

**V(A). Planned Program (Summary)**

**Program # 1**

**1. Name of the Planned Program**

Global Food Security and Hunger

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
102	Soil, Plant, Water, Nutrient Relationships	20%	20%	10%	10%
112	Watershed Protection and Management	10%	10%	5%	5%
201	Plant Genome, Genetics, and Genetic Mechanisms	0%	0%	15%	15%
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%	0%	5%	5%
205	Plant Management Systems	15%	15%	10%	10%
304	Animal Genome	0%	0%	10%	10%
305	Animal Physiological Processes	0%	0%	5%	5%
307	Animal Management Systems	15%	15%	5%	5%
311	Animal Diseases	10%	10%	15%	15%
601	Economics of Agricultural Production and Farm Management	5%	5%	5%	5%
605	Natural Resource and Environmental Economics	5%	5%	10%	10%
903	Communication, Education, and Information Delivery	20%	20%	5%	5%
	<b>Total</b>	100%	100%	100%	100%

**V(C). Planned Program (Inputs)**

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

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	17.5	4.3	66.0	2.0
Actual Paid Professional	19.1	5.1	63.9	1.5
Actual Volunteer	0.0	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
804703	356640	515468	256577
1862 Matching	1890 Matching	1862 Matching	1890 Matching
152546	356640	291676	256577
1862 All Other	1890 All Other	1862 All Other	1890 All Other
2190048	362803	1605375	356538

## V(D). Planned Program (Activity)

### 1. Brief description of the Activity

For animal agriculture, research and extension programs will target: (1) Poultry Health and Disease Prevention and Control - mechanisms of disease induction, host genetic resistance and immune responses in poultry with a focus on diagnostic surveillance methodology, vaccination and biocontainment; (2) Poultry Growth and Development - basic molecular and cellular mechanisms regulating poultry growth, development and meat yield;(3) Avian Genomics - development and application of avian microarrays for: disease diagnosis, resistance, and control; growth and development; and optimization of desired production traits; (4) Alternative Production Systems - alternative production systems to reduce disease, mortality, and waste production, minimize antibiotic use, integrate alternative energy into production systems and foster compatibility between animal production, environmental quality, and urban populations; (5)Nutrient Utilization in Poultry and Ruminants - increased nutrient utilization and reduced nutrient excretion via improved understanding of animal biology; (6) Comparative Pathology Laboratory. This laboratory supports the efforts of poultry diagnostic laboratories in Delaware and Maryland and features collaborative research on histopathologic analysis for researchers engaged in studies related to animal disease and animal models of human disease, and consultation regarding tissue dissection, collection, trimming, fixation, image capture, and techniques in immune-histochemistry. For crop production, key activities are: (1) Agronomic, Vegetable and Horticultural Crop Production - improving varietal selection, disease and pest resistance, seed technology, cultural and marketing practices; (2) New Crops - financial and environmental impacts of new crops or new varieties of existing crops, (3) Integrated Pest Management - control of insect pests, weeds, and plant pathogens via biological and chemical methods; (4) Engineering Technologies - improvements in harvesting and guidance systems and expanded research and extension programs on irrigation management; implementing recent advances in remote sensing, tillage, and pesticide application; (5) Plant Breeding, Crop Genomics, Proteomics, and Bioinformatics - basic research on how plants adapt to their environments and manage stress and the nature of soil microorganism-plant symbiotic relationships and plant/soil interfacial reactions affecting crop growth and quality; (6) Pasture and Forage Management - research on pasture-based animal production systems and forage research on improving biological control systems for alfalfa. Soil science programs focus on: (1) Fate, Transport, and Reaction Mechanisms - fate, transport and reaction mechanisms of plant nutrients, wastes, and organic chemicals in soils, and their effects on soil, air and water pollution (2) Cost-Effective, In-Situ Remediation - cost-effective, in-situ methods for the remediation and speciation of contaminated soils; (3) Nutrient Management for Water and Quality - fertilizer and waste management programs to ensure economic and environmental sustainability while considering crop needs, nutrient reactions in soils, alternative fertilizer sources, and government policies. Resource and international economics activity areas include: (1) Protection and Preservation of Agricultural Land - current strategies to protect and preserve agricultural land will be evaluated and promising new approaches will be investigated; (2)

International Economics and Trade: improved understanding of factors controlling export-import markets, particularly poultry.

**2. Brief description of the target audience**

For animal agriculture, primarily poultry integrators, growers, breeders, trade groups and allied industries; dairy and beef producers; livestock commodity groups; forage producers, equine owners, producers and interest groups; state and federal agencies; federal research laboratories; peer scientists in the U.S. and international colleagues, K12 teachers, and environmental and community groups.. For our resource economic programs the audience includes farmers, landowners, state agencies (Delaware Development Office; Land Use Planning and Preservation; Department of Agriculture; Department of Health and Human Services; Department of Natural Resources & Environmental Control; Department of Transportation; Economic Development Office), federal agencies (USDA, NRCS, USEPA), land use organizations (Conservation Districts, AFT), environmental organizations, business and community leaders, families, students, and the general public.

**3. How was eXtension used?**

In 2013 UD and DSU eXtension Institutional Team comprised of faculty and staff from across all planned program areas completed the following:

- Training on how to incorporate eXtension into grants
- Connected the Extension website with eXtension.org
- Implemented Ask an Expert throughout the state. Staff and faculty engaged in the eXtension Learn feature
- Faculty and staff increased participation in the Communities of Practice (COP)-DE is represented by 81 eXtension members in 43 of the 73 approved CoP
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We trained 40 "experts" to use the Ask an Expert system and have fielded over 295 questions in the past 9 months. (84% of those questions were answered by Delaware experts).

For planned program #1, UD's Dr. Carissa Wickens, assistant professor of animal sciences and Extension equine specialist is an active member of the My Horse university and the related COP. She integrates eXtension Horse Quest with her program offerings including a 3 week adobe connect Horse Behavior shortcourse. She incorporates honors students in the implementation of this program who are also introduced to eXtension as a result. Additionally, Delaware has multiple membership with active involvement in the following Communities of Practice: Corn and Soybean production, eOrganic, HorseQuest, Land Use Planning, Livestock and Poultry Environmental Learning centers, Goat Industry, Small and backyard flocks, Niche meat processor network, Farm Safety and health and Pesticide Environmental Stewardship.

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	23804	52645	8605	350

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

**Patent Applications Submitted**

Year: 2013  
 Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2013	Extension	Research	Total
Actual	4	36	40

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number of Competitive Grants Submitted

Year	Actual
2013	65

**Output #2**

**Output Measure**

- Number of Competitive Grants Awarded

Year	Actual
2013	28

**Output #3**

**Output Measure**

- Number of Research Projects Completed

Year	Actual
2013	83

**Output #4**

**Output Measure**

- Number of Undergraduate Researchers

<b>Year</b>	<b>Actual</b>
2013	45

**Output #5**

**Output Measure**

- Number of M.S. Graduate Students

<b>Year</b>	<b>Actual</b>
2013	32

**Output #6**

**Output Measure**

- Number of Ph.D. Graduate Students

<b>Year</b>	<b>Actual</b>
2013	18

**Output #7**

**Output Measure**

- Number of Post-Doctoral Research Associates

<b>Year</b>	<b>Actual</b>
2013	9

**Output #8**

**Output Measure**

- Number of Refereed Journal Articles

<b>Year</b>	<b>Actual</b>
2013	40

**Output #9**

**Output Measure**

- Number of Books and Book Chapters

<b>Year</b>	<b>Actual</b>
2013	4

**Output #10**

**Output Measure**

- Number of Technical Reports

<b>Year</b>	<b>Actual</b>
2013	23

**Output #11**

**Output Measure**

- Number of Extension Bulletins and Factsheets

<b>Year</b>	<b>Actual</b>
2013	26

**Output #12**

**Output Measure**

- Number of Invited Presentations

<b>Year</b>	<b>Actual</b>
2013	99

**Output #13**

**Output Measure**

- Number of Volunteered Presentations

<b>Year</b>	<b>Actual</b>
2013	101

**Output #14**

**Output Measure**

- Number of Websites Established

<b>Year</b>	<b>Actual</b>
2013	14

**Output #15**

**Output Measure**

- Number of Workshops Conducted

<b>Year</b>	<b>Actual</b>
2013	265

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Increased number of poultry producers participating in surveillance, diagnostic testing, and vaccination programs for infectious avian diseases. Implementation of statewide plans to address major outbreaks of avian diseases and an increase in the number of diagnostic laboratories using advances in avian genomics to rapidly diagnose infectious diseases.
2	Sustainable production practices for the dairy and beef industries that link forage and pasture production practices with animal health, performance, and meat and milk quality.
3	Increased number of poultry and dairy farmers using feed management practices that increase nutrient utilization and feeding diets with lower concentrations of nitrogen and phosphorus.
4	Increased use of air quality best management practices that prevent odor, ammonia, and particulate emissions from poultry farms.
5	Cost-effective solar power technology to heat and cool poultry houses will allow farmers to reduce their reliance on natural gas, oil, and purchased electricity, increasing the energy efficiency of poultry production.
6	Increased number of farmers adopting new crop varieties and high value, niche market crops, (culinary herbs, spices and essential oils). Integrating innovations in cultural practices, biological and chemical pest management, harvesting equipment, and irrigation management into these systems, including feasibility studies of greenhouses to produce high value plants, such as those intended for pharmaceutical or nutraceutical uses.
7	Increase in the number of farmers and others (e.g., the "Green Industry" - greenhouses, nurseries, landscapers) implementing comprehensive nutrient management and conservation plans that are profitable and protective of ground and surface water quality, build soil quality, prevent soil erosion, and protect natural resource areas.
8	Increased use of soil management programs and best management practices for agricultural, natural, suburban/urban, and disturbed or contaminated settings that incorporate latest advances in research and greater adoption of watershed scale modeling to predict changes in the functions and environmental impacts of soils in mixed-used watersheds (agriculture, suburban, urban, forests) as land use changes from agricultural to suburban and urban uses.
9	Improved economic competitiveness of Delaware agriculture relative to other regions in the U.S. and global competitors with an emphasis on greater adoption of new innovations in marketing and risk management for farmers who must increasingly compete globally.
10	Increased interactions and long-range strategic planning efforts between research and extension staff and the diverse stakeholders (state and federal agencies, community groups, not-for-profit organizations, developers, farmers, etc.) involved in farmland preservation and land use conversion from agriculture to suburban and urban uses.
11	Disease Prevention and Control: basic and applied research on mechanisms of poultry disease will translate into useable tools and strategies for improved disease surveillance, diagnosis, prevention, and control in broiler chicken production. Knowledge will be extended to commercial poultry and allied industries.
12	Animal Genomics: increased understanding of gene function and expression and targeting of candidate genes affecting economically important traits in broiler chicken growth and production, disease resistance and immunity. Improvements in classical poultry breeding programs by use of marker assisted selection (MAS) and technology transfer.
13	Animal Nutrition: research will lead to improved understanding of nutritional requirements for poultry and ruminants and adoption of recommended dietary strategies by practicing

	<p>nutritionists and producers. Specifically, results of poultry directed research aim to minimize nutrient contamination of the environment from manure. Results from ruminant based research will lead to improved management of forages to maximize nutritional value, safe use, and minimize spoilage during storage. Nutritional effects on dairy cattle health and immune function including factors impacting white blood cell gene expression will be studied. Research will also lead to improved understanding of the molecular and cellular mechanisms associated with bovine lameness and early detection of the disease</p>
14	<p>Environmental Compatibility of Animal Agriculture: In addition to addressing nutrient related problems, research and extension programs will develop long-term strategies and management practices for other environmental issues related to animal agriculture such as the fate and transport of trace elements; concerns about air quality with ammonia, hydrogen sulfide, volatile organic compounds, and fine particulates originating from poultry houses; environmental and human health impacts of endocrine disruptors (estrogen, testosterone) found in manures; fate and transport of viruses and other pathogens during disease outbreaks and subsequent disposal of poultry mortality, and potential environmental and human health effects of antibiotics.</p>
15	<p>Plant Biology and Crop Production: basic research will lead to improved understanding of plant molecular biology and allow genetic manipulation of physiological processes important to increasing crop yields and quality and crop resistance to biotic and abiotic stresses. Applied research and extension programs on cultural practices, crop varieties, fertilizer and manure use, precision agriculture, and integrated pest management will increase crop yields, minimize costs, and protect environmental quality. Extension programs will guide management practices for horticultural plants for the "Green Industry" and for homeowners, important because of the rapid conversion of farmland to urban and suburban uses.</p>
16	<p>New Markets: advances in plant molecular biology and genomics will provide new markets for farmers and commercial-scale horticulture, such as plants for bioenergy, pharmaceutical and nutraceutical uses. New and creative marketing programs will stimulate diversification and growth in the production of value-added and niche market crops, such as culinary herbs, spices, essential oil plants, and specialty vegetables for urban and suburban markets.</p>
17	<p>Land Use Change: research will identify strategies needed to manage land use change in a state where preserving farmland is a major goal, but economic and social forces are resulting in steady conversion of agricultural lands to suburban and urban uses. The economic, social, and cultural impacts of land fragmentation, suburban sprawl, and the "critical mass" of land and businesses needed to sustain agriculture in the long-term will be determined. Research knowledge and extension programs will guide long-term land use planning in cooperation with state and local agencies and governments, community groups, and other stakeholders</p>
18	<p>International Economics and Trade: research will provide strategies to foster international trade and economic growth in developed and developing countries, with an emphasis on policy issues related to agricultural and energy markets and climate change, particularly those related to poultry production and bioenergy crops. Extension programs will educate agricultural producers on international marketing strategies for traditional agricultural products (e.g., poultry, grain crops) as well as new cropping systems, such as organic agriculture and genetically modified crops.</p>
19	<p>Educational programs for K-12 teachers and youth on: (i) advances in animal and plant molecular biology and applications of the basic animal and plant sciences to the production of animals and of plants used for food, fiber, landscaping, timber, bioenergy, and pharmaceutical and nutraceutical purposes; (ii) value of soils as a critical natural resource vital to civilization, including the many functions of soils in agricultural and natural ecosystems, the importance of soil management to environmental quality, and the role of soils in sustaining aesthetically pleasing managed landscapes in suburban and urban settings; and (iii) the relationship between land use and major societal issues, such as economic development, community and family adaptation to changing social and political conditions, and the value of</p>

	sustaining ecosystems and protecting environmental quality.
20	Soils and Environment: basic research will increase understanding of physical, chemical, and biological factors influencing the fate and transport of nutrients, metals, organics, and pathogens in soils. Applied research will lead to development of nutrient management strategies and recommendations that minimize nonpoint nutrient pollution from all land uses. Remediation practices for soils contaminated by metals, organics, and nutrients will use innovative, research-based measures to prioritize risk to the environment and human health based on the speciation, mobility, and bioavailability of contaminants in soils. Mitigation approaches for polluted soils will combine soil chemistry, physics, and soil/plant molecular biology to enhance removal or in-situ degradation or stabilization of pollutants in soils.
21	Irrigation management for crop production, water resource sustainability, and environmental protection
22	Integrated Pest Management for Ornamental Plants in Urban and Suburban Landscapes

**Outcome #1**

**1. Outcome Measures**

Increased number of poultry producers participating in surveillance, diagnostic testing, and vaccination programs for infectious avian diseases. Implementation of statewide plans to address major outbreaks of avian diseases and an increase in the number of diagnostic laboratories using advances in avian genomics to rapidly diagnose infectious diseases.

Not Reporting on this Outcome Measure

**Outcome #2**

**1. Outcome Measures**

Sustainable production practices for the dairy and beef industries that link forage and pasture production practices with animal health, performance, and meat and milk quality.

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Actual
2013	0

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

During the 2014 program year 4 (Kent/Sussex) Master Food Educators volunteered to support workshops and public events giving just over 132 hours to Cooperative Extension's outreach efforts. This has an approximate economic value of \$3037.00 (based on \$23.01/hour 2014 values from Independent Sector.org).

The Master Food Educators conducted a variety of outreach programs including:

• Staffing Displays at 8 Public Events including at 4-H Favorite Foods, Milton Elementary School back to school night, events at Fifer Orchards, Frederica Senior Center, Sussex County Farm Tour.

• Assisting Extension Agents with over programs such as Dining with Diabetes, ServSafe and DineSafe, Food Safety for Entrepreneurs and Food Preservation 101 by conducting demonstrations, preparing food for taste testing and assisting with the program implementation. Created factsheets that addressed different fruits providing basic nutrition and handling information as well as 2 low cost simple recipes.

#### What has been done

A pasture management short course was held over the time period of three nights at the Kent County Extension Office in March 2013. Susan Garey, Extension Animal Science Agent, and Phillip Sylvester, Extension Agriculture Agent in Kent County, facilitated the educational series. Expert guest speakers presented on topics including fertility management, pasture establishment and species selection, weed control, and grazing management.

#### Results

Participants were asked to complete a pre-knowledge assessment at the beginning of the course and an evaluation at the conclusion of the course to determine knowledge or skills gained by participating. A highlight of the results is listed below:

• 88% of the participants had more confidence in interpreting a soil test report.

• 88% of the participants had more confidence in ability to select appropriate forage species.

• 38% of the participants indicated that the information gained from the short course was valued between \$5-30/acre and an additional 32% of the participants indicated that it was valued at over \$30/acre.

• 100% of the participants indicated they are going to change at least one pasture management practice based on the knowledge gained at the short course. The top four indicated management practice changes were.

• 69% will rotationally graze pasture

• 56% will stockpile tall fescue

• 50% will evaluate and renovate a pasture in Fall 2013

• 50% will utilize the UD Pasture and Hay Weed Management guide for herbicide selections

As a direct result, several on farm follow up visits occurred to further discuss management practices and evaluate individual pastures. Overall, the program increased the knowledge and skills of producers to enable them to more efficiently manage pastures in Delaware.

### 4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems
601	Economics of Agricultural Production and Farm Management

### **Outcome #3**

#### **1. Outcome Measures**

Increased number of poultry and dairy farmers using feed management practices that increase nutrient utilization and feeding diets with lower concentrations of nitrogen and phosphorus.

#### **2. Associated Institution Types**

- 1890 Extension
- 1890 Research

#### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

#### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2013	0

#### **3c. Qualitative Outcome or Impact Statement**

##### **Issue (Who cares and Why)**

In the Mid-Atlantic Region, small flock owners do not have many opportunities to learn about good management practices and biosecurity. Additionally, approximately one month before Easter holiday, many people consider starting a flock and need a way to learn how to do so properly.

##### **What has been done**

Cooptastic! 2013, a one day conference, sponsored by Delaware State University Cooperative Extension held at the Delaware State Fairgrounds in Harrington, DE, covered multiple topics related to either starting a flock or maintaining a flock of chickens. Attendees were treated to poultry presentations, a display of chicken breeds for egg laying, vendors selling equipment and feed, and an egg judging contest. Scientists, diagnosticians, extension poultry specialists, and extension agents from across the region spoke on topics including biosecurity, predators, starting a flock, nutrition, marketing eggs and starting an egg business.

##### **Results**

Based on the attendance at certain talks and feedback from equipment vendors, attendees were most interested in starting a small flock. The evaluation indicated attendees increased poultry knowledge by 20% after attending Cooptastic! 2013. These parameters indicate that interest remains high in starting a small flock and that research-based education is greatly needed to influence proper care of small flocks. The Cooptastic! conference will continue to be held in odd years; the next is scheduled for 2015.

#### **4. Associated Knowledge Areas**

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<b>KA Code</b>	<b>Knowledge Area</b>
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102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
307	Animal Management Systems
605	Natural Resource and Environmental Economics
903	Communication, Education, and Information Delivery

#### **Outcome #4**

##### **1. Outcome Measures**

Increased use of air quality best management practices that prevent odor, ammonia, and particulate emissions from poultry farms.

Not Reporting on this Outcome Measure

#### **Outcome #5**

##### **1. Outcome Measures**

Cost-effective solar power technology to heat and cool poultry houses will allow farmers to reduce their reliance on natural gas, oil, and purchased electricity, increasing the energy efficiency of poultry production.

Not Reporting on this Outcome Measure

#### **Outcome #6**

##### **1. Outcome Measures**

Increased number of farmers adopting new crop varieties and high value, niche market crops, (culinary herbs, spices and essential oils). Integrating innovations in cultural practices, biological and chemical pest management, harvesting equipment, and irrigation management into these systems, including feasibility studies of greenhouses to produce high value plants, such as those intended for pharmaceutical or nutraceutical uses.

##### **2. Associated Institution Types**

- 1890 Extension

##### **3a. Outcome Type:**

Change in Action Outcome Measure

##### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2013	0

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

Delaware producers seek to add ethnic and other specialty or niche crops to their current operations for greater profit.

#### What has been done

Delaware State University Cooperative Extension's Small Farms program has held numerous workshops, on and off farm demonstrations, and farm visits regarding high tunnel production, ethnic crop production, alternative crops, and labor saving equipment and techniques that farmers can adapt to their farming operations.

#### Results

Participants in this program increased their knowledge of subjects covered. Seventeen new growers expressed interest in high tunnel production and requested support from NRCS to purchase them. Completed surveys indicated that program participants would consider adding some of newly introduced techniques to their farming operations during the next growing season. Approximately \$25,000 worth of ethnic food crops was produced in Delaware in 2013, either as due to new acreage or increased value of ethnic crops.

### 4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
601	Economics of Agricultural Production and Farm Management
903	Communication, Education, and Information Delivery

### Outcome #7

#### 1. Outcome Measures

Increase in the number of farmers and others (e.g., the "Green Industry" - greenhouses, nurseries, landscapers) implementing comprehensive nutrient management and conservation plans that are profitable and protective of ground and surface water quality, build soil quality, prevent soil erosion, and protect natural resource areas.

#### 2. Associated Institution Types

- 1890 Extension

#### 3a. Outcome Type:

Change in Action Outcome Measure

#### 3b. Quantitative Outcome

Year	Actual
2013	0

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

Socially disadvantaged and small farmers in Delaware are looking for new ways to increase production and profitability on their limited acreage.

#### What has been done

The 2013 Profiting From a Few Acres (PFFA) conference focused on season extension and growing niche crops for small scale and socially disadvantaged farmers. Conference participants heard from other farm owners, and public and private sector educators throughout the Mid-Atlantic region who discussed their successes managing their businesses and mitigating risk.

#### Results

The conference evaluations reflected a total knowledge gained of 89 percent from both the plenary and breakout sessions. The evaluations also reflected that 96 percent felt the conference was excellent. During the balance of the year, DSU Extension educators have made multiple farm visits with participating farmers who adopted the management practices presented during previous PFFA Conferences.

### 4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
205	Plant Management Systems
601	Economics of Agricultural Production and Farm Management
903	Communication, Education, and Information Delivery

### Outcome #8

#### 1. Outcome Measures

Increased use of soil management programs and best management practices for agricultural, natural, suburban/urban, and disturbed or contaminated settings that incorporate latest advances in research and greater adoption of watershed scale modeling to predict changes in the functions and environmental impacts of soils in mixed-used watersheds (agriculture, suburban, urban, forests) as land use changes from agricultural to suburban and urban uses.

#### 2. Associated Institution Types

- 1862 Extension
- 1890 Extension

#### 3a. Outcome Type:

Change in Action Outcome Measure

### 3b. Quantitative Outcome

Year	Actual
2013	0

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

The Chesapeake Bay Program is a partnership made up of representatives from federal, state, and local governments, non-profit organizations, academic institutions, and other groups with the common goal of restoring the health of the Chesapeake Bay and the streams and rivers that drain to it. This group comes together to evaluate data, share best practices, report on progress, and make policy and management decisions intended to help achieve restoration goals. The partnership acknowledges the need to continuously evaluate and update data sources and assumptions.

#### What has been done

Jennifer Volk, with the UD Cooperative Extension, helped plan and conduct, with other members of the Chesapeake Bay Program's Agriculture Workgroup, a 2-day "Building a Better Bay Model" workshop for agricultural partners across the watershed. The workshop, which was held May 22nd and 23rd 2013 at the University of Maryland's Conference Center, informed participants about current model data inputs, assumptions, and processes. Through facilitated discussions, feedback and suggestions on potential new data sources and approaches that could help the models to better characterize the agricultural sector in the future were also gathered. The workshop provided attendees an opportunity to participate in the continual model evaluation process.

#### Results

The Agricultural Modeling Subcommittee, where Jennifer Volk represents Delaware, began meeting in mid-2013. This Subcommittee has grouped and prioritized the recommendations and is working with Bay Program modelers to investigate appropriate next steps for updating key areas of the model. After thorough vetting, these new ideas and data sources will replace the outdated data and assumptions utilized today.

Based on a post-conference survey (completed by 59% of attendees), respondents felt the conference was a success. Participants reported they met the objectives of (a) gaining a better understanding of the model (81%) and (b) providing their input (75%) which was supported by the large number of innovative ideas supplied. Additionally, 84% of respondents felt that if the recommendations offered are implemented, agriculture would be better represented in the model. This is tightly tied to 85% of those surveyed reporting that they left feeling more optimistic that the needs of agriculture can be balanced with Bay restoration, which are two goals often viewed as being at odds. To secure this balance, an open dialogue must continue between modelers and the agricultural sector and the work of the Ag Modeling Subcommittee hopes to facilitate that process.

### 4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships

112	Watershed Protection and Management
205	Plant Management Systems
605	Natural Resource and Environmental Economics
903	Communication, Education, and Information Delivery

### **Outcome #9**

#### **1. Outcome Measures**

Improved economic competitiveness of Delaware agriculture relative to other regions in the U.S. and global competitors with an emphasis on greater adoption of new innovations in marketing and risk management for farmers who must increasingly compete globally.

Not Reporting on this Outcome Measure

### **Outcome #10**

#### **1. Outcome Measures**

Increased interactions and long-range strategic planning efforts between research and extension staff and the diverse stakeholders (state and federal agencies, community groups, not-for-profit organizations, developers, farmers, etc.) involved in farmland preservation and land use conversion from agriculture to suburban and urban uses.

Not Reporting on this Outcome Measure

### **Outcome #11**

#### **1. Outcome Measures**

Disease Prevention and Control: basic and applied research on mechanisms of poultry disease will translate into useable tools and strategies for improved disease surveillance, diagnosis, prevention, and control in broiler chicken production. Knowledge will be extended to commercial poultry and allied industries.

Not Reporting on this Outcome Measure

### **Outcome #12**

#### **1. Outcome Measures**

Animal Genomics: increased understanding of gene function and expression and targeting of candidate genes affecting economically important traits in broiler chicken growth and production, disease resistance and immunity. Improvements in classical poultry breeding programs by use of marker assisted selection (MAS) and technology transfer.

Not Reporting on this Outcome Measure

### **Outcome #13**

#### **1. Outcome Measures**

Animal Nutrition: research will lead to improved understanding of nutritional requirements for poultry and ruminants and adoption of recommended dietary strategies by practicing nutritionists and producers. Specifically, results of poultry directed research aim to minimize nutrient contamination of the environment from manure. Results from ruminant based research will lead to improved management of forages to maximize nutritional value, safe use, and minimize spoilage during storage. Nutritional effects on dairy cattle health and immune function including factors impacting white blood cell gene expression will be studied. Research will also lead to improved understanding of the molecular and cellular mechanisms associated with bovine lameness and early detection of the disease

Not Reporting on this Outcome Measure

### **Outcome #14**

#### **1. Outcome Measures**

Environmental Compatibility of Animal Agriculture: In addition to addressing nutrient related problems, research and extension programs will develop long-term strategies and management practices for other environmental issues related to animal agriculture such as the fate and transport of trace elements; concerns about air quality with ammonia, hydrogen sulfide, volatile organic compounds, and fine particulates originating from poultry houses; environmental and human health impacts of endocrine disruptors (estrogen, testosterone) found in manures; fate and transport of viruses and other pathogens during disease outbreaks and subsequent disposal of poultry mortality, and potential environmental and human health effects of antibiotics.

#### **2. Associated Institution Types**

- 1862 Extension
- 1890 Extension
- 1862 Research
- 1890 Research

#### **3a. Outcome Type:**

Change in Condition Outcome Measure

#### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2013	0

#### **3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

The benefits of Delaware's nutrient management efforts in our water quality monitoring data is not being captured. Animal based agriculture is a key contributor of nutrients to ground and surface waters and progress in improving nutrient management for animal agriculture needs to be documented.

#### **What has been done**

A seminar entitled "Monitoring the Results of Investments in Water Quality Improvement: Are we moving the needle?" was held at the Delaware Technical and Community College campus in Dover. The objective of the seminar was to highlight ongoing agricultural management activities from multiple perspectives, discuss how those impacts on water quality are assessed, and review the changes we have observed. In the afternoon, interested attendees were encouraged to participate in a structured discussion about how to better integrate efforts, data, and networks with the goal of building an atmosphere of scientific collaboration. Approximately 88 people were in attendance representing numerous government agencies, academic institutions, environmental organizations, and agricultural businesses. Speakers addressed the relationship between agriculture and nutrient management activities.

#### **Results**

Approximately 40% of the attendees completed a conference evaluation form and of those surveyed, the overwhelming majority indicated the event was a success with good (33%) and excellent (61%) ratings.

Based on evaluation results, regardless of affiliation, a good portion of respondents (78%) already felt they were either moderately or considerably aware of Delaware's nutrient management initiatives prior to the conference, with all falling within these categories after. Similarly, a good portion (58%) of respondents indicated they also had moderate or considerable familiarity with approaches to assess water quality changes prior to the conference; but 97% had a high level of familiarity after the event. The greatest increase in knowledge occurred in regard to awareness of ground and surface water monitoring programs in the state. Prior to the event, only about 50% of respondents felt they were adequately aware of these programs whereas after the event, 97% reported awareness.

When posed with the question if they would support the creation of a formalized collaborative group around water quality monitoring initiatives, 31 of the respondents (86%) replied, "yes," while one answered no, and one indicated indifference.

The DGS and UD Cooperative Extension are discussing the possibility of jointly coordinating efforts to identify and invite representatives to a scoping committee in spring 2014.

#### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
205	Plant Management Systems
305	Animal Physiological Processes
307	Animal Management Systems
601	Economics of Agricultural Production and Farm Management
605	Natural Resource and Environmental Economics
903	Communication, Education, and Information Delivery

## **Outcome #15**

### **1. Outcome Measures**

Plant Biology and Crop Production: basic research will lead to improved understanding of plant molecular biology and allow genetic manipulation of physiological processes important to increasing crop yields and quality and crop resistance to biotic and abiotic stresses. Applied research and extension programs on cultural practices, crop varieties, fertilizer and manure use, precision agriculture, and integrated pest management will increase crop yields, minimize costs, and protect environmental quality. Extension programs will guide management practices for horticultural plants for the "Green Industry" and for homeowners, important because of the rapid conversion of farmland to urban and suburban uses.

### **2. Associated Institution Types**

- 1862 Extension
- 1862 Research

### **3a. Outcome Type:**

Change in Condition Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2013	0

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

The National Database Program Area Committee grew from a meeting of National Plant Diagnostic Network (NPDN) diagnosticians and IT personnel across the U.S. in 2007, with the mission of correcting errors in the National Repository Pest Dictionary for the NPDN data upload. The role expanded to create upload guidelines for diagnosticians, and review of requests and valid taxonomic nomenclature. Valid accepted nomenclature is crucial for reporting of new detections, reporting, and epidemiology. The International Code of Nomenclature for Algae, Fungi, and Plants stated that as of Jan 1, 2013, one scientific name for fungi will be required.

#### **What has been done**

? Research supported by USDA entitled "Incorporation of the Standard Scientific Name for Fungi into National Regulatory and Extension Databases and other Nomenclature Support for Safeguarding" has been funded through Goal 3 (to Enhance and Strengthen Pest Identification and Technology

?Direct collaboration with the database personnel at CERIS based at Purdue University and the SMML at USDA in Beltsville, MD, to create working files in Excel. Expert review of taxonomic subject matter.

?Broadening of scope to include stakeholders nationwide, including USDA ARS, USDA APHIS NIS (National Identification Service), USDA APHIS CAPS, NAPIS users, Extension personnel, and Federal personnel in new pest identification and safeguarding at the ports.

?Resources Secured - USDA Farm Bill Award of \$38,500 in 2012-13 for One Name for Fungi Project to work with Systematic Mycology and Microbiology Laboratory in Beltsville and worldwide experts to review accuracy of nomenclature for fungi. Farm Bill Award for 2013-14, of \$125,994 to University of Delaware to continue the project.

?Invited professional presentations were made at the Potomac Division of the American Phytopathological Society, USDA APHIS and ARS SMML labs in Beltsville, MD, and USDA APHIS CPHST Plant Epidemiology and Risk Analysis unit.

?Scholarly Publications- Newsletter articles in the monthly national newsletter of the NPDN

?Method of Program Evaluation to measure impact includes changes to the software and to the Pest Dictionary for pathogen names and synonyms. End result will be incorporation of valid taxonomic name with ability to handle all other names as synonyms. Evaluation by the National Database PAC, University and Extension personnel, diagnosticians, and regulatory personnel across the country is providing feedback.

### **Results**

Knowledge and skills have improved data accuracy dramatically over the past seven years, with approximately 20% fewer errors. Pest code entries have been streamlined in the Pest Dictionary (for example, fungal entries were reduced from 3,400 down to 2,900 more accurate entries). Over 80% of the current 2,900 names have been verified by nomenclature experts, and are now consistent across data systems. Software changes incorporate pest grouping into a relational database that is easily searchable.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
201	Plant Genome, Genetics, and Genetic Mechanisms
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
601	Economics of Agricultural Production and Farm Management
903	Communication, Education, and Information Delivery

### **Outcome #16**

#### **1. Outcome Measures**

New Markets: advances in plant molecular biology and genomics will provide new markets for farmers and commercial-scale horticulture, such as plants for bioenergy, pharmaceutical and nutraceutical uses. New and creative marketing programs will stimulate diversification and growth in the production of value-added and niche market crops, such as culinary herbs, spices, essential oil plants, and specialty vegetables for urban and suburban markets.

Not Reporting on this Outcome Measure

## **Outcome #17**

### **1. Outcome Measures**

Land Use Change: research will identify strategies needed to manage land use change in a state where preserving farmland is a major goal, but economic and social forces are resulting in steady conversion of agricultural lands to suburban and urban uses. The economic, social, and cultural impacts of land fragmentation, suburban sprawl, and the "critical mass" of land and businesses needed to sustain agriculture in the long-term will be determined. Research knowledge and extension programs will guide long-term land use planning in cooperation with state and local agencies and governments, community groups, and other stakeholders

Not Reporting on this Outcome Measure

## **Outcome #18**

### **1. Outcome Measures**

International Economics and Trade: research will provide strategies to foster international trade and economic growth in developed and developing countries, with an emphasis on policy issues related to agricultural and energy markets and climate change, particularly those related to poultry production and bioenergy crops. Extension programs will educate agricultural producers on international marketing strategies for traditional agricultural products (e.g., poultry, grain crops) as well as new cropping systems, such as organic agriculture and genetically modified crops.

Not Reporting on this Outcome Measure

## **Outcome #19**

### **1. Outcome Measures**

Educational programs for K-12 teachers and youth on: (i) advances in animal and plant molecular biology and applications of the basic animal and plant sciences to the production of animals and of plants used for food, fiber, landscaping, timber, bioenergy, and pharmaceutical and nutraceutical purposes; (ii) value of soils as a critical natural resource vital to civilization, including the many functions of soils in agricultural and natural ecosystems, the importance of soil management to environmental quality, and the role of soils in sustaining aesthetically pleasing managed landscapes in suburban and urban settings; and (iii) the relationship between land use and major societal issues, such as economic development, community and family adaptation to changing social and political conditions, and the value of sustaining ecosystems and protecting environmental quality.

### **2. Associated Institution Types**

- 1862 Extension
- 1890 Extension
- 1862 Research
- 1890 Research

### **3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

Year	Actual
2013	0

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Animals and humans have the ability to transmit some kinds of illness or disease to each other. Illnesses or diseases that infect livestock but can be passed to humans are called zoonotic diseases. Common causes of zoonotic diseases are viruses, bacteria, and fungi. In the fall of 2012, a two year old boy died after being infected along with 106 other fairgoers with E. Coli 0157:H7, following a visit to a petting zoo at a North Carolina County. E. Coli 0157:H7 is also a zoonotic disease, caused by a single, specific strain of E. Coli bacteria.

**What has been done**

The animal science extension agent developed a classroom training for livestock exhibitors, focused on zoonotic diseases and more specifically on the current strain of H3N2v and E. Coli 0157:H7 infection. The training was offered to 75 youth during the Kent County Livestock Overnighter camp, 83 youth and parents during classes offered in New Castle, Kent and Sussex counties in the spring of 2013 and to an additional 45 youth at Cow Camp.

**Results**

Utilizing a pre/post-test evaluation in the three county based classroom trainings, participants demonstrated increased knowledge about both H3N2v and E. Coli 0157:H7. 65 sets of pre/post-test evaluations were returned. Participants demonstrated knowledge increase in:  
 ?understanding of disease transmission terminology (40% pre vs 92% post)  
 ?recognizing the types of pathogens that cause H3N2v and E. Coli 0157:H7 (48% pre vs 72% post)  
 ?understanding of a variant virus (9% pre vs 79% post)  
 ?identifying a zoonotic disease (74% pre vs. 94% post)  
 Following completion of the training, 91% of participants were able to correctly identify two ways to keep livestock from getting sick in comparison to only 50% before the training. In questions only asked following the training, 100% of participants were able to name two ways to keep people from getting sick from animals and 98% indicated they learned something new in the class that they planned on using as they raised their project animal.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
201	Plant Genome, Genetics, and Genetic Mechanisms
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants

205	Plant Management Systems
304	Animal Genome
305	Animal Physiological Processes
307	Animal Management Systems
311	Animal Diseases
601	Economics of Agricultural Production and Farm Management
605	Natural Resource and Environmental Economics
903	Communication, Education, and Information Delivery

## **Outcome #20**

### **1. Outcome Measures**

Soils and Environment: basic research will increase understanding of physical, chemical, and biological factors influencing the fate and transport of nutrients, metals, organics, and pathogens in soils. Applied research will lead to development of nutrient management strategies and recommendations that minimize nonpoint nutrient pollution from all land uses. Remediation practices for soils contaminated by metals, organics, and nutrients will use innovative, research-based measures to prioritize risk to the environment and human health based on the speciation, mobility, and bioavailability of contaminants in soils. Mitigation approaches for polluted soils will combine soil chemistry, physics, and soil/plant molecular biology to enhance removal or in-situ degradation or stabilization of pollutants in soils.

### **2. Associated Institution Types**

- 1862 Extension
- 1890 Extension
- 1862 Research
- 1890 Research

### **3a. Outcome Type:**

Change in Condition Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2013	0

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

More than 90% of Delaware waters do not meet quality standards for designated uses, such as recreation, fishing, or drinking. Water quality problems related to agricultural non-point nutrient losses resulted in the 1999 Delaware Nutrient Management Act, which mandated that individuals who fertilize more than 10 acres of land, own/manage more than eight animal units (1 animal unit

= 1000 pounds live animal weight), apply nutrients for a fee (commercial fertilizer handler), or consult in the business of nutrients must become nutrient certified. In addition, the Delaware Nutrient Management Law set requirements for animal waste management plans and nutrient management plan and sets limits for application of nutrients to agricultural soils.

#### **What has been done**

The University of Delaware Cooperative Extension continues to offer initial nutrient management certification training semi-annually to individuals who apply nutrients to ten or more acres of Delaware land or have a commercial livestock operation. These state-wide training sessions are led by University of Delaware Cooperative Extension, with assistance from the Delaware Department of Agriculture. Program oversight is provided by the Delaware

#### **Results**

Pre- and post-test evaluations of all attendees of the Delaware Nutrient Management Certification Sessions in 2013 indicated that knowledge of Delaware's nutrient management issues and certification requirements increased by 19.5%, on average, by those attending sessions I and II. Participant feedback on the educational content quality and value of the Delaware Nutrient Management Sessions was overwhelmingly positive.

In 2013, certified individuals attended a total of 7,331.25 hours of nutrient management continuing education. The combined attendance of certified individuals at the 120 programs approved for Delaware Nutrient Management Continuing Education Credits in 2013 was 3,099.

#### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
605	Natural Resource and Environmental Economics
903	Communication, Education, and Information Delivery

#### **Outcome #21**

##### **1. Outcome Measures**

Irrigation management for crop production, water resource sustainability, and environmental protection

##### **2. Associated Institution Types**

- 1862 Extension
- 1862 Research

##### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

Year	Actual
2013	0

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

Nearly 30% of crop land in Delaware is under irrigation. Knowing the right time to implement irrigation is key for sustainable yields and profitability. Several technologies are available to growers to quantify soil moisture levels and can be used to trigger irrigation.

#### What has been done

An irrigation management session was held as part of the Kent County Crop Masters Series in early 2014. Irrigation expert James Adkins discussed soil types and moisture holding capacities, review of available water and managed allowable depletion, soil moisture measurement techniques, and soil infiltration rates. A review of irrigation pumping options, delivery system types, and their ideal applications were also discussed. Phillip Sylvester, Extension Agriculture Agent in Kent County, facilitated the educational event.

#### Results

Participants were asked to complete a pre-knowledge assessment at the beginning of the course and an evaluation at the conclusion of the course to determine knowledge or skills gained by participating. A highlight of the results is listed below:

?100% indicated they learned a new technique, skill or gained knowledge that will be useful in their operations

?97% indicated they would implement some type of irrigation scheduling

?66% said they would either use the hand-feel method using a soil probe, tensiometers such as Watermark sensors, or the ET scheduling method. The success of this program indicates the need for additional programming on irrigation management.

### 4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
601	Economics of Agricultural Production and Farm Management
605	Natural Resource and Environmental Economics
903	Communication, Education, and Information Delivery

## **Outcome #22**

### **1. Outcome Measures**

Integrated Pest Management for Ornamental Plants in Urban and Suburban Landscapes

### **2. Associated Institution Types**

- 1862 Extension
- 1890 Extension

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2013	0

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

Plant disease diagnosis, pest identification and integrated pest management can be overwhelming and confusing to novice Master Gardeners, landscape professionals, and homeowners.

#### **What has been done**

A group of Master Gardeners and landscape professionals learned how to scout and examine plants in the landscape for pests, including pathogens and insects, along with beneficial insects at recent pest walks. Pest Walks were held at the UDBG in New Castle County (May 21 and June 19) and at the Carvel Center in Georgetown on June 26, 2013.

Participants learned:

?Awareness and knowledge of plant diseases and insects, as well as beneficial insects, on ornamental plants.

?How to look for and diagnose insects and diseases of plants in landscapes, at low levels best for management and control.

?Knowledge of types of plantings to use in DE, cultural controls, environmentally friendly chemical controls and biological control methods.

Respondents said they will change their landscape management practices by:

?Scouting and examining plantings regularly, and keeping records of plant pests observed on certain dates

?Implementing IPM (integrated pest management) practices before using chemicals

#### **Results**

91% of Master Gardeners in training gave the trainings the highest mark on a scale of 1:4.

Respondents indicated that the pest walks ?brought all of the things I learned in this class

together?.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
601	Economics of Agricultural Production and Farm Management
605	Natural Resource and Environmental Economics
903	Communication, Education, and Information Delivery

#### 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.)

##### Brief Explanation

#### V(I). Planned Program (Evaluation Studies)

##### Evaluation Results

Evaluation of the Global Food Security and Hunger planned program for FY 13 (66 research FTEs, 24 Extension FTEs) indicates continued strong efforts in basic and applied research and extension activity. Food security and agricultural productivity has long been a primary area of emphasis in the state. Delaware's agricultural systems, particularly poultry, grain, and vegetable crop production, are linked closely with exports to other countries and serve as models for the application of new knowledge, derived from basic research, to challenges in emerging and developed countries worldwide. Research grants (28 awarded) supported the efforts of our faculty who mentored 104 graduate students, post-docs, and undergraduate researchers and collectively published 40 refereed journal articles and book chapters, made 200 invited and volunteered presentations, and conducted 265 workshops on improved efforts to contribute to the global need for a safe and secure food supply, increase agricultural profitability, become more competitive in global markets, and ensure the environmental compatibility of all forms of agriculture. Our evaluations have included annual internal administrative reviews, periodic University level Academic Program Reviews, and - for extension - surveys and other evaluations conducted with stakeholders participating in workshops and other extension programs. In general, we have received very positive feedback from the agricultural and natural resource communities about the

programs we conduct related to Global Food Security and Hunger.

### **Key Items of Evaluation**

There are no major items requiring NIFA attention at this time, other than the continued need for more federal funding for research and extension programs that seek to further expand our efforts to address the global challenges related to producing a safe and secure food supply