

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Biotechnology and Biotechnology-based Agribusiness

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
201	Plant Genome, Genetics, and Genetic Mechanisms	25%	25%	25%	25%
304	Animal Genome	25%	25%	25%	25%
601	Economics of Agricultural Production and Farm Management	10%	10%	10%	10%
602	Business Management, Finance, and Taxation	10%	10%	10%	10%
603	Market Economics	10%	10%	10%	10%
604	Marketing and Distribution Practices	10%	10%	10%	10%
903	Communication, Education, and Information Delivery	10%	10%	10%	10%
	Total	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	0.5	0.5	20.0	4.5
Actual Paid Professional	0.2	0.0	21.3	0.1
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
0	0	129343	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	267042	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
12095	0	4181908	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research and Extension programs will target avian and plant biotechnology. In the avian arena, these projects will be aimed at understanding basic mechanisms, including those affected by microRNAs, disease etiology and control and emergence of new disease causing agents. Research will continue and expand on annotating the chicken genome, as well as the genome of many poultry pathogens, to help provide the tools needed to advance our understanding of poultry growth, health and disease. We plan to apply these tools to diagnosis and treatment of disease and screening for desirable production traits. We also seek to develop genome based diagnostic methods, and study the molecular basis of disease resistance and susceptibility. Some specific avian biotechnology research areas planned include: identification of genomic factors influencing pathogenesis of avian herpes viruses and mycoplasmas; evolution of virulence of Marek's Disease virus; interaction of MDV proteins with host cells; regulation of the immune response to avian pathogens; and gene expression profiles in growth-selected chickens. With respect to production-oriented research, a new integrated, multi-disciplinary approach, including collaboration with an international team of scientists, is now underway to help identify genes that explain the differences on fatness between two lines of chickens, the French Fat and Lean chicken lines. This research extends to the implementation of genomics technologies in commercial chicken breeding programs to be done in close collaboration with poultry industry researchers. With regard to plant biotechnology, projects will focus on understanding basic mechanisms of gene control in plants, disease resistance, nitrogen fixation, and plant/environment interactions. Areas of particular interest for basic plant biotechnology research include: RNA turnover or small RNA-mediated gene regulation; understanding disease resistance and signal transduction pathways in plants; understanding and enhancing symbiotic nitrogen fixation via the application of molecular and proteomics approaches; developing biotechnology-based diagnostic methods for major plant diseases; and understanding processes controlling plant/soil interfacial relations at the molecular and atomic levels to enhance crop utilization of nutrients and the effectiveness of plants at remediation of soils contaminated with metals and organics. For both avian and plant biotechnology, findings will be applied as much as possible to existing issues in agriculture with the goal of integrating biotechnology research into new agribusinesses such as those producing plants better adapted to environmental and biological stress, plants used for the production of pharmaceuticals and nutraceuticals, and plant with bioenergy uses.

2. Brief description of the target audience

Farmers, landowners, state agencies (Delaware Development Office, Departments of Agriculture, Health and Human Services, Natural Resources and Environmental Control, Transportation), federal agencies (USDA, USEPA), land use organizations, environmental organizations, business and community

leaders, families, students, and the general public.

3. How was eXtension used?

Extension in Delaware has set the following goals for use of eXtension:

- 1) Incorporating eXtension into grants;
- 2) Connecting the UD Extension website with eXtension.org;
- 3) Establishing an Ask an Expert widget for Delaware;
- 4) Encouraging the use of eXtension's Learn feature;
- 5) Encouraging a positive culture regarding eXtension;
- 6) Maintaining an accurate list of institutional members in the eXtension people database; and
- 7) Encouraging participation in Communities of practice.

For Planned Program #2,

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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	0	30	30

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Competitive Grants Submitted

Year	Actual
2013	11

Output #2

Output Measure

- Number of Competitive Grants Awarded

Year	Actual
2013	5

Output #3

Output Measure

- Number of Research Projects Completed

Year	Actual
2013	16

Output #4

Output Measure

- Number of Undergraduate Researchers

Year	Actual
2013	12

Output #5

Output Measure

- Number of M.S. Graduate Students

Year	Actual
2013	19

Output #6

Output Measure

- Number of Ph.D. Graduate Students

Year	Actual
2013	14

Output #7

Output Measure

- Number of Post-doctoral Research Associates

Year	Actual
2013	8

Output #8

Output Measure

- Number of Refereed Journal Articles

Year	Actual
2013	30

Output #9

Output Measure

- Number of Books and Book Chapters

Year	Actual
2013	2

Output #10

Output Measure

- Number of Technical Reports

Year	Actual
2013	8

Output #11

Output Measure

- Number of Extension Bulletins and Factsheets

Year	Actual
2013	0

Output #12

Output Measure

- Number of Invited Presentations

Year	Actual
2013	25

Output #13

Output Measure

- Number of Volunteered Presentations

Year	Actual
2013	2

Output #14

Output Measure

- Number of Websites Established

Year	Actual
2013	2

Output #15

Output Measure

- Number of Workshops Conducted

Year	Actual
2013	3

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increased awareness by all components of the poultry industry of the opportunities to use biotechnology to prevent, diagnose, and control avian infectious diseases.
2	Increased number of farmers and members of the horticultural industry aware of the opportunities to use advances in plant biotechnology to develop new businesses.
3	Educational programs for K-12 youth and teachers on basic principles and applications of biotechnology to the plant, animal, and environmental sciences.
4	Commercial evaluation in agronomic and horticultural settings of genetically modified plants developed using biotechnology research.
5	Integration of plant and animal biotechnology educational materials developed cooperatively by research and extension staff into K-12 curricula in Delaware schools.
6	Stronger, more formal links between scientists conducting biotechnology research, extension specialists familiar with biotechnology applications, and state and regional economic development agencies and private industry.
7	Avian Biotechnology: basic research will provide an improved understanding of the fundamental causes and modes of action of avian diseases and the factors that influence their potential to spread to other animal species and humans; applied research will provide innovations in surveillance and diagnostic tools that help prevent or contain disease outbreaks and vaccines that prevent or control infectious diseases.
8	Plant Biotechnology: basic research will lead to an improved understanding of the processes by which plants grow, resist or adapt to diseases and other stresses; can be used to produce bio-based products useful for human health and nutrition, and regulate the uptake of plant nutrients in agricultural soils and contaminants (e.g., heavy metals) in polluted soils; applied research will lead to plants that can produce increased yields with lower inputs, resist pest and climatic stresses, and remediate or stabilize polluted soils.
9	Biotechnology-Based Agribusinesses: research and extension programs will link results of biotechnology research to industries interested and capable of marketing advances in animal and plant biotechnology; biotechnology, financial planning, marketing, and risk management will be combined to establish agribusinesses specializing in the diagnosis and control of avian infectious diseases, production of crop varieties that have lower fertilizer requirements and that are more tolerant of climatic stress; utilization of hyper-accumulating plants that can remediate contaminated soils, and the production of high-value plant products useful for human health and nutrition.

Outcome #1

1. Outcome Measures

Increased awareness by all components of the poultry industry of the opportunities to use biotechnology to prevent, diagnose, and control avian infectious diseases.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Increased number of farmers and members of the horticultural industry aware of the opportunities to use advances in plant biotechnology to develop new businesses.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Educational programs for K-12 youth and teachers on basic principles and applications of biotechnology to the plant, animal, and environmental sciences.

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Commercial evaluation in agronomic and horticultural settings of genetically modified plants developed using biotechnology research.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Integration of plant and animal biotechnology educational materials developed cooperatively by research and extension staff into K-12 curricula in Delaware schools.

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Stronger, more formal links between scientists conducting biotechnology research, extension specialists familiar with biotechnology applications, and state and regional economic development agencies and private industry.

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

Avian Biotechnology: basic research will provide an improved understanding of the fundamental causes and modes of action of avian diseases and the factors that influence their potential to spread to other animal species and humans; applied research will provide innovations in surveillance and diagnostic tools that help prevent or contain disease outbreaks and vaccines that prevent or control infectious diseases.

Not Reporting on this Outcome Measure

Outcome #8

1. Outcome Measures

Plant Biotechnology: basic research will lead to an improved understanding of the processes by which plants grow, resist or adapt to diseases and other stresses; can be used to produce bio-based products useful for human health and nutrition, and regulate the uptake of plant nutrients in agricultural soils and contaminants (e.g., heavy metals) in polluted soils; applied research will lead to plants that can produce increased yields with lower inputs, resist pest and climatic stresses, and remediate or stabilize polluted soils.

Not Reporting on this Outcome Measure

Outcome #9

1. Outcome Measures

Biotechnology-Based Agribusinesses: research and extension programs will link results of biotechnology research to industries interested and capable of marketing advances in animal and plant biotechnology; biotechnology, financial planning, marketing, and risk management will be combined to establish agribusinesses specializing in the diagnosis and control of avian infectious diseases, production of crop varieties that have lower fertilizer requirements and that are more tolerant of climatic stress; utilization of hyper-accumulating plants that can remediate contaminated soils, and the production of high-value plant products useful for human health and nutrition.

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Evaluation of the Biotechnology and Biotechnology-Based Agribusiness planned program for FY13 (21.4 Research FTEs) shows continued excellence in basic research and an increasing emphasis on application of results from fundamental studies, particularly in the plant sciences. Plant molecular biology faculty are expanding field studies with soybeans, corn, and rice in a concerted effort to extend findings from basic research to real-world conditions. Evaluations of research productivity showed that 5 major research grants were awarded and that faculty in this program supported the efforts of 53 graduate students, post-docs, and undergraduate researchers, that they published 30 refereed journal articles and book chapters, and made 27 invited and volunteered presentations at national and international meetings. Our evaluations focused on research and included annual internal administrative reviews, periodic University level Academic Program Reviews, and analyses of interactions of faculty with industry and state agencies interested in seeing biotechnology advances adopted by businesses. Feedback from all sources has been positive and we anticipate that expanded efforts in the translation of basic research in this planned program to both applied field studies and industrial applications will continue in the future.

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 conduct fundamental studies on plant and animal biology and apply the results to global challenges related to producing a safe and secure food supply.