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: 2010	Extension		Research	
	1862	1890	1862	1890
Plan	67.9	0.0	92.9	0.0
Actual	103.1	0.0	93.9	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**
3629309	0	3154394	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
9049877	0	13372287	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
4008087	0	9807675	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Long-term sustainability of farms is dependent upon the ability to plan for the future and to implement and adjust those plans. Agriculture is facing mounting public pressure. Consumer concerns about the well-being of livestock and production methods are spawning new policies and legislation. In addition, environmental laws, regulations, and less formal challenges are increasing. As a result of these pressures, producers may deal with legal/regulatory issues related to maintaining, growing or changing their operation. Producers face many sources of risk that can impact cash flow, profitability and long-term sustainability. Tools such as crop insurance, forward contracting, futures and options, etc. can help to mitigate risk and stabilize farm finances. An increasing number of farmers are exploring value-added enterprises to increase profits. Programs on integrated planning focused on financial management, marketing, production, business succession, environmental, community and organizational changes. Extension Faculty and Educators have developed a researched-based curriculum that addresses the Good Production Practices (GPP) for quality management as it relates to developing a hazard analysis critical control points (HACCP) of producing animal products. Plant pathologists, entomologists, nematologists, virologists, weed scientists, and pomologists provided research-based education programs to producers on the availability and feasibility of new pest management programs for better insect pest, disease, nematode, weed, and vertebrate control. The recommended methods utilized multi-prong approaches incorporating the best available technologies including bio-rational, biological pest control, cultural control, and organic tools as well as the most efficacious, environmentally friendly conventional products. Insect and disease phenological developmental models will be utilized for the best timing of recommended practices. Programs are based on research by an inter-disciplinary team and delivered by multiple venues (meetings, newsletters, and farm visits) as well as increased use of web (VTC, Adobe Connect). These programs are designed to provide producers, their employees, and advisors the skills and strategies they need to meet these challenges to sustaining the agriculture industry in Pennsylvania.

2. Brief description of the target audience

Target audiences in the agricultural systems area include: youth enrolled in Animal Science and Crop projects, volunteer leaders, parents, commodity groups, farm managers, farm workers, and farm owners, farm consultants, agribusiness, ag professionals, agency representatives, and decision and policy makers.

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	131500	506100	0	0
Actual	103986	3419663	3289	14871

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

Patent Applications Submitted

Year: 2010
Plan: 1
Actual: 4

Patents listed

Serial No.: 61/298,424; Filed: 1/26/10; Title: Root Cortical Aerenchyma as a Selection Trait for Drought Tolerance in Plants

Serial No.: 61/342,429; Filed: 4/14/10; Title: Strategies for the Transgenic Manipulation of Filamentous Fungi

Serial No.: 61/351,162; Filed: 6/3/10; Title: Plant-derived Feed Supplement for Reducing Methane Production from Ruminant Species

Serial No.: 61/353,513; Filed: 6/10/10; Title: Root Cortical Aerenchyma as a Selection Trait for Abiotic Stress Tolerance in Plants

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2010	Extension	Research	Total
Plan	0	0	
Actual	0	0	540

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of invention disclosures

Year	Target	Actual
2010	4	3

Output #2

Output Measure

- Number of people enrolled or registered in programs related to agricultural systems

Year	Target	Actual
2010	107600	117633

Output #3

Output Measure

- Number of research projects completed

Year	Target	Actual
2010	{No Data Entered}	23

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 and 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
2010	4000	20652

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Agriculture is the largest industry in Pennsylvania. Combined with the food system, every citizen is affected along the farm to fork continuum. To sustain the contribution of production agriculture, participants must become knowledgeable, and develop skills to ensure a profitable business to contribute to the food system locally and internationally. Research and education through applied outreach programs strive to sharpen the competitive nature of production agriculture and agribusiness in Pennsylvania for continuity of operations.

What has been done
Research and Extension efforts focus on providing answers to individual and societal issues for the food and agriculture sector. Through one-on-one visits, workshops, focus groups, webinars, on-line training, field days, conferences, and other interactive educational interventions, program participants learn best management practices to ensure profitability and sustainability in an environmentally acceptable manner. Feedback helps identify research and educational needs.

Results
Participants can identify quality indicators in animal and plant production techniques as a result of participation in experiential learning regarding current research on profitability and cost effective business management practices, environmental and regulatory issues, and quality assurance including food safety. Programs emphasize reducing costs and maximizing income through value added and improved yields and quality products. Youth participants receive training in Good Production Practices (GPPs) that mirror the adult expectations. Pest prediction and integrated response minimizes the impact and costs of pests. Programs focused on BMPs to reduce nutrient and sediment pollution and promote animal and plant health and productivity.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
205	Plant Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
304	Animal Genome
305	Animal Physiological Processes
307	Animal Management Systems
502	New and Improved Food Products
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
604	Marketing and Distribution Practices

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
2010	1500	3903

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Adoption of research based solutions to issues results in enhanced profitability, reduced costs, improved quality, continuity of operations, improved sustainability, and economic stability for agricultural producers and agricultural businesses.

What has been done
Through a variety of educational intervention strategies, food and agriculture program participants adopt BMP's specific to their operation. Practices implemented include, pest and disease

monitoring, economic analysis, certification, cash flow planning, improved variety selection, balancing nutrient needs, production records kept, and plant and animal health monitoring.

Results
Participants who implemented practices improved animal and plant productivity and yields, improved plant and animal health and welfare, reduced costs, improved quality, reduced negative environmental impact, improved sustainability and profitability, increased product quality and marketability, and minimized or managed risks.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
205	Plant Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
305	Animal Physiological Processes
307	Animal Management Systems
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
604	Marketing and Distribution Practices

Outcome #3

1. Outcome Measures

Number of volunteers that helped with program leadership and program delivery

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	2362	303

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Stakeholder involvement with issues needs assessment, prioritization, program development, marketing and promotion, program delivery, evaluation, and advocacy is critical to the partnership of stakeholders. Volunteers support the research and educational effort for agricultural systems in numerous ways.

What has been done
Expertise from Ag business and industry assist in research trials and in support and delivery of Extension programs. Advisory and Advocacy groups have stepped forward to assist Penn State in providing science driven solutions to the ag sector.

Results
Advisory groups help identify research needs and extension educational programs. Advocacy groups assist with marketing and promotion of programs, as well as documenting the need for support for research and outreach programs for the agriculture sector.

4. Associated Knowledge Areas

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

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
- Other (Extramural Funding)

Brief Explanation

There is probably no industry more affected by adverse factors more than production agriculture. Weather extremes and anomalies dramatically affect plant health and productivity. Adverse weather can also affect productivity for animal agriculture. Not only are effects of adverse weather recognized directly by Pennsylvania producers on their crops and herds, but weather affecting crop and animal production in distant parts of the world affect market prices for products and commodities produced and/or utilized by Pennsylvania agriculture producers. Market fluctuations are affected not only by weather

events, but also political factors, consumer demand, societal influence on environmental and production methods. Governmental and other political regulations locally, nationally, and internationally affect market share for Pennsylvania producers. Understanding the global influence for markets of commodities produced and utilized by Pennsylvania producers can help reduce risk, and ultimately improve profitability for producers. Financial support from public sources -- local, state, and nationally -- are under increasing scrutiny. Support levels are stagnant, reducing, or in rare occasions, increasing slightly. As a result, research and outreach programming is being reviewed to adjust as necessary to balance with available support. Current trends indicate lower funding and increasing costs which can only be accommodated by fewer programs and fewer people.

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)
- Case Study
- Comparisons between program participants (individuals, group, organizations) and non-participants
- Comparisons between different groups of individuals or program participants experiencing different levels of progra intensity.

Evaluation Results

Through a variety of evaluation tools, participants were invited to provide feedback on the research-based educational outreach activities delivered through Extension. A sampling of the results follows. 43% of (N=44, n=19) educators responded that they will utilize the kits provided or add to a kit they already have by the Quality Management of Youth Animal Sciences team to provide educational programs in their local communities. 32% (N=44, n=14) intend to train all or some of their volunteers to deliver this program in local clubs. 97% (N=44, n=43) feel comfortable accessing information for QMYAS curriculum on the SharePoint intranet site. 79.5% (N=44, n=35) correctly identified the number of GPPs that youth will be required to complete training in annually. 63% (N=44, n=27) felt the hands-on activities were beneficial to reinforcing the expected curriculum outcomes. 37% (N=44, n=16) felt the hands-on activities were of some value to reinforcing the expected curriculum outcomes. 87% (N=44, n=34) will utilize the state-wide training for all volunteers or key volunteers. Economic impact data were collected with surveys or estimated from detailed financial analysis from 716 clientele that attended Farm Business Management programs. These data showed an average impact of $6,993 per farm, for a total impact of $5,007,165. Research documented that producers could save an average of $16/acre on seed costs with reduced seeding rates. Dairy Discussion Group results of follow-up phone surveys held 2-3 months after the final session: of 37 respondents (57% of participants) - 72% reported change in knowledge; 43% reported change in behavior; 27% reported change in attitude. Friday Facilitator Forum survey results immediately following program: 56% change in knowledge on 2-3 topics; 43% change in knowledge on 1 topic; 43% change in attitude about 3 concepts; 52% change in attitude about 1-2 concepts; 52% anticipated change in 3 behaviors; 47% anticipated change in 1-2 behaviors. N=21. 30 dairy nutritionists and veterinarians attended the Feed Management

Planner Certification program with 15 nutritionists taking the American Registry of Professional Animal Scientists (ARPAS) feed management exam and passing. 40 consultants and certified feed management planners attended the plan writing workshops with 11 completing their 2 plan requirement to become a technical service provider through Natural Resource and Conservation Service (NRCS). Income over Feed Cost Tool implemented on 22 dairies. Cash flow planning and Income Over Feed Costs (IOFC) implemented on 14 dairies. Cash flow planning implemented on 29 dairies. Team 1 reduced Somatic Cell Count (SCC) from 225,000 to 90,000 (gaining them a .20/cwt bonus 3 consecutive months, gaining them $1425 increase over the 3 months). Also increased milk production from 66 lbs/cow/day to 75 lbs/cow/day while maintaining average days in milk (an average increase of 1.5 lbs/cow/day each month, or 5,000 lbs/month ($754 @ $15/cwt). Team 2 increased milk production from 64 lbs/cow/day to 68 (1140 lbs/mo, $171 @ $15/cwt), and increased pregnancy rate from 19% to 23% (4% change, saving the farm $3500 in replacement costs.

Key Items of Evaluation

Plans to include and train more volunteers, adoption of Good Production Practices for Youth programs, collection, interpretation and decisions for ag producers based on detailed financial analysis of farm business, training resulted in certification for ag planners and consultants, increase in knowledge, indication of intent to adopt Best Management Guidelines, increase in production and yield, reduction in costs, increased profitability, improvement in animal health and longevity. 100 % of the participants stated that they had a moderately large to large increase in: forage identification and selection and weed identification and management. 74% planned to add additional paddocks and/or stress lots to reduce grazing pressure. 72% planned to generate a forage inventory for their farm. 74% planned to generate a weed and toxic plant inventory. 72% planned to renovate the pastures to introduce new varieties and thicken the stand. 80% planned to begin to conduct fecal egg counts to identify horses that routinely shed parasite eggs. 73% planned to reduce the use of deworming agents when environmental conditions pose a reduced risk. 66% planned to adopt pasture management strategies designed to reduce exposure to parasites. 66% already had or planned to have a nutrient management plan developed for their farm. 86% planned or already apply nutrients based on soil test results. 66 % planned or already had a proper manure storage facility. 80% already contact or planned to contact Cooperative Extension for assistance.