their skills in animal management and working with others.

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Families, Youth, and Communities

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 (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	151.1	0.0	20.3	0.0
Actual	185.8	0.0	28.5	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
3130723	0	537377	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
9162500	0	2640076	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
9308415	0	3363250	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Evidence-based programs for families and youth promote healthy lifestyles, family strengths, and resiliency. Nutrition education programs are prevention oriented, encourage lifestyle changes, increase awareness, and change behaviors increasing the consumption of fruits, vegetables, grains and low-fat foods. Health oriented programs address chronic diseases such as osteoporosis, diabetes, obesity, heart disease, and cancer as well as emergency readiness and tobacco prevention. Some programs now use bio-markers so the program participants can learn how to improve daily blood glucose, hemoglobin A1C (HgA1C), and lipoproteins. Other health programs conduct pre- and post-program participant assessment tests to measure strength, flexibility, and fitness. Limited income households acquired knowledge, skills, attitudes, and behaviors that led to nutritionally sound diets, personal development, and increased physical activity. Family programs addressed out-of-school care, strategies to strengthen families, intergenerational opportunities, eldercare, and financial management. Families facing financial difficulty participated in educational programs on bankruptcy and tax education, using credit wisely, managing family records, keeping personal information safe, conserving resources, and making sound financial decisions. 4-H Youth development programs helped youth develop into healthy and productive citizens. Science, engineering, and technology (SET) is one of the mission mandates of the 4-H Youth Development program. In PA, 76,700 4-H members take 4-H SET projects including animal sciences, environmental and earth sciences, and science and technology, and thousands of volunteers support 4-H SET. Volunteers play a major role in the 4-H program extending our ability to reach more youth, and the tax education program involves college student volunteers to reach limited resource taxpayers. On-line resources such as the Extension Disaster Education Network (EDEN), Children Youth and Families Are Resilient (CYFAR), eXtension, and Food Preservation databases helped consumers have quick access to the latest research and educational information. New delivery methods such as webinars and websites have helped span program delivery across time and distance. A new Family Living Well blog hosted by Extension educators in southeast Pennsylvania, provides information on family, food, and finances. Educational programming has also been conducted on the economic, environment, and social implications of the Marcellus Shale natural gas development in Pennsylvania. Research on communities affected by natural gas development is building from longitudinal studies supported by PA AES and examining impacts on local infrastructure, community services, employment opportunities for local residents, technical training needs, and local government decision-making. Community development programs help youth understand their communities to chose their direction and help community groups chart their future. Learning Today, Leading Tomorrow is a curriculum focused on developing personal, interpersonal, and group leadership skills as well as how to use those leadership skills in community or public policy settings.

2. Brief description of the target audience

Youth and families benefit from Extension programs. Specific programs are targeted to parents, older adults, grandparents, and other relatives raising children, limited resource adults and youth, people with disabilities, and community groups. Teachers, child care providers, aging and human service organizations, and community collaborators are target audiences who also help reach families and youth. For the nutrition programs, the typical adult audience is suburban and rural with half of the adult audiences between the ages of 41-64 and 65-79. Audiences in adult nutrition programs are 70% female and 30% are male. In addition, approximately, 50% have a high school education. Volunteers are also part of the audience and also assist with delivering programs. The Pennsylvania 4-H Youth Development program reaches youth ages 5-18 through 4-H club, schools, and out-of-school programming. Both boys and girls are recruited to participate in the program. About 6% of participants are Hispanic, 83% are white, and 13% are African American. American Indian, Asia, native Hawaiian, and mixed race youth also participate in programs. About 42% of youth participants live in rural areas or on farms. The rest live in towns, suburbs, and cities. Within the Marcellus Shale region of Pennsylvania, landowners/mineral right owners, local government officials, and businesses have been the target audience.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	342000	626000	0	0
Actual	244040	900496	0	0

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

Patent Applications Submitted

Year: 2009
Plan: 0
Actual: 4

Patents listed
Serial No.: 08113073.5; Filed: 12/01/08; Title: Soy/Whey Protein Recovery Composition
Serial No.: 61/183,289; Filed: 06/02/09; Title: Anti-Malarial Compositions and Methods of Use
Serial No.: 08113073.5; Filed: 12/01/08; Title: Soy/Whey Protein Recovery Composition
Serial No.: 61/162,044; Filed: 03/20/09; Title: Methods and Compositions Comprising Small Molecules Which Target Viral Transcription

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	0	
Actual	0	0	162

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of participants in programs related to families, youth, and communities

Year	Target	Actual
2009	232000	176880

Output #2

Output Measure

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

Year	Target	Actual
2009	14	13

Output #3

Output Measure

- Number of invention disclosures

Year	Target	Actual
2009	1	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of participants who were evaluated and demonstrated increased knowledge and skills related to families, youth, and communities
2	Number of participants who were evaluated in a follow up and who implement/adopt practices related to families, youth, and communities
3	Number of volunteers that helped with program leadership or program delivery.

Outcome #1

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	24500	20963

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The United States trails in developing its future workforce of scientists, engineers, and technology experts. America faces a future of intense global competition with a startling shortage of scientists. The key is to interest youth in opportunities such as biology, food science, agriculture, engineering, robotics, bio-fuels, renewable energy, and computer science. Another issue of significant impact in Pennsylvania is the exploration of natural gas in the Marcellus Shale.

What has been done
In the Youth Engaged in Technology program, youth learn basic and some advanced computer skills. Over 65,000 youth participated in 4-H science activities during school which enhanced the science curriculum and provided youth with an intro to agriculture. Over 58,000 4-H'ers work in animal sciences and were trained in quality assurance and ethics. For the gas exploration program, seventy-three meetings utilized a variety of face-to-face and electronic delivery methods such as webinars.

Results
Youth engaged in technology programs have shown increases in life skills. Students have gained an understanding about careers in science, technology, engineering, and math. Teachers ranked the science enhancement curricula as an excellent way to reach youth with state science standards. Teachers noted youth life skill development in areas such as patience, cooperation, sharing, and responsibility. For the gas exploration program, landowners are able to understand the market value of their mineral rights, and thus can negotiate more appropriately (and on a more equal basis with the natural gas companies). They learn the importance of consulting with an attorney prior to signing leasing documents. Participating landowners have been able to negotiate for much higher lease values than they could prior to attending our sessions. We estimate that participants are able to negotiate for an aggregate increase of more than $250 million in lease payments over what they were originally offered by gas companies.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

Outcome #2

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	16900	8279

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
A Healthy People 2010 national objective is to reduce the prevalence of obese adults to less than 15%. In PA, the current prevalence is 29%. Another objective is to increase the percent of healthy weight adults to 60%. In PA, it is 34%. Obesity increases the incidence of many chronic diseases. Overweight and obesity and their related health problems have a major economic impact on the health care system. Medical costs associated with overweight and obesity involves many direct and indirect costs.

What has been done
The My New Weigh of Life course was developed by Penn State Extension based on the most current research available on weight loss and behavior change, exercise, obesity, and healthful eating. The program's objective is to motivate permanent lifestyle changes of healthier eating and increased physical activity so that adult participants can achieve and maintain a healthier weight. The course consists of 12 classes. The program was conducted in

ten counties as a pilot the first year.

Results
Average weight loss was 8 pounds, average decrease of BMI was 1.65 and average decrease in waist circumference was 2.3 inches. These changes can impact not only the quality of life of the individual, but also incidence of chronic diseases and associated healthcare costs. After completing the pilot program: 94% (45) make a healthy choice over an unhealthy one more frequently, 88% (42) consumed low calorie foods and beverages more frequently, 90% (43) consumed 2 cups or more of vegetables more frequently, 79% (38) consumed 1 ½ cups or more of fruits more frequently, 73% (35) consumed 3 servings of low-fat or fat free dairy products more frequently, 83% (40) consumed 3 or more servings of whole grain products more frequently, 77% (37) engaged in at least 30 minutes of moderate intensity physical activity more frequently, 85% (41) track their daily intake by writing down what they ate more frequently.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

Outcome #3

1. Outcome Measures

Number of volunteers that helped with program leadership or program delivery.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	9600

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Communities are continually stressed with change and ongoing community issues. Leaders must be equipped to solve and work with others to address these issues. Communities are stressed economically; infrastructures are decaying, urban sprawl continues and many find the only way to meet increased costs is to raise taxes. Residents need to become more engaged in community; one way to do that is for them to develop the skills and capacity to work collaboratively to address complex problems and improve the quality of life.

What has been done
Through local, regional, and state initiatives and club activities, youth are engaged in decision making, goal setting, and problem solving activities. Youth are given the opportunity to lead club activities as elected officers, design regional events through workshops and camps, develop citizenship by immersing themselves in the community, and achieving a diverse collaboration of participants. Worthwhile service learning experiences are integrated into the 4-H programs.

Results
Across PA, there are 8,014 adult volunteers, 1,208 teen volunteers, totaling 9,222 volunteers. In Northwest PA, 639 volunteers were involved in 4-H programs. 254 volunteers served as in-direct volunteers in the same programs. 185 volunteers received training in topics such as VIP training, quality assurance ethics, and program related training. 96 new volunteers were recruited this year throughout the Northwest region. In this region of the state, (n=127) 74.5% of the youth participated in a community service project in their respective counties. Of those surveyed 47.1% spent over three hours on a community service activity.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

External factors affecting the children youth and community programs include all funding sources. As local, state, and federal appropriations remain the same, are reduced and in some cases eliminated, extension is being challenged to charge for programs (once delivered at no out-of pocket cost to the constituents), seek extramural funding to support and grow new programs, and compete in the market place for other sources of revenue. In many cases, resource stressed individuals are finding it increasing difficult to pay, even minimally, for extension programs. 4-H is charging membership fees, where historically, no fees were charged. As more organizations fight for market share, extension is finding more competitors in many program areas. The changing face of community demographics are factors in extension programs; the culture of traditional extension programs may not fit new audiences.

V(I). 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)
- Time series (multiple points before and after program)
- Comparisons between program participants (individuals, group, organizations) and non-participants

Evaluation Results

The most germane aspects of the evaluation results are shown in the results sections as number of participants increasing knowledge or implementing new practices or methods.

Key Items of Evaluation

Extension programs are led by volunteers, master volunteers, and teen volunteers. The 4-H youth development program employs nearly 10,000 volunteers. Youth education programs are grounded in evidence based curricula that lead to high quality educational programs. Diet, nutrition, and health programs are empowering individuals to take charge of their lifestyle for an improved quality of life.

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Natural Resources and Environment

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 (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	19.9	0.0	59.0	0.0
Actual	31.4	0.0	38.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
750374	0	616335	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
2323079	0	4617575	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
1727431	0	4258900	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The protection, management, and overall sustainability of Pennsylvania's natural resources are high priorities for the PA AES and CES Programs. The health and well-being of ecosystems and their components (air, water, soil, flora and fauna) are intrinsic to the structure and function of the food and fiber system, and all human and community systems. Consequently, our research and extension are structured to proactively address the critical needs in this emphasis area and identify research and educational gaps and opportunities. This requires continued diligence and attention in addressing the legacy issues related to working lands and particularly resource extraction (agriculture, natural gas, forests) as well as the emerging issues related to new environmental contaminants like endocrine disrupting chemicals and complex, global impacts such as climate change.

CES integrates research with innovative outreach for statewide delivery and engagement that addresses Pennsylvania's critical natural resource issues through: environmental stewardship of land and water resources, sustaining forest systems, agronomic production, horticulture and green industry production, and managing wildlife and fisheries. Environmental protection and pollution prevention in animal production is also a priority, addressing air- and water- emissions that impact water quality and climate change. Research on use of animal agriculture and paper mill waste in mine reclamation locations in conjunction with biomass crops to sequester organic carbon and nitrogen has revealed value for all three of these purposes (reclamation, biomass production, nutrient sequestration). Because Pennsylvania's land and water contributions influence the health of national priority watersheds (the Chesapeake Bay and Mississippi River), CES works to increase options for adaptive management in both policy and practice, to reduce the loads of all nonpoint and atmospheric sources of pollutants that cause hypoxia in otherwise economically productive and environmentally critical national estuaries and gulf regions. PA AES research has demonstrated the connection between nutrients in stream ecosystems and stream biofilms. This work is being used by the Environmental Protection Agency (EPA) and PA Department of Environmental Protection (DEP) to craft science-based water quality standards for phosphorous, nitrogen, and chlorophyll, 3 stated water quality parameters. Dramatic changes in land uses across the Marcellus shale region of the state (traditionally the coal producing areas) have presented added pressures for reaching rural audiences that have exponentially increased influence on land use decisions and trade-offs relative to natural gas production and the accompanying natural resource protection challenges for groundwater and surface water protection (quality and quantity), forest fragmentation, invasive species introduction, and wildlife impacts.

2. Brief description of the target audience

The audiences engaged include working land owners and managers (farm and forest), municipal officials and leaders, youth, homeowners and households, businesses, agriculture and forest industry, county level practitioners, and regional, state, and federal agencies. Because community-based environmental protection continues to emerge as the most effective scale at which behavioral change is possible, there is increased attention to reaching audiences who in the past were perceived as having smaller realms of influence (e.g. residents who may not be homeowners) but who, in fact, are influential in their respective work environments, households, and other locations at which natural resource and environmental choices are integrated across daily activities. Citizens of the Marcellus shale region of the state increasingly comprised audiences for water protection and forest management programs based on the rapid and impending land use changes underway.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	33000	436000	0	0
Actual	18768	120033	0	0

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

Year: 2009
Plan: 0
Actual: 1

Patents listed
Serial No.: 61/183,806; Filed: 06/03/09; Title: Systems and Methods for Wastewater Treatment

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	0	
Actual	0	0	200

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of invention disclosures

Year	Target	Actual
2009	1	3

Output #2

Output Measure

- Number of participants in programs related to natural resources and environment

Year	Target	Actual
2009	48000	15446

Output #3

Output Measure

- Number of research projects completed on natural resources and environmental issues

Year	Target	Actual

2009	14	26

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of participants who were evaluated and demonstrated increased knowledge and skills related to natural resources and environment
2	Number of participants who were evaluated in a follow up and who implement/adopt practices related to natural resources and environment
3	Number of volunteers that helped with program leadership or program delivery.

Outcome #1

1. Outcome Measures

Number of participants who were evaluated and demonstrated increased knowledge and skills related to natural resources and environment

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	7600	10584

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Non-point source pollution stemming from agriculture, commercial, municipal, residential, and resource extraction activities cause water quality impairments. The majority of the over 1 million private water supplies serving nearly 3.6 million rural residents fail to meet drinking water standards due to contamination from the same sources that impair surface waters. Well managed forests improve local water quality; having educated, private ownership of forests will benefits the entire Commonwealth.

What has been done
Workshops, webinars, and targeted outreach efforts offered landowners knowledge and tools by which to make decisions. The Master Well Owner Network (MWON) and PA Forest Stewards (PAFS) maximized the outreach through train-the-trainer, safe drinking water clinics, and woodlot owners associations. The Marcellus Shale region outreach focused on groundwater and land protection to establish critical baseline information, to reduce drinking water contamination, and threats to forest and wildlife.

Results
MWON volunteers reported 391 hours educating 4,185 private water system owners; 63 of PA's 67 counties have MWON volunteers (367). Over 90% of participants indicated they learned at least one practice for protection of their private water system. The PAFS network had 20,000 contacts, community and urban forestry reached nearly 13,000, and wildlife management 40,000, resulting in increased private forest owner participation in web-based training, awareness of urban tree planting benefits, and wildlife habitat improvements. Over 1,200 people (managing >300,000 acres of land within the Marcellus region) participated in drinking water protection workshops. 64% indicated that they would create a 100' radius buffer of their private water supply, 63% would test their water and establish baseline conditions, 70% would add restrictive language for water protection to a natural gas lease agreement. Over 500 practitioners and producers increased knowledge of conservation practices for on-farm air and water quality protection.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

Outcome #2

1. Outcome Measures

Number of participants who were evaluated in a follow up and who implement/adopt practices related to natural resources and environment

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	2000	9065

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Removing stream impairments, improving drinking water quality, and retention and increase of forest acreage through forest stewardship require transferring knowledge to implementation at all scales: household, farm, community, small watershed, and at the confluences of small watersheds into the next higher order landscape. The adoption of practices that result in environmental condition response and improvement at the micro scale are the building blocks for increased beneficial impacts as scale increases.

What has been done
Safe drinking water clinics and MWON contacts reached >3,000 individuals; pond and lake management training reached 733 individuals (managing nearly 2,000 acres of surface waters) focusing on water quality protection, invasive species control, and reduction of chemical use. Stormwater management training included the use of community urban forestry techniques to promote increased infiltration, stormwater control and household level 'retrofits' of impervious areas, and increased rain barrel and rain garden installation.

Results
Over 82% of program respondents indicated that they had taken an action to protect their drinking water supply including establishment of a source protection area, testing the drinking water, installation of well caps, and septic

system maintenance. Education in the Marcellus region resulted in over 1,000 homeowners having their drinking water tested by Penn State's certified test lab. Ninety-one participants utilized materials received to install either rain gardens or rain barrels for onsite stormwater control. Seventy-four percent of pond and lake management workshop attendees took action by conducting water testing, installing buffer strips, reducing use of harsh chemicals, or identifying invasive species for removal.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

Outcome #3

1. Outcome Measures

Number of volunteers that helped with program leadership or program delivery.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	1161

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Neighbor-to-neighbor delivery of best management practices for the protection of private drinking water resources and improved forest management significantly increases the potential for improved implementation of the practices. By developing and growing the network of trained volunteers who can increase community and county level delivery of knowledge that will assist them in improved natural resource management decisions, improved environmental outcomes are possible.

What has been done

Train the trainer approaches for both the MWON and the PAFS programs have resulted in the development of strong and active networks of volunteers who contribute agreed upon hours towards engaging one-on-one and group audiences on private water system, water quality protection, and improved forest management and stewardship. PAFS volunteers undertake 40 hours of training and there are now nearly 500 volunteers statewide. MWON volunteers (367) cover 63 of Pennsylvania's 67 counties.

Results

Over 1,250 volunteers are extending extension education programs that are teaching citizens about how to improve and protect their private well water and to manage forest land for better forest sustainability, water quality, and a healthy environment. The nearly 500 PAFS volunteers held their 20th training event during the 2009 program year and have 20,000 contacts equivalent to nearly 20 years of service (FTEs). The MWON volunteers provided 301 hours of service and educated 7,185 private water system owners. An additional 400 volunteers are serving as Tree Tenders and Tree Managers through the Community and Urban Forestry Program, providing the equivalent of 15 years of service (FTEs).

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Extreme weather events in Pennsylvania resulting in drought conditions, flooding, and resultant perturbances of ecosystems and consequent (and unrelated) pest and invasive species movement and infestations (e.g. gypsy moth) have contributed to stress of forest and stream health. Coupled with the continued decrease in state appropriations that diminishes the capacity of educational programs delivered by educators and specialists, the development and support of viable, well-trained networks of volunteers to deliver programs in water quality and forest sustainability are essential. Field educator positions are not routinely filled when vacated due to scarcer resources, making grants, along with enhanced partnerships with other state funded agencies, to continue critical research and educational programs.

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

1. Evaluation Studies Planned

- After Only (post program)
- Retrospective (post program)
- Before-After (before and after program)
- Other (Direct Observation)

Evaluation Results

The most germane aspects of the evaluation results are shown in the results sections as number of participants increasing knowledge or implementing new practices or methods.

Key Items of Evaluation

MWON education sessions: of the participants responding 97% felt the interaction was beneficial, 92% learned at least one new idea for private water system management, and 82% had taken an action to better protect their drinking water supply; Over 1,250 volunteers are conducting education and service to water quality education and forest sustainability reaching over 27,000 contacts.

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Pest Management

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 (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	18.0	0.0	55.7	0.0
Actual	40.3	0.0	70.3	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
864920	0	1387804	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
2237058	0	6328453	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
2364488	0	10662297	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Pest management research and education is addressing the ever-changing pest issues in the complex agricultural systems of Pennsylvania. The college has led in the development of pest prediction and management models and in the development of research-based extension programs focusing on integrated pest management and pesticide application and management training. Pest management research in the college has focused on development of pest management models for predicting outbreaks of various species using modeling and monitoring programs. Ongoing research at the Computational Epidemiology & Aerobiology Laboratory for example, is focused on monitoring and modeling programs for Asian Soybean Rust, Wheat Stem Rust and Marestail, and has played a key role in the development of the PIPE (Pest Information Platform for Extension) which is used extensively by extension educators. PA AES researchers are also focused on invasive species ecology and management. A recent study has focused on the spread of Japanese stiltgrass in forests. This is one of several projects related to weed ecology, which also includes efforts in ecologically based weed management and plant dispersal in diverse environments. A comprehensive agronomic weed management research program complements this program with efforts in herbicide performance and cover crop effects on weed control. Implementation of mating disruption (MD) to control tree fruit pests has resulted in a reduction of pesticide applications (up to 60%) compared to orchards not in the MD program. This AES project has led to an increase from 1% of PA apple and peach orchards using MD in place of insecticide-only programs to 13% of apple orchards and 18% of total reported tree fruit acreage. This is a substantial change in practice. PA is now ranked third in value of organic production, and research/extension programs are focused on providing appropriate pest management options for this ag sector. Of particular value has been our certified organic apple orchard and vineyard, where hands-on workshops were held to showcase on-going research in pest management alternatives. Cooperative Extension has a significant effort focused on integrated pest management education focused on monitoring for new pest species and developing appropriate tactics to manage these species in agricultural and forestry systems. As part of this effort, Extension faculty and educators have developed production guides for agronomic and horticultural crops, developed regular online newsletters, field scout training events, and have utilized on-line pest development models that predict the potential pest infestation levels throughout the state. In 2009, Extension used these to help forecast and manage the Fusarium Head Blight epidemic that occurred on winter wheat and severely impacted crop quality. Extension entomologists also initiated a Western Bean Cutworm trapping program in 2009 and were able to document the occurrence of this important corn pest in the state for the first time. In addition, Extension is engaged in a large effort in pesticide applicator training in conjunction with the Pennsylvania Department of Agriculture.

2. Brief description of the target audience

The target audience included agricultural producers, private and commercial pesticide applicators, state and federal agency personnel and agribusiness professionals.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	30000	517000	0	0
Actual	31747	34233	0	0

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

Patent Applications Submitted

Year: 2009

Plan: 0

Actual: 9

Patents listed
Serial No.: PCT/US2009/037410; Filed : 03/17/09; Title: Highly Lycopene Content Tomato Plants and Markers for Use in Breeding for Same
Serial No.: 12/405,572; Filed: 03/17/09; Title: High Lycopene Content Tomato Plants and Markers for Use in Breeding for Same
Serial No.: PCT/US2009/037410; Filed: 03/17/09; Title: Highly Lycopene Content Tomato Plants and Markers for Use in Breeding for Same
Serial No.: 12/405,572; Filed: 03/17/09; Title: High Lycopene Content Tomato Plants and Markers for Use in Breeding for Same
Serial No.: 61/162,044; Filed: 03/20/09; Title: Methods and Compositions Comprising Small Molecules Which Target Viral Transcription
Serial No.: 61/176,608; Filed: 05/08/09; Title: Compositions and Methods for Eliciting a Protective Immune Response to Bordetella
Serial No.: 61/234,425; Filed: 08/17/09; Title: Compositions, Methods, and Kits for Detecting and Treating Abnormal Metabolic and Cardiovascular Diseases
Serial No.: 61/274,571; Filed: 08/19/09; Title: Novel Recombinant Mumps Virus Strain and Methods for Use of Same
Serial No.: 61/275,623; Filed: 09/01/09; Title: Parainfluenza Virus 5 as an Oncolytic Agent, Expression System and Vaccine

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	0	
Actual	0	0	252

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of invention disclosures

Year	Target	Actual
2009	0	2

Output #2

Output Measure

- Number of research projects completed on pest management

Year	Target	Actual
2009	11	18

Output #3

Output Measure

- Number of participants in programs related to pest management

Year	Target	Actual
2009	26000	32810

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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

Outcome #1

1. Outcome Measures

Number of participants who were evaluated and demonstrated increased knowledge and skills related to pest management

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	2300	1010

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Numerous plant, insect, and disease pests present management challenges for Pennsylvania crop, fruit, vegetable, ornamental, and forestry producers. Producers need to understand the best management practices to minimize environmental impacts while maintaining profitability in their operations. Also, pesticide applicators need to use practices that will result in effective product performance while minimizing any potential health or environmental effects associated with the applications.

What has been done
Pest management and pesticide applicator training programs have continued to be strengthened using new training methods, statewide monitoring efforts, and on line pest prediction models. Program efforts have been a joint partnership between Extension, industry, state agencies, and private consultants.

Results
Capital Region Professional Applicators School, 173 attendees composed of professional and private pesticide applicators, extension educators, and agency personnel. In a program evaluation, 59% percent indicated they tried a new pest management practice, 52% tried a new IPM approach, and 96% have indicated they adopted an environmentally friendly pesticide application practice. Statewide monitoring websites were developed and hosted for Fusarium Head Blight (http://www.wheatscab.psu.edu/riskTool_2009.html). This website had over 5,000 hits from 1,816 unique users. The website was heavily promoted in Pennsylvania through the Field Crop News newsletter. Other pest development websites tracked important diseases such as soybean rust (http://sbr.ipmpipe.org/cgi-bin/sbr/public.cgi) , which has not been identified in the state, but was monitored by extension educators at ten locations in the state.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

Outcome #2

1. Outcome Measures

Number of decision support tools adopted based upon predictive modeling research

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	1	9

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Producers make pest management decisions based on multiple inputs. Model-based monitoring systems enhance the reliability of these decisions. We have continued to build our predictive modeling tools as part of a decision support system available to researchers, Extension educators, and agricultural producers.

What has been done
Eight new insect pest species were added to the decision-support tool PA Pest Information Platform for Extension and Education. The Integrated Aerobiology Modeling System (IAMS) was implemented to forecast aerial movement of the soybean rust pathogen into Pennsylvania.

Results
Data from the national soybean rust observation network were used to test the IAMS approach, and predictions matched field observations. However, soybean rust was not detected in PA through the PA soybean rust sentinel network, so local implementation of the predictive tool was not necessary.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

Outcome #3

1. Outcome Measures

Number of diagnostic tools implemented or adopted for pest identification

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	1	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Fungi in the genus Fusarium are important plant, animal, and human pathogens. However, identification using conventional tools have been problematic. Diagnostic tools based upon DNA sequence data are becoming widely available and adopted for many taxa. This approach is ideal for implementation in Fusarium.

What has been done
A database of DNA sequence data for Fusarium isolates (leveraging the extensive genetic resources of our internationally respected Fusarium Research Center) has been made available on the web. This database represents a set of diagnostic tools that are linked to cultures available to authorized researchers around the world, and it is a more extensive genetic resource that other current efforts to develop DNA barcode tools

Results
The FUSARIUM-ID DNA sequence identification database (http://isolate.fusariumdb.org/index.php) is freely available to researchers. This tool is being used by clinical pathologists and researchers to match fungal isolates to appropriate species designation.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

Outcome #4

1. Outcome Measures

Number of participants who were evaluated in a follow up and who implement/adopt practices related to pest management

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	1410	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Pesticide applicators need to adopt new practices to minimize their impact on the environment and to ensure their own health and safety. These practices include storage and handling procedures, selecting the right product, recordkeeping, and a knowledge of pesticide chemistry and its potential toxicity.

What has been done
A Pesticide Applicator Training program conducted in the southcentral region of the state is conducted annually and the programs are attended by over 5,000 private and commercial pesticide applicators annually. In 2009 a survey was conducted to assess the impact of these programs on clientele and their adoption of recommended pest management practices. In the western extension region of the state, two extension educators also conducted an extensive Pesticide Applicator Program conducted 81 training events with 3,005 attendees. Calibration cards and pesticide record keeping notebooks were distributed to over 1,000 clientele. These are typical of the extent of the pesticide training conducted throughout the state.

Results
As a result of this training in the southcentral region conducted over the course of a year, a follow up survey of 1,000 attendees indicated that 92% indicated increased efforts to protect children and other family members from mixing and application sites; 91% improved record keeping system for restricted use pesticides; 89% increased use of personal protective equipment; 81% changed selection of pest control materials to those with less or minimal impact on beneficial insects and/or other non-target organisms; 76% improved laundering practices for clothing worn while applying pesticides; and 64% improved pest-scouting record keeping. In the western region of the state, a follow-up survey indicated that 90% of producers planned to improve their recordkeeping of pesticide applications. Additionally, 92% reported that they would improve their evaluation of pesticide storage tanks.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

Outcome #5

1. Outcome Measures

Number of volunteers that helped with program leadership or program delivery.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	62

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Pest identification for home owners and gardeners takes a great deal of time for extension educators and faculty. Constituents call, deliver, or bring samples to the office and expect someone to tell them what the pest is and how to eradicate it. The volume of pest identification requests is significant; a volunteer system, such as Master Gardener program, can redirect this service to a volunteer corps, if properly trained.

What has been done
Volunteers receive 40 hours of instruction, pass an exam, and volunteer 50 hours before they are recognized as a Penn State Master Gardener (MG). MG education is through workshops, hands-on, and distance education, and many counties have active MG groups that facilitate on-going training.

Results
Master Gardeners provide invaluable service to the community by answering inquiries concerning plants, plant diseases, insects, and wildlife; 490 volunteers from around the State volunteered 13,508 hours in their local Cooperative Extension Office manning Garden Hotlines. This service provided the public with environmentally safe choices for their garden or landscape regarding insect problems. Volunteers provided information that

included diagnosis and treatment options to 18,303 consumers of which the following were insect related: Insects identified in-house 1,055, Insects sent to lab 174, Insect question answered 2,975; 236 people attended GardenWise, York County: 145 responded to evaluation of which 62% identified they would reduce pesticide use to protect pollinators as new practice.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

The depressed dairy farm economy has caused many agricultural producers in the state to have limited resources to manage pests and invest in new pest management technologies. Seed and pesticide industry options for managing crop pests remain relatively expensive due to the relatively strong grain prices. As a result, many livestock producers search for low cost alternatives that can still be effective. With careful scouting and assessment of alternatives often cost effective alternatives can be developed but this does require careful management.

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

1. Evaluation Studies Planned

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

Evaluation Results

The most germane aspects of the evaluation results are shown in the results sections as number of participants increasing knowledge or implementing new practices or methods.

Key Items of Evaluation

The development of pest management tools and tactics is critical to address the needs of the diverse agricultural and forestry issues in the state to ensure minimal impacts on human health, environmental issues and profitability. Management of invasive species and continued development and promotion of Integrated Pest Management tactics is critical.

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Global Food Security and Hunger

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 (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Actual	9.6	0.0	7.3	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
170671	0	127870	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
424897	0	902035	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
1009711	0	1032844	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Three billion additional people to feed, shrinking amounts of arable land, climate change, increased natural disasters, energy and environmental issues, pests and diseases, political and social issues; all these factors and more will affect the future availability of food for a hungry world. There is little debate that increasing agricultural productivity in an efficient and sustainable manner is imperative. Land-Grant institutions have science and outreach capability to address the current and future needs for a safe, nutritious and abundant supply of food for the world. Research and extension programs to enhance production efficiency through genetic genotype enhancement, reproductive and yield enhancement, and adjustment to more widely variable environmental conditions are needed. Work on selection of drought-tolerant maize and bean varieties adapted to low nutrient (specifically phosphorous) soil conditions is addressing this research need. PA AES scientists focusing on root traits in these

crops are developing not only new varieties, but also methodological approaches and the social adoption of improved crop varieties through participatory breeding and community involvement. From a technical perspective, the website roots.psu.edu was accessed 7.6 million times last year, with 229,000 visitors, 5.4 million page views, and 7 million file downloads; there was particular interest in material on this web site originating in Latin America, where some of the bean work has been translated into commercially available seed stock. PA AES-supported work on agricultural policies has addressed changes in food quality demand in China and led to the organization and execution of a workshop on the evaluation of global rural development policies in conjunction with the Organisation for Economic Co-Operation and Development (OECD) in Paris. PA AES and CES are working globally on topics of clear importance to food security at home and abroad, including land use practices, low-input pest management tools, culturally-appropriate nutrition education programs, and food safety and quality throughout the food supply chain.

2. Brief description of the target audience

The Food and Agriculture Sector audience is very diverse and complex. Cooperative extension provides educational programming for Global Food Security and Hunger audiences from producers to consumers. Producers of food products include farmers who raise small fruit, tree fruit, vegetables, 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. The commodity organizations that represent the various different crop and animal food products are not only audiences, but also provide significant volunteer support to extension programming. The logistics of moving food products including crops and animals are included as a target audience. The companies that process and manufacture food from the raw materials produced on Pennsylvania farms are an important and significant audience for extension programs. Local state and federal agencies who have interest or responsibility for the safety and security of our food are both an audience, and a collaborative volunteer partner in food protection education. Restaurant and institutional food preparation 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. Educational programs to teach food nutrition and food safety improves the lives for participants. Reducing hunger and improving the safety of our food supply is important for individuals, families, communities, the food production and food processing sectors, and state and federal agencies and organizations with food safety responsibilities.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual	2438	2079	0	0

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

Year: 2009
Plan:
Actual: 1

Patents listed
Serial No.: 61/183,289; Filed: 06/02/09; Title: Anti-Malarial Compositions and Methods of Use

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan			

Actual	0	0	26

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of research projects completed on global food security and hunger.

Year	Target	Actual
2009	{No Data Entered}	2

Output #2

Output Measure

- Number of invention disclosures.

Year	Target	Actual
2009	{No Data Entered}	0

Output #3

Output Measure

- Number of participants in programs related to global food security and hunger.

Year	Target	Actual
2009	{No Data Entered}	1834

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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 implement/adopt practices.
3	Number of volunteers that helped with program leadership or program delivery.

Outcome #1

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Pennsylvania agriculture helps to feed the world. The state's 63,200 farms generated agricultural products valued at more than 6.2 billion dollars in 2008. Pennsylvania agriculture production ranks in the top 10 states in the nation for 34 agriculture commodities. Agriculture producers in Pennsylvania play a role in contributing to a sustainable, safe and competitive food source. The need to double production to meet world food needs, reinforces the requirement to keep producers competitive.

What has been done
Cooperative Extension provides science-based information to producers to enhance the sustainability for safe food from PA farms. The 4-H animal science youth program requires all 4-H youth to participate in quality assurance training to assure animals raised and sold at 4-H livestock sales are safe to consumers. Training is conducted at 4-H club meetings through lecture, demonstration, and hand-on experiences. Videos and on-line resources are also utilized to teach the subject matter.

Results
The 4-H animal livestock program requires quality assurance training for all youth who sell animals at county livestock sales. Evaluation of one county's program indicated participants (n=112): 77% learned the six key areas of responsibility, ethics and conduct, and the importance of quality assurance and increase their decision making skills when ethical, unethical, and quality assurance situations occur; 89% responded correctly to the question "Is this a problem?" The groups' discussions led to resolutions for the unethical situations; through demonstration 98% learned the correct way to wash their hands and 75% indicated that they would improve their hand washing techniques. In one livestock sale, the total value of traditional market quality animal sources (beef, lamb, and hog) were valued at over $106,600 in the consumer market in Northwest Pennsylvania produced by a youth audience for the consumer.

4. Associated Knowledge Areas

KA Code	Knowledge Area
606	International Trade and Development
611	Foreign Policy and Programs
722	Zoonotic Diseases and Parasites Affecting Humans

Outcome #2

1. Outcome Measures

Number of participants who were evaluated in a follow up and who implement/adopt practices.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Pennsylvania agriculture producers recognize the need to be competitive in a world market. Adoption of best management practices enhances their ability to become more sustainable. External factors create challenges to the profitability of farms. Extension helps producers identify factors that they can manage, and prepare for the effects of external factors. The viability of agriculture depends upon adoption of extension programs. Nutrition education promotes healthy economical food choices.

What has been done
Extension programs have focused to help food producers increase production efficiency, reduce negative environmental impact, reduce inputs, increase quality, manage risks, develop continuity of operations and business plans, and improve financial management for producers through adoption of HACCP practices and enhanced product quality. The 4-H animal science youth program requires quality assurance training to assure animals raised and sold at 4-H livestock sales are safe to consumers.

Results
Producers have implemented biosecurity practices including surveillance, detection and control to manage invasive species, pests, diseases, and contamination. IPM practices reduce input costs and minimizes environmental impact. Livestock and plant disease management improves food product quality. Development and implementation of financial and business management plans improves sustainability and profitability in a world food market. Continuity of operations planning minimizes the impact from natural or intentional disasters that can devastate a plant or animal food crop, or an entire industry. Adoption of best production practices for food processors ensures higher quality products, fewer food recalls, and enhanced consumer confidence in the food system. Increased collaboration with food sector stakeholders bolsters the effectiveness of multiple resources for the food system. Farm accidents and injuries are reduced. Economic stability across the food spectrum is enhanced.

4. Associated Knowledge Areas

KA Code	Knowledge Area
606	International Trade and Development
611	Foreign Policy and Programs

722 Zoonotic Diseases and Parasites Affecting Humans

Outcome #3

1. Outcome Measures

Number of volunteers that helped with program leadership or program delivery.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	72

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Agency and organization representatives collaborated with extension to plan, implement and evaluate educational programs in Global Food Security and World Hunger. Agriculture commodity groups, industry representatives, local, state and federal agencies and organizations with interest in food and agriculture safety and security compliment the educational effort of extension. The continuous supply of safe, nutritious food for the world market is of common concern for individuals, groups, and communities.

What has been done
Food and Agriculture sector representatives compliment extension resources by providing assessment of educational needs, resources, subject matter experts, and financial support for extension programming in food and agriculture safety and security. Extension and food system stakeholders deliver programs that compliment food safety and food security goals. Financial support enables research and outreach. 4-H volunteers teach quality assurance subject matter to youth in animal science club programs.

Results
Collaborative relationships between volunteers representing the food and agriculture sector and extension have enhanced the quality and quantity of educational programs for Pennsylvania food producers and processors. Food system agency representative compliment efforts from other food sector industry groups such as commodity groups, food industry and food manufacturing groups, and other stakeholders with interest in the safe, nutritious, continuous, and economical source of food from Pennsylvania, to the world. Youth must pass quality assurance education and demonstrate good practices in order to sell their animal at the county roundup livestock sale. In one livestock sale, the total value of traditional market quality animal sources (beef, lamb, and hog) were valued at over $106,600 in the consumer market in Northwest Pennsylvania produced by a youth audience for the consumer.

4. Associated Knowledge Areas

KA Code	Knowledge Area
606	International Trade and Development
611	Foreign Policy and Programs

722 Zoonotic Diseases and Parasites Affecting Humans

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Regulations regarding safe food are increasingly impacting farmers' management and profitability margins to produce a safe food supply; processors and food preparers must also comply with safe food practices to assure consumer health and well-being. Educating producers and the public about food production from field to table is critical so that regulations and policies are met at all levels of the food chain. New and emerging issues with food production continue to challenge the research and education agenda.

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

1. Evaluation Studies Planned

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

Evaluation Results

The most germane aspects of the evaluation results are shown in the results sections as number of participants increasing knowledge or implementing new practices or methods.

Key Items of Evaluation

Youth increased knowledge and skills in six key areas of quality assurance for animal livestock.

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Climate Change

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 (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Actual	2.6	0.0	21.8	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
68084	0	569435	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
174004	0	2547968	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
157448	0	2398571	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Climate change sciences address the physical, biological, and social uncertainties, risks, and responses both present and projected. The issues and impacts that PA AES and CES address through research and outreach are growing and

include climate change uncertainties, risk management, climate futures, water resources, forests and wildlife, aquatic ecosystems and fisheries, agricultural productivity, energy, and economic implications of adaptation and mitigation. Climate change will likely cause many changes in Pennsylvania's forests, making it increasingly less suitable for northern hardwood ecosystems while becoming generally more hospitable for southern species of oaks, hickories, and potentially evergreen species such as loblolly and shortleaf pines. The state's forest products industry will need to adjust to this changing resource. Research to determine the possibilities for increased carbon sequestration in PA forests could lead to robust extension education programs. Likewise, Extension programs are providing increased information on how to reduce carbon emissions from agricultural production, both crop systems and animal operations, through webinar deliveries of best management practices for air and water quality protection. We are engaged in plant breeding programs in developing countries of Africa and Latin America to identify germplasm with physiological capacity to deal with heightened climate variability. A unique feature of these breeding programs is their participatory nature and the linkage of social and biological sciences into a single project to ensure that new traits are bred into acceptable crop varieties for local adoption.

2. Brief description of the target audience

The audience includes farm and forest managers, farm and forest owners, practitioners working with working lands operators (including conservation districts, NRCS, agricultural consultants, state agencies), and the other land managers.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual	10292	6535	0	0

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

Year: 2009
Plan:
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan			
Actual	0	0	141

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of research projects completed on climate change.

Year	Target	Actual

2009	{No Data Entered}	11

Output #2

Output Measure

- Number of invention disclosures.

Year	Target	Actual
2009	{No Data Entered}	0

Output #3

Output Measure

- Number of participants in programs related to climate change.

Year	Target	Actual
2009	{No Data Entered}	8411

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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 implement/adopt practices.
3	Number of volunteers that helped with program leadership or program delivery.

Outcome #1

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	551

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Climate change forecasts and increasing evidence of the benefits of improved management of working lands and manure systems to significantly reduce carbon emissions and increase on-site sequestration of carbon has resulted in the integration of climate change education into Extension programming.

What has been done
Forest stewardship, timber harvest, community forest management, and manure management programs incorporate best management practice training for carbon sequestration and emission reductions options for working lands. Weekly webinars reached over 500 participants on greenhouse gas emission reductions through precision feeding, improved manure storage and treatment, and alternative land application techniques.

Results
Participants in webinars on greenhouse gas emissions and options for improving on-farm management to reduce emissions identified that prior to the training, that 100% had no or minimal understanding of the issue or options. Post webinar, 72% of respondents indicated that their understanding of the issue and options for management of greenhouse gases was moderate or considerably higher.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

Outcome #2

1. Outcome Measures

Number of participants who were evaluated in a follow up and who implement/adopt practices.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	254

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Climate change forecasts and increasing evidence of the benefits of improved management of forest lands to significantly reduce carbon emissions and increase on-site sequestration of carbon has resulted in the integration of climate change education into Extension programming.

What has been done
Education for private forest land owners has been conducted through face-to- face meetings, webinars, demonstration plots, and volunteers (PA Forest Stewards). Program foci have been on forest stewardship, timber harvest, and community forest management programs that include basic forest ecological principles and silvicultural methods. Programs help private forest landowners learn how to maintain the health and sustainability of their woodlots.

Results
Private forest landowners participated in "Before You Sell Your Timber" (n=31) and "Timber Harvest" (n=15) tour sponsored by a private woodland owners' association. 90% of the participants said they plan to implement two or more forest stewardship practices within the year; of the 16 post workshop surveys, 14 were very likely to use the information to manage their land; 8 indicated they intended to develop a management plan and implement; 8 indicated they would control invasive and plant native plants; 2 indicated interest in the Forest Stewardship program and 2 indicated interest in increasing habitat. Urban forestry program: inventories and management plans based on Mobile Community Tree Inventory methods were completed for 6 towns or counties', another City's plan is being renewed. Urban foresters, along with other partners, offered 70 programs comprising 466 events, proctored 5 of the 6 Penn Del Chapter exams, within the Chapter 56 arborists and 13 others were certified.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

Outcome #3

1. Outcome Measures

Number of volunteers that helped with program leadership or program delivery.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	471

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Forest covers 62% of Pennsylvania, and covers over 17 million acres, including urban forest cover, nearly three quarters of which is in private ownership. Decisions made by private landowners are critical for long-term impacts of forest values, productivity, and addressing the issue of climate change. Penn State Extension can effectively increase its efforts to teach the private landowners is through its effective network of volunteers.

What has been done
Extension volunteers are engaged in two programs: PA Forest Stewards (PAFS) and PA Community and Urban Forestry Program. Faculty and staff provide leadership for both groups in which community education and wood land management education is offered to private forest owners, others interested in the responsible forest stewardship, and communities interested in community forestry. Education occurs through face-to-face meetings, workshops, and demonstration or field tours.

Results
PAFS: 400 active members; they had nearly 20,000 contacts in 2008 and have been instrumental in the establishment of 27 local woodland owner associations. Pennsylvania Community and Urban Forestry Program: 400 volunteers provided 30,212 volunteer hours of education and service; special projects with inner-city youth in Pittsburgh, and the Cobbs Creek Environmental School in Philadelphia reached underserved and diverse audience.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Appropriations changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

Factors affecting programming in this area are clear--governmental regulations are being imposed regarding water and air quality as they are important for well-being of individuals. Educating individuals, legislators, and policy makers on the issues is important so that they are better able to make decisions based on sound research and unbiased information. Shifting of resources to address these new emerging issues continues to be a challenge for Penn State Extension and Research faculty and staff; shifting faculty and staff programmatic responsibilities takes time and resources as the option to hire many new people to cover these areas has not been possible due to shortfalls in appropriate staff and time lag in securing new grants.

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

1. Evaluation Studies Planned

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

Evaluation Results

The most germane aspects of the evaluation results are shown in the results sections as number of participants increasing knowledge or implementing new practices or methods.

Key Items of Evaluation

Increase in knowledge of greenhouse gas emissions and options for improving on-farm management to reduce emissions identified: prior to training, 100% had no or minimal understanding of the issue or options; after webinar series 72% indicated that their understanding of the issue and options for management of greenhouse gases was moderate or considerably higher. 800 volunteers are instrumental in extending forestry education to private woodland owners and communities.

V(A). Planned Program (Summary)

Program # 8

1. Name of the Planned Program

Sustainable Energy

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	40%		19%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Actual	10.7	0.0	2.3	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
266812	0	88341	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
741734	0	322238	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
300349	0	317956	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The production of renewable energy and the appropriate development of existing fossil fuel resources in Pennsylvania are critical for economic development, reducing the carbon emissions of the state, and minimizing the environmental impacts of energy development on the state. Renewable energy research has been multifaceted at Penn State. Several projects are focused on evaluating the potential of crops for biofuels, one evaluating establishment of switchgrass and woody biomass on marginal lands, another on the developing value added oil seed crops for biodiesel feedstocks, and two others on the development of harvesting systems for biomass crops. PA AES researchers are also collaborating with USDA-ARS scientists to study the sustainability of corn stover utilization for biofuel as part of a national DOE Feedstock development program. The development of woody biomass as an energy resource has also been a focus of the college effort with efforts focusing on developing a cost model for woody biomass harvesting of low value species in natural forest stands and a second effort focusing

on documenting the woody biomass utilization industry in the state. A successful poultry waste to energy research project has resulted in the development of a demonstration facility on one farm with the potential to expand in the near future.

Cooperative Extension launched a major effort focusing on the sustainable development of natural gas in the state with the recent discovery of Marcellus Shale deposits throughout northern and western Pennsylvania. Programs were developed throughout the state on various key issues surrounding the development of the resource. Initial programming focused on helping land owners with leasing issues. Other programs have focused on potential environmental impacts of gas leasing and potential impacts on rural communities and the need for community planning. Extension has also launched another significant effort in Renewable and Alternative energy strategies in the state.

2. Brief description of the target audience

The target audience included general public, landowners, public and private renewable energy resource developers, community leaders, elected officials and agricultural producers of potential feedstock materials, and agribusiness professionals.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual	1998	5714	0	0

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

Year: 2009
Plan:
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan			
Actual	0	0	49

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of research projects completed on sustainable energy.

Year	Target	Actual
2009	{No Data Entered}	5

Output #2

Output Measure

- Number of invention disclosures.

Year	Target	Actual
2009	{No Data Entered}	0

Output #3

Output Measure

- Number of participants in programs related to sustainable energy.

Year	Target	Actual
2009	{No Data Entered}	1746

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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 implement/adopt practices.
3	Number of volunteers that helped with program leadership or program delivery.

Outcome #1

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	280

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Due to recent advances in technology, economic factors, and the increasing awareness of the need to develop new energy supplies, the production of "unconventional" natural gas is an inevitable progression in Pennsylvania and throughout the Appalachian basin. In addition, the intensive use of imported fossil fuels for energy production has considerable economic and carbon emissions consequences; the development of renewable energy is a state priority.

What has been done
A Marcellus Education Team formed to address issues of Marcellus Shale; Renewable and Alternative Energy Team was formed to address issues of renewable energy. Educational meetings were held for private land owners, professionals such as attorneys, elected officials, gas industry representatives, and webinars were conducted-all covered a wide range of topics relevant to the audience needs. Program efforts have been a joint partnership between Extension, industry, state agencies, and private consultants.

Results
Natural Gas Summit: 280 participants included attorneys, legislators, local elected officials, industry representatives, business leaders, and environmental advocates; Webinars reached 593 during live presentations and 6,735 additional viewed the recorded sessions; over 10,000 people attended public meetings; compiled landowners reports concluded over $250M was paid to land owners due to their increased knowledge on leasing rates.

Renewable Energy program: 200 attendees; 74% planned to implement the knowledge gained on homeowner considerations regarding solar energy; another conference reported that fifty-two legislators, county extension board members, and staff increased their understanding of the opportunities and limits of wind power; Sixty-five North Central Forest Landowners Association members increased their knowledge on the Smethport Woody Biomass Demonstration Project and how the harvesting of woody biomass for carbon-neutral fuel may affect them in the near future.

4. Associated Knowledge Areas

KA Code	Knowledge Area
125	Agroforestry

131	Alternative Uses of Land
202	Plant Genetic Resources

Outcome #2

1. Outcome Measures

Number of participants who were evaluated in a follow up and who implement/adopt practices.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Sustainable energy efforts require changes in infrastructures that support communities and small business. Leaders must be aware and make decisions that affects these changes. In addition, new entrepreneurial endeavors need support to be implemented which will enable study for long time cost effectiveness. Efforts to secure external funding through grants and other sources require increased knowledge of where funds are available and then assistance to secure funding.

What has been done
A Natural Gas Summit was held for professionals who provide leadership and jurisdiction to county and local municipalities on topics that related to their jurisdiction and legal issues in natural gas leasing and development. The Renewable and Alternative Energy team has been working with state agencies, state and regional groups, local governments, academic institutions, and environmental groups. Extension has provided leadership for community/small business projects.

Results
Natural Gas Summit: A post conference evaluation revealed that 47% (n=280) agreed/strongly agreed they changed their behaviors/practices as a result of attending the conference.

Extension educators/faculty provided leadership or assisted with the following: McKean County, serving on the Smethport Wood Biomass project leadership team in which the $50M project has moved forward into the engineering design and feasibility study; a local school district to secure $750K to fund a biomass based heat system; a cheese plant in 2009 to install an anaerobic digester with an internal combustion generator that generated 2.3 million KWh per year that is expected to produce $250K/yr. through energy savings and reduced disposal costs; and crop producers to develop a value added oilseed feedstock for a large biodiesel plan, obtained $115K external funding and secured a Memorandum of Understanding (MOU) with a county government owned farm as a an ongoing demonstration project.

4. Associated Knowledge Areas

KA Code	Knowledge Area
125	Agroforestry
131	Alternative Uses of Land
202	Plant Genetic Resources

Outcome #3

1. **Outcome Measures**

Number of volunteers that helped with program leadership or program delivery.

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Extreme weather events in Pennsylvania resulting in drought conditions, flooding, and resultant perturbances of ecosystems and consequent (and unrelated) pest and invasive species movement and infestations (i.e. gypsy moth) have contributed to stress of forest and stream health. Coupled with the continued decrease in state appropriations that diminishes the capacity of educational programs delivered by educators and specialists, the development and support of viable, well-trained networks of volunteers to deliver programs in water quality and forest sustainability are essential. Field educator positions are not routinely filled when vacated due to scarcer resources, making grants, along with enhanced partnerships with other state funded agencies, necessary to continue critical research and educational programs. The challenge to offer programs to youth beyond traditional program structure requires new partnerships and targeted marketing around the curricula foci of STEM.

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

1. Evaluation Studies Planned

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

Evaluation Results

The most germane aspects of the evaluation results are shown in the results sections as number of participants increasing knowledge or implementing new practices or methods.

Key Items of Evaluation

Marcellus Shale, a natural gas resource, is a new sustainable energy resource in the Appalachian Basin; a major natural gas resource for Pennsylvania. This emerging industry of deep gas well drilling will impact Pennsylvania socially and economically. Renewable energy is imperative as a source of future energy source to bring about less dependence on foreign energy supplies.

V(A). Planned Program (Summary)

Program # 9

1. Name of the Planned Program

Childhood Obesity

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 (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Actual	14.3	0.0	3.7	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
142245	0	7412	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
580100	0	522596	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
996895	0	503907	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The *Family Fitness Program* was developed in 2004 as a researched-based program by the Penn State Cooperative Extension Family Fitness team. The programs aim to change family knowledge, attitudes, and behaviors (parents, care-giving grandparents or other child care-giving adults, and children aged eight-12, and to promote intergenerational collaboration/ communication that support the changed behaviors, for the overall purpose of improving child and family healthy eating and enhanced physical activity. The *Family Fitness/Childhood Overweight Prevention* team documented the intense struggles between parents (grandparents or other caregivers) and elementary-age (grades three-five) children in selecting, preparing, consuming and scheduling time for healthy meals, snacks, and regular physical activity in two different focus groups studies. The *Family Fitness Program* was developed to address those struggles and to offer attainable solutions. The *Family Fitness Program* provides parents, adult caregivers and children with the information, skills, and motivational guidance necessary to achieve better

diet quality and a healthier level of physical activity. The program is informed by and applies elements of the Trans-theoretical Model and Motivational Interviewing. The Family Fitness Program Goals and objectives are:

Increase fruit, vegetable, whole grain, and low-fat dairy consumption
Increase positive family communication and collaboration on planning and preparing healthy meals and snacks
Increase minutes of physical activity for youth and families
Decrease hours of sedentary activity
Reduce sweetened drink consumption
Increase the frequency of breakfast consumption and family meals
Increase goal setting and tracking of healthy diet and physical activity behaviors
(for overweight youth) Maintain their *body mass index* (BMI) six months post-program and improve fitness.

The Better Kid Care programs consist of a DVD program that includes hands-on educational activities as part of the program, including: Fighting Children's Obesity Part I (They Are What They Eat), Fighting Children's Obesity Part II (Active Play), and Increasing Fiber Intake in Pre-school Age Children. PA AES supported research that has generated the first formal analysis of a functional foods market using demand data. This project, using yogurt as a model functional food, will provide the springboard for formal analysis of a food system approach that is often touted as a mechanism to address nutritional challenges in our diets. PA AES collaboration in multistate research has led to development of a new 4-H food curriculum that will be released in 2010.

2. Brief description of the target audience

Family Fitness: Student target audience are those overweight, defined as a BMI between 85 and 95 percentiles, or obese (>95 percentile), as well as all interested children and families in this age group (8-12 year olds), since most can make healthy changes, and inviting all reduces "overweight stigma." Better Kid Care: Childcare providers and the children and youth they serve.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual	20070	57689	0	0

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

Year: 2009
Plan:
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan			
Actual	0	0	42

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of research projects completed on childhood obesity.

Year	Target	Actual
2009	{No Data Entered}	1

Output #2

Output Measure

- Number of invention disclosures.

Year	Target	Actual
2009	{No Data Entered}	0

Output #3

Output Measure

- Number of participants in programs related to childhood obesity.

Year	Target	Actual
2009	{No Data Entered}	30511

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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 implement/adopt practices.
3	Number of volunteers that helped with program leadership or program delivery.

Outcome #1

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	2795

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The percentage of child overweight and obesity has quadrupled in the past thirty years for children ages 6-11, so the need for successful research-based interventions is urgent. Childhood overweight has been documented to increase the risk for cardiac disease and its risk factors--hypertension, type II diabetes, and high cholesterol for children, adolescents, and adults. Overweight and obesity and their associated health problems have a significant economic impact on the U.S. health care system.

What has been done
The Family Fitness Program for grades 3-5 and their families was conducted in 15 sites in 10 counties. The program offers help to all children ages 8-12 and their families for improving healthier food and fitness behaviors. Children attend 9 weekly sessions to practice making healthy food choices and increase physical activity. Parents participate to receive information, skills, and motivational guidance leading to improved food choices and physical activity. The Better Kid Care programs reached 116 childcare providers.

Results
Family Fitness: N=99 parents/caregivers, 205 children participated (n=48 parents, n=100 children; 76% eligible for free/reduced lunch) pre vs. post program: Healthy Eating: 53% of parents increased their knowledge of the Nutrition Fact Labels, 69% of parents use the Nutrition Facts Labels more often (35% of children), 55% increased setting healthy eating goals for parent and child, 60% of children increased willingness to try new vegetables, 29% of children increased eating 3 or more vegetables daily, 38% of children increased eating 2 or more fruits, 40% of children increased eating 3 or more dairy, 54% of children increased eating whole grains, 38% of children decreased high sugar foods or drinks, 47% of children increased knowledge of foods high in calcium. Physical activity: 55% increased setting physical activity goals for parent and child, 57% of children increased their willingness to try new physical activities, 46% of children increased knowledge of the number of minutes children need to stay physically active and 40% of bone building activities, 62% of children increased enjoyment of physical activity, 69% of families increased enjoyment of physical activity. Families increased minutes of physical activity: 49% of families increased walking; 35% jump rope; 52% increased other physical activity, 62% of children increased the number of days per week they exercised for 20 or more minutes, 39% of children decreased minutes of TV, 41% of children decreased computer game time.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle
802	Human Development and Family Well-Being

Outcome #2

1. Outcome Measures

Number of participants who were evaluated in a follow up and who implement/adopt practices.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	1774

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The percentage of child overweight and obesity has quadrupled in the past thirty years for children ages 6-11, so the need for successful research-based interventions is urgent. Childhood overweight has been documented to increase the risk for cardiac disease and its risk factors--hypertension, type II diabetes, and high cholesterol for children, adolescents and adults. Overweight and obesity and their associated health problems have a significant economic impact on the U.S. health care system.

What has been done
The Family Fitness program was delivered to children in 9 weekly sessions to practice making healthy food choices and increase physical activity. Parents participated three times to receive information, skills, and motivational guidance leading to improved food choices and physical activity.

Results
In the follow-up, the majority of children above 85 MBI percentile maintained their weight and decreased in systolic blood pressure 6 months post program, consumed three or more daily vegetables by 51-60% and 2 or more fruits (both $p<.05$). They increased consumption of whole grains by 53-58% ($p<.05$). Families agreed to eat more healthfully (increased by 55%), and families became more physically active (increased by 53%). Families talked more (49%) and agreed to more (30%) more physically active.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle
802	Human Development and Family Well-Being

Outcome #3

1. Outcome Measures

Number of volunteers that helped with program leadership or program delivery.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	124

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The percentage of child overweight and obesity has quadrupled in the past thirty years for children ages 6-11, so the need for successful research-based interventions is urgent. Childhood overweight has been documented to increase the risk for cardiac disease and its risk factors--hypertension, type II diabetes, and high cholesterol for children, adolescents, and adults. Overweight and obesity and their associated health problems have a significant economic impact on the U.S. health care system.

What has been done
Volunteers assisted with the classroom teaching, record keeping, and coordinating the physical activities.

Results
N=99 parents/caregivers, 205 children participated in state summary (n=48 parents, n=100 children; 76% eligible for free/reduced lunch) pre vs. post program: Healthy Eating: 53% of parents increased their knowledge of the Nutrition Fact Labels, 69% of parents used the Nutrition Facts Labels more often (35% of children), 55% increased setting healthy eating goals for parent and child, 60% of children increased willingness to try new vegetables, 29% of children increased eating 3 or more vegetables daily, 38% of children increased eating 2 or more fruits, 40% of children increased eating 3 or more dairy, 54% of children increased eating whole grains, 38% of children decreased high sugar foods or drinks, 47% of children increased knowledge of foods high in calcium. Physical activity: 55% increased setting physical activity goals for parent and child, 57% of children increased their willingness to try new physical activities, 46% of children increased knowledge of the number of minutes children need to stay physically active and 40% of bone building activities, 62% of children increased enjoyment of physical activity, 69% of families increased enjoyment of physical activity. Families increased minutes of physical activity: 49% of families increased walking; 35% jump rope; 52% increased other physical activity, 62% of children increased the number of days per week they exercised for 20 or more minutes, 39% of children decreased minutes of TV, 41% of children decreased computer game time.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle

802 Human Development and Family Well-Being

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Other (School Policy)

Brief Explanation

The program had to be conducted within the confines of school policies regarding time, personnel and use of facilities.

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

1. Evaluation Studies Planned

- After Only (post program)
- Comparisons between program participants (individuals, group, organizations) and non-participants

Evaluation Results

The most germane aspects of the evaluation results are shown in the results sections as number of participants increasing knowledge or implementing new practices or methods.

Key Items of Evaluation

From research sites, children have significantly increased their knowledge of healthy eating and the importance of physical activity. End results are improved BMI.

V(A). Planned Program (Summary)

Program # 10

1. Name of the Planned Program

Food Safety

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 (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Actual	12.0	0.0	7.8	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
359760	0	212278	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1227046	0	937802	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
386384	0	795061	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Individuals holding a valid Pennsylvania Food Employee Certification certificate are required to complete a minimum of 7.5 hours of food safety education over five years to maintain Pennsylvania Department of Agriculture (PDA) Food Employee Certification. Penn State (through PA CES) Food Safety Certification Training, which meets PDA requirements, is a combination of in-class instruction and self-study by the participant using the National Restaurant Association Educational Foundation (NRAEF), *ServSafe® Essentials* curriculum. Extension educators or consultants must meet requirements to be a Certified *ServSafe®* Instructor and Registered *ServSafe®* Proctor for the National Restaurant Association Solutions. Penn State Food Safety Certification Online Training (PSFSC Online) is a self-paced learning program that also meets the PDA requirements for

Food Employee Certification. PSFSC Online, which includes a module for certification and recertification, uses the Training Achievement Program Series *Food Safety Manager Certification and Recertification* online curricula. This training program is available in English and Spanish. *Cooking for Crowds: A Volunteers Guide to Safe Food Handling* (CFC) is an educational food safety workshop for volunteer groups that prepare and serve food to the public. Topics include personal health and hygiene, time and temperature controls, preventing cross-contamination, and proper sanitizing procedures. The workshop is 3-4 hours and is delivered by county extension educators. Training methods include a power point, handouts, hands-on demonstration, and videos. Participants receive the CFC manual, posters, and thermometers.

Pulsed UV light was validated as a microbial decontamination tool for ready-to-eat poultry products and shell eggs, and a pilot scale UV decontamination system was built and is being evaluated in a step toward commercialization. DNA-based characterization of E. coli O157:H7 strains isolated during 2008 in PA identified two distinct groups of the pathogen responsible for human illness, including one group commonly isolated from cattle but not considered to be regularly associated with human infection. PA AES had input into new technologies for detecting foodborne pathogens through membership on a National Advisory Committee on Microbiological Criteria for Foods subcommittee review of USDA-FSIS request for guidance.

2. Brief description of the target audience

ServSafe®: 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, Schools, Vending operations, Festival and fair food booths, and Career Link Students. Many participants are minorities.

Cooking for Crowds: The target audiences are volunteers involved in preparing and serving food for fundraisers or civic events for non-profit 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 4-H Clubs, Boy and Girl Scouts, Summer Camps, Fraternal and Service organizations such as Lions, Rotary, Sportsman Clubs, Personal Care Homes, Meals on Wheels, American Red Cross that serves food to victims of fire, flood and other emergency situations, and other organizations serving food that are exempt from the Pennsylvania Department of Agriculture Food Employee Certification Act requirement.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual	9627	41521	0	0

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

Year: 2009
Plan:
Actual: 3

Patents listed
Serial No.: 12/502,677; Filed: 07/14/09; Title: Phytonutrient Compositions from Mushrooms or Filamentous Fungi and Methods of Use
Serial No.: PCT/US2009/041516; Filed: 04/23/09; Title: Methods and Compositions for Improving the Nutritional Content of Mushrooms and Fungi
Serial No.: 12/386,810; Filed: 04/23/09; Title: Methods and Compositions for Improving the Nutritional Content of Mushrooms and Fungi

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan			
Actual	0	0	44

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of research projects completed on food safety.

Year	Target	Actual
2009	{No Data Entered}	3

Output #2

Output Measure

- Number of invention disclosures.

Year	Target	Actual
2009	{No Data Entered}	1

Output #3

Output Measure

- Number of participants in programs related to food safety.

Year	Target	Actual
2009	{No Data Entered}	8398

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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 implement/adopt practices.
3	Number of volunteers that helped with program leadership or program delivery.

Outcome #1

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	5838

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Awareness of the safety of our food has increased dramatically in recent years. In 1999, the Food Employee Certification Act was passed, which requires one supervisor from for-profit facilities that carry a Pennsylvania Department of Agriculture license to attend an approved food safety course and pass a test. The state has a proud tradition of events involving food. Volunteers preparing food for community activities may be experienced at preparing family meals but may not have the skills to prepare and store large quantities of foods.

What has been done
21 Extension Educators and 6 Extension paid instructors delivered the Penn State Food Safety Certification Training (PSFSC) program in 40 to 45 counties. The program was delivered in a face-to-face classroom format. A minimum of 7.5 hours of classroom instruction (for recertification) and additional classroom instruction and/or home study activities to total 15 hours (for initial certification) of instruction was offered. 21 extension educators offered Cooking for Crowds: A Volunteers Guide to Safe Food Handling in 35 to 40 of Pennsylvania's counties.

Results
896 participants completed the ServSafe(r) certification exam and qualified for food safety certification from PDA. Food safety practices they plan to use include: checking food temperatures with a calibrated thermometer; cooking food to the proper temperature; washing hands for 20 seconds; limiting the time food spends in the temperature danger zone; cooling foods quickly; separating raw from ready-to-eat foods during preparation, storage and serving and using sanitizer test trips to measure the strength of the sanitize. A total of 9,197 participants including consumers, volunteer cooks, and ServSafe(r) participants gained new knowledge. 3,022 participants planned to implement one or more food safety practices. 292 organizations used the Cooking for Crowds manual to plan and implement food events, as well as, 67% plan to check food temperatures using a calibrated thermometer, and 66% plan to use correct sanitizer methods. Over 514,000 customers/consumers served by food handlers benefited from their attendance at a food safety program.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

Outcome #2

1. Outcome Measures

Number of participants who were evaluated in a follow up and who implement/adopt practices.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	404

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Awareness of the safety of our food has increased dramatically in recent years. In 1999, the Food Employee Certification Act was passed, which requires one supervisor from for-profit facilities that carry a Pennsylvania Department of Agriculture license to attend an approved food safety course and pass a test. The state has a proud tradition of events involving food. Volunteers preparing food for community activities may be experienced at preparing family meals but may not have the skills to prepare and store large quantities of foods.

What has been done
21 Extension Educators and 6 Extension paid instructors delivered the Penn State Food Safety Certification Training (PSFSC) program in 40 to 45 counties. The program was delivered in a face-to-face classroom format. A minimum of 7.5 hours of classroom instruction (for recertification) and additional classroom instruction and/or home study activities to total 15 hours (for initial certification) of instruction was offered. 21 extension educators offered Cooking for Crowds: A Volunteers Guide to Safe Food Handling in 35 to 40 of Pennsylvania's counties.

Results
ServSafe(r): 250 participants identified one or more practices implemented within 3 to 6 months post program. 52 participants increased frequency of established food handling practices within 3 to 6 months. 586 participants shared information with others.

Cooking for Crowds: All participants increased knowledge about person hygiene, controlling time and temperature, cross contamination, cleaning, sanitizing, and foodborne pathogen recognition. 42% implemented at least one new practice, 72% implemented 1 to 3 new practices, and 84% implemented 4 or more new practices. Participants increased frequency of food safety practices within 3 to 6 months after the training that included checking food temperatures with a calibrated thermometer; cooking foods to proper temperature; washing hands for 20 seconds; limiting the time food spends in the temperature danger zone; cooling foods quickly; separating raw from ready-to-eat foods during preparation, storage, and serving; and using sanitizer test strips.

4. Associated Knowledge Areas

KA Code	Knowledge Area

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

Outcome #3

1. Outcome Measures

Number of volunteers that helped with program leadership or program delivery.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	82

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Awareness of the safety of our food has increased dramatically in recent years. In 1999, the Food Employee Certification Act was passed, which requires one supervisor from for-profit facilities that carry a Pennsylvania Department of Agriculture license to attend an approved food safety course and pass a test. The state has a proud tradition of events involving food. Volunteers preparing food for community activities may be experienced at preparing family meals but may not have the skills to prepare and store large quantities of foods.

What has been done
Volunteers helped arrange training sites, served as guest speakers, and consultants. Two served as instructors of the food safety classes taught in Chinese. Penn State Continuing Education staff helped with program registration and promotion.

Results
Cooking for Crowds: All volunteer participants increased knowledge about person hygiene, controlling time and temperature, cross contamination, cleaning, sanitizing, and foodborne pathogen recognition. 42% implemented at least one new practice, 72% implemented 1 to 3 new practices, and 84% implemented 4 or more new practices. Participants increased frequency of food safety practices within 3 to 6 months after the training that included checking food temperatures with a calibrated thermometer; cooking foods to proper temperature; washing hands for 20 seconds; limiting the time food spends in the temperature danger zone; cooling foods quickly; separating raw from ready-to-eat foods during preparation, storage, and serving; and using sanitizer test strips.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Government Regulations

Brief Explanation

The average case of foodborne illness costs almost $1,700 per person. With an estimated 76 million cases of foodborne illness per year--the cost is staggering. The Penn State Food Safety Certification Training provides owners and operators of food service operations the information needed to implement safe food handling practices and receive/maintain certification.

Non-profit organization rely on food events for fundraisers; Cooking for Crowds: A Volunteers Guide to Safe Food Handling training, provide these non-profit organizations with information that allows them to operate community fund raisers while maintaining safe food service standards.

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

1. Evaluation Studies Planned

- After Only (post program)
- Comparisons between program participants (individuals, group, organizations) and non-participants

Evaluation Results

The most germane aspects of the evaluation results are shown in the results sections as number of participants increasing knowledge or implementing new practices or methods.

Key Items of Evaluation

Professionals in the food service business must serve a safe product to consumers. The safe food service and handing programs teach people safe food service standards and practices. Volunteers who serve food as fund raisers must serve products that are safe for public consumption and must follow safe food handling and service as well.