V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Advanced Agricultural and Food Systems

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
133	Pollution Prevention and Mitigation	2%		1%	
201	Plant Genome, Genetics, and Genetic Mechanisms	2%		5%	
202	Plant Genetic Resources	2%		2%	
204	Plant Product Quality and Utility (Preharvest)	2%		2%	
205	Plant Management Systems	6%		7%	
206	Basic Plant Biology	2%		5%	
211	Insects, Mites, and Other Arthropods Affecting Plants	9%		18%	
212	Diseases and Nematodes Affecting Plants	7%		11%	
213	Weeds Affecting Plants	4%		4%	
216	Integrated Pest Management Systems	9%		9%	
301	Reproductive Performance of Animals	3%		7%	
302	Nutrient Utilization in Animals	4%		4%	
307	Animal Management Systems	11%		7%	
308	Improved Animal Products (Before Harvest)	4%		2%	
311	Animal Diseases	6%		3%	
315	Animal Welfare/Well-Being and Protection	9%		3%	
402	Engineering Systems and Equipment	2%		2%	
405	Drainage and Irrigation Systems and Facilities	3%		1%	
601	Economics of Agricultural Production and Farm Management	7%		4%	
602	Business Management, Finance, and Taxation	6%		3%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual Paid	25.1	0.0	22.4	0.0
Actual Volunteer	123.1	0.0	0.0	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
4077805	0	2989384	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
4860829	0	7146762	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
2817910	0	5764169	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

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

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

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

We are also focused on mechanization in pruning and harvesting to increase efficiency and reduce dependence on transient labor that is not always available in adequate supply.

Another important theme is meeting the needs of traditionally underrepresented audiences, such as female and young farmers, and farm workers whose first language is not English.

2. Brief description of the target audience

Agricultural Producers/Farmers/Landowners
Agriculture Services/Businesses
Nonprofit Associations/Organizations
Business/Industry
Community Groups
Education
General Public
Government Personnel
Non-Governmental Organizations
Nonprofit Associations/Organizations
Policy Makers
Special Populations (at-risk and underserved audiences)
Students/Youth
Volunteers/Extension Leaders

3. How was eXtension used?

Penn State Cooperative Extension supports faculty and staff use of eXtension and promotes communities of practice as a way of broadening sources of information and outreach. Penn State Cooperative Extension supports the professional development offered through eXtension.org.

At least some members of most extension teams answer ask the expert questions and use eXtension resources as reference materials to address client questions and acquire personal knowledge when appropriate.

A member of the soils team worked with the eOrganic community of practice on eXtension to present webinars and develop fact sheets.

Members of the vegetable, small fruit, and mushroom team developed six 30minute pesticide recertification courses accessible via eXtension for which clients can pay a fee to complete.

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	78266	515433	70440	25194

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

Patent Applications Submitted

Year: 2014

Actual: 3

Patents listed

Serial No. 2,759,246; Filed 4/23/2009; Title: Rapid Generation of Vitamin D2 from Mushrooms and Fungi Using Pulsed UV-Light

Serial No. 2,452,183; Filed 12/28/2003; Title: Methods and Compositions for Highly Efficient Transformation of Filamentous Fungi

Serial No. 13/640,131; Filed 10/9/2012; Title: Strategies for the Transgenic Manipulation of Filamentous Fungi

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	48	164	212

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of participants in extension education classes and workshops.

Year	Actual
2014	146402

Output #2

Output Measure

- Number of technology disclosures involving college faculty, staff, extension educators, or students.

Year	Actual
2014	6

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Amount of cost savings (in $) if feed and labor costs for just 10% of heifers in PA were managed at maximum efficiency.
2	Number of insecticide active ingredients receiving Section 18 Emergency Registration from EPA for use on fruit in PA during the 2014 season, to protect against heavy losses in specialty crops.
3	Exploration of spatial distribution of injury at harvest caused by brown marmorated stink bug in commercial Mid-Atlantic apple orchards.
4	Savings (in $) in commercial greenhouse crop salvaged after green industry extension team helped identify herbicide-polluted irrigation water as the culprit.
5	Increase (in $) in Pennsylvania's alfalfa crop value per year if 60% of farmers growing alfalfa grow one of the top five yielding varieties from Penn State blind trials.
6	Finding that spraying the leaves of the Theobroma cacao tree (from which we obtain cocoa) with a low-concentration glycerol solution triggers the plant's defense response and enhances its natural disease resistance in the laboratory.
7	New hybrid rye line that is yielding more than two times the currently common variety in PA & NY trials and is of interest for the expanding brewing and distilling market.
8	Development of a set of rules for pruning apple trees and grape vines to produce results more effectively and efficiently.
9	Approximate potential value of growth in income if all PA dairy producers earned just $30 more per culled animal by focusing on reducing tissue blemishes

Outcome #1

1. Outcome Measures

Amount of cost savings (in $) if feed and labor costs for just 10% of heifers in PA were managed at maximum efficiency.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	3200000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Dairy heifers are the future revenue-generating units on a dairy operation. However, during their pre-productive period, they represent a significant cost toward the production of milk. The total cost of raising dairy heifers is the second largest contributor to the annual operating expense of dairy farms in Pennsylvania. Efficiency in feeding, breeding, and milk production will allow PA dairy farms to improve their competitive position and remain sustainable in the future.

What has been done
Data were collected from 44 dairy operations in Pennsylvania on management practices, feeding, and costs for labor, health, bedding, and reproduction for replacement heifers from birth to first calving. Costs/heifer were broken into 4 periods: birth to weaning, weaning to 6 mo of age, 6 mo of age to breeding age, and heifers from breeding to calving. Milk production records were obtained from Dairy Herd Improvement. The average number of milking cows/farm was 198 (range: 38-1,708).

Results
All costs given here are averages. Total cost/heifer was $1,808 from birth to freshening. Cost per animal for the 4 time periods was: birth to weaning, $217; weaning to 6 mo, $247; 6 mo to breeding, $607; and breeding to calving, $736. Feed was the largest component of cost, accounting for nearly 73% of the total. Data envelopment analysis determined that 9 farms were the most efficient of those studied. These farms best combined feed and labor investments, spending, on average, $1,137 and $140/heifer for feed and labor, respectively. These heifers calved at 23.7 mo and produced 88% of the milk produced by older cows. In contrast, the 35 inefficient farms spent an average of $227 more on feed and $78 more on labor per heifer for

animals that calved 1.6 mo later and produced only 82% of the milk made by their mature herd mates. If 10% of the 105,000 heifers in PA were managed at optimal efficiency, dairy farms would save $3.2 million. This work appeared in Journal of Dairy Science.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
601	Economics of Agricultural Production and Farm Management

Outcome #2

1. Outcome Measures

Number of insecticide active ingredients receiving Section 18 Emergency Registration from EPA for use on fruit in PA during the 2014 season, to protect against heavy losses in specialty crops.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There are more than 600 'specialty' crops, with a total value in the U.S. of about $49.6 billion. This represents 34% of the value of all crops. The economic importance of these crops varies widely. In 10 states, including PA, sales of specialty crops exceed $1 billion/year. In the Northeast, sales of specialty crops represent more than half of total crop sales in all states, and exceed 75% in most. Insect damage to specialty crops can have devastating impacts on local and regional economies.

What has been done
This project facilitates registrations of pest management products for specialty food crops and for minor uses on major crops. It is estimated that one-third of plants grown are lost to pest damage. This amount would be even higher without the availability of modern pest management technology.

Results
Multiple new pest management products were evaluated during efficacy trials conducted on pome and stone fruit crops. Based on field trials and using residual data support provided by the IR4 headquarters and expressed, continuous need for the products, two insecticide active ingredients--dinotefuran and bifenthrin--again received Section 18 Emergency Registration from EPA for use on fruit in PA during the 2014 season. The project director provided pest management recommendations to fruit growers during more than 30 commercial grower meetings across PA. Patterns for rational use of newly registered products and dinotefuran and bifenthrin were discussed during multiple on-site grower visits.

4. Associated Knowledge Areas

KA Code	Knowledge Area
211	Insects, Mites, and Other Arthropods Affecting Plants

Outcome #3

1. Outcome Measures

Exploration of spatial distribution of injury at harvest caused by brown marmorated stink bug in commercial Mid-Atlantic apple orchards.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The invasive brown marmorated stink bug (BMSB) (Halyomorpha halys) has caused serious economic injury to many crops in the Mid-Atlantic region, including to tree fruit. Losses to apple in 2010 were estimated at $37 million in that region alone. As a result, pesticide use increased fourfold between 2010 and 2011, and growers are recently seeing more secondary pest outbreaks. Increased pesticide use is detrimental to the environment and to growers' bottom lines.

What has been done

Researchers studied the spatial distribution of BMSB injury at harvest in commercial Mid-Atlantic apple orchards in 2011 and 2012. Within each orchard block, a border zone (next to woods), an interior zone (near orchard center), and an intermediate zone were designated. Just before harvest, fruit were sampled from 3 positions within the canopies of trees in each zone. Following 3-5 weeks in cold storage, external and internal injuries, and severity of internal injury from BMSB were assessed.

Results
Apples from the upper canopy of border zone trees were most likely to show external and internal injury. The lowest rate of injury occurred in the lower canopy within the interior zone. Results confirm patterns seen previously, in which BMSB move into orchards to feed from host plants in wooded areas. Results also confirm previous research findings that BMSB tend to gather at the tops of trees. In a Maryland orchard untreated for BMSB because the apples were bound exclusively for processing, injury rates were 75%. Results indicate that sampling fruit accessible from the ground may not provide accurate estimates of BMSB injury or the need for treatment to prevent injury. Scouting, and possibly spraying, for BMSB should focus on border areas. Maintaining a more open canopy may also improve the efficacy of pesticides. The research, which highlights the need for a return to more sustainable orchard pest management practices, was written up in the Journal of Economic Entomology.

4. Associated Knowledge Areas

KA Code	Knowledge Area
211	Insects, Mites, and Other Arthropods Affecting Plants
216	Integrated Pest Management Systems

Outcome #4

1. Outcome Measures

Savings (in $) in commercial greenhouse crop salvaged after green industry extension team helped identify herbicide-polluted irrigation water as the culprit.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	12000000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Besides teaching green industry professionals how to identify and safely manage plant pests, pathogens, and abiotic disorders, the green industry team helps commercial greenhouses and others solve production problems.

What has been done
A Lancaster County greenhouse saved a $12-million herbaceous perennial plug crop when an extension educator helped them discover herbicide-polluted irrigation water. Several years ago the growers began to notice cupping and curling of dicot foliage, terminal shoot loss in some cases, and stunting.

Results
The green industry extension team helped identify the culprit: the herbicide picloram at 3-4 parts per billion in irrigation water. The client subsequently changed water sources and installed a water purification system to resolve the problem. The herbicide may have been used as a right-of-way treatment on the rail line behind the facility.

This grower produces up to 360,000 trays of product per year. Roughly 2/3 of the crop was dicot and 1/3 was monocot. Monocots are not generally affected by picloram. At an average flat price of $50, the total site production value would be approximately $18 million, and 2/3 of this is $12 million.

4. Associated Knowledge Areas

KA Code	Knowledge Area
405	Drainage and Irrigation Systems and Facilities

Outcome #5

1. Outcome Measures

Increase (in $) in Pennsylvania's alfalfa crop value per year if 60% of farmers growing alfalfa grow one of the top five yielding varieties from Penn State blind trials.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	126480000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Growing high-yielding, high quality crops can make a difference in long-term farm sustainability.

What has been done
Penn State Extension runs yearly variety trials for perennial forage crops. The goal is to provide unbiased, comprehensive, accurate, and assessable forage variety testing results to industry and producers. The team specializes in alfalfa and cool season grasses. Funding also comes from a fee charged to seed companies to enter a variety in the trial.

Results
Between 1996 and 2002, average dry matter yield for alfalfa was 5.7 tons per acre. Between 2005 and 2011, the average yield was 7.3 tons per acre, an increase of 1.6 tons per acre in just 10 to 15 years. This difference was present in all years of the stand life. Fertility and pest control were constant during the period, so yield improvement was likely from improved genetics.

So how valuable can non-bias alfalfa trial evaluation be to farmers' In Pennsylvania over the past 16 years, the yield of the top five varieties has averaged 1.7 tons more per acre than the yield of the bottom five varieties. To a producer making variety selections (assuming a hay value of $200 per ton), this difference would amount to an increase of nearly $340 per acre per year from selecting a top variety using variety trial data.

About 620,000 acres of alfalfa are grown in PA yearly, so if 60% of those farmers use the variety trial data, the total added earnings per year could be over $126 million per year.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
601	Economics of Agricultural Production and Farm Management

Outcome #6

1. Outcome Measures

Finding that spraying the leaves of the Theobroma cacao tree (from which we obtain cocoa) with a low-concentration glycerol solution triggers the plant's defense response and enhances its natural disease resistance in the laboratory.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Cocoa farmers this year will lose an estimated 30 to 40 percent of their crop to pests and disease, and with chocolate prices having risen globally by roughly two-thirds in the past decade, concern is growing about sustainability in cocoa production. Of particular concern are the environmental impact and human health risks of toxic agrichemicals--organochloride insecticides and heavy-metal-based fungicides--used in cocoa production to fight pests and disease.

What has been done
Penn State scientists have found--in a safe, biodegradable compound--a potential alternative to the hazardous antifungal agents currently being used to combat one of the most damaging cacao diseases, Phytophthora pod rot (also known as black pod), responsible for an estimated 20 to 30 percent loss in yield annually. Spraying the leaves of the Theobroma cacao tree with a low-concentration glycerol solution triggers the plant's defense response and enhances its natural disease resistance.

Results
Cocoa farmers are currently using fungicides and other chemicals that are very effective but are also highly toxic compounds, very persistent in the soil, and relatively expensive. Glycerol, on the other hand, is extremely non-toxic; it's super safe, super cheap, biodegradable, and it triggers the plants' defenses very efficiently - it only takes small amounts to trigger the whole plant defense system. Glycerol, a simple sugar-alcohol compound called a polyol, is a colorless, odorless, viscous liquid commonly used in soaps and other cosmetic products and is produced in different ways, including as a byproduct of biodiesel production. Production of biodiesel is expected to increase, so glycerol should become even less expensive. The lab is now field-testing the treatment.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
212	Diseases and Nematodes Affecting Plants

Outcome #7

1. Outcome Measures

New hybrid rye line that is yielding more than two times the currently common variety in PA & NY trials and is of interest for the expanding brewing and distilling market.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Rye grain yields are often disappointing. This has discouraged use of the crop for grain and even seed production. Most of the current production is older varieties like Aroostook.

What has been done
Two years ago, Penn State agronomists began evaluating a hybrid rye line, Brasetto, from German breeder KWS, versus Aroostook. The crops were managed similarly to wheat in the trials, with planting in October and harvesting at or around the same time as the wheat. The hybrid rye yielded about 90 bushels/acre, and Aroostook averaged 40 bushels/acre. Similar results were obtained by Cornell.

Results
There are limited markets for rye grain, but having this hybrid as an option could be useful in developing new markets, such as the growing distilling industry with its need for high quality rye grain to make vodka or whiskey. A few growers in PA and NY are gearing up to meet this demand, which emerged in PA in 2012, when the new 'Limited Distillery' license was created.

In Europe rye is widely used in hog and beef rations, so this might be an additional potential future market.

The KWS hybrid rye has been licensed to Seedway. It will be commercially available for 2015. The hybrid is a premium-priced seed marketed to be planted and not saved, so a lower seeding rate is key to managing seed cost.

An advantage to introducing a newly feasible crop is that as farms have more diverse crop rotations, ecosystem services tend to increase.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
601	Economics of Agricultural Production and Farm Management

Outcome #8

1. Outcome Measures

Development of a set of rules for pruning apple trees and grape vines to produce results more effectively and efficiently.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
To maintain viability in the highly competitive global market, the U.S. specialty crop industry must reduce the need for a large seasonal workforce by mechanizing and automating. Growers need to reduce the expense of and uncertainty about the availability of seasonal labor. This is especially true for labor-intensive crops such as deciduous fruits, for which pruning is among the most labor-intensive practices. The 'art' of pruning can be phased out in favor of scientifically sound principles.

What has been done
The aim is to make apple and grape production more cost competitive and to reduce risk from insufficient labor. The team is accomplishing this by integrating engineering and horticulture to develop technologies that automate pruning. The researchers developed a set of rules for pruning that has been evaluated and compares favorably with human-pruned trees and vines.

Results

The team is using the pruning rules to develop automated decision systems and to train people to prune more effectively and efficiently. Data from field experiments to develop and refine the pruning rules appear to encapsulate optimal pruning.

The rules are valuable as an educational tool to help growers make pruning cuts that result in favorable outcomes. Following pruning workshops, orchard employees participated in a trial to assess ease of following the pruning rules. They quickly adopted the rules, and the trees they pruned were indistinguishable from trees pruned by horticulturalists in the automated pruning project.

The cost of autonomous pruning by a machine currently being tested for wine grapes in California is $251/ac--lower than the estimated labor costs from 7 of 9 recent cost studies from various states. A similar machine for apples could have the potential to economically replace pruning labor in high-density orchards.

4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
402	Engineering Systems and Equipment
601	Economics of Agricultural Production and Farm Management

Outcome #9

1. Outcome Measures

Approximate potential value of growth in income if all PA dairy producers earned just $30 more per culled animal by focusing on reducing tissue blemishes

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	6000000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A recent study of dairy herds indicated that 90% of cows culled were sold for beef. Producers often view these animals as being of little value to their bottom line. The study found that producers had little knowledge of the quality performance of animals sold for beef, the average hot carcass weight, or the average body condition of cull animals. Each cull animal is deducted an average of $60 due to preventable tissue blemishes.

What has been done
The Penn State Extension Veterinary Team, in conjunction with the PA Beef Council, conducted 17 beef quality assurance programs in FY 2013-14, impacting more than 2,000 producers across the state. Participants learned facts and statistics about the beef industry and how meat is affected by poor handling and improper injection techniques. Residue avoidance, judicious antibiotic use, and impending changes to Food & Drug Administration regulations on antibiotic use in animals were also emphasized.

Results
Dairy producers found the information presented to be easily and directly applicable to their operations. One dairy producer who attended the program captured, on average, $90 more per cull animal. She stated that this 'was the easiest way she added $5,000 to her checkbook for the year!" If each dairy producer in PA captured only one-third of this amount ($30) per culled animal, the industry would realize almost $5 million in income, most of which would be profit.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)
601	Economics of Agricultural Production and Farm Management

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Natural Disasters

• There have been weather extremes with too wet or too dry conditions that had major implications for somatic cell count and feed quality and quantity. This can have huge

impacts on a producer's income, due to decreased milk production and milk premium earned, and increased feed costs.

- Adverse weather factors continued to influence clientele participation.
- Wet growing conditions for much of the season fostered numerous, severe plant disease outbreaks that required diagnosis and clientele education to manage those diseases safely and efficiently.

Economy

- The economic climate continues to have a significant impact on the ability of clientele to attend meetings and conferences.
- The economy influenced the ability of clientele to implement tactics suggested.

Appropriations Changes

- Appropriation changes affected both the research and extension functions of the College of Agricultural Sciences and resulted in fewer faculty and staff across all areas of the college. The ability to travel to interact with clientele, attend meetings to improve skills, and hire personnel to help conduct programs have all been affected.

Public Policy Changes

- Oversight of food and farm businesses at all levels of government affects our program efforts, and we must stay current.

Government Regulations

- Nutrient management legislation now demands that cover crops are used after corn silage if the farmer wishes to apply manure in the winter. The Resource Enhancement and Protection legislation continues to assist farmers to get 50% tax credits for purchased notill equipment and other BMPs. This requirement has increased interest in the integrated crop production practices program.
- The Food Safety Modernization Act is having an enormous impact on the food supply chain. The need for programs is expected to rise.
- Pennsylvania's new limited distillery license is increasing interest in new specialty grain crops.

Competing Public Priorities

- Competing public priorities force us to continually align our program priorities with budget realities.
- Although the awareness and knowledge is increased, the implementation of best management practices may have been impaired by the economy and public policy priorities.
- Competing public priorities continue to be an issue as program funding declines.

Competing Programmatic Challenges

- The Pennsylvania Department of Agriculture is changing pesticide exams to closed book, which will increase the need for training to help employees prepare.

Populations changes (immigration, new cultural groupings, etc.)

- Population changes continue to drive the need to make more extension offerings available in other languages.

Other - Extramural Funding

- Some of our programs are affected by extramural funding, either by adding resources to promote them or by shaping the content of the product.
- Extramural funding has allowed some teams to conduct practical applied research projects that include integrated extension/educational components.
- Extramural funding continues to decline. An increasing amount of time is spent on developing proposals for extramural funding.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The generation of outcomes from existing programs and the development of new programs require improved evaluation that identifies pre- and post- responses to information and monitoring for long-term behavioral changes that result in improved outcomes. More statewide extension programs are using retrospective evaluation to gather information about the number of participants who actually put into practice lessons learned through extension programs. Measuring costs averted or profit increased can show powerful, tangible benefits of our programming--the type of feedback that keeps people coming back for more information. Customer satisfaction and needs assessment instruments (Salesforce and Atlas) are scheduled to be implemented in fall 2015 to provide feedback on the quality and value of our programs.

Key Items of Evaluation

See highlights of state-defined outcomes in this planned program.