PLANT BIOLOGY AND CROP PRODUCTION SYSTEMS

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V(A). Planned Program (Summary)

1. Name of the Planned Program

PLANT BIOLOGY AND CROP PRODUCTION 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	10%	10%	10%	10%
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	10%	10%	10%	10%
205	Plant Management Systems	20%	20%	20%	20%
206	Basic Plant Biology	10%	10%	10%	10%
212	Pathogens and Nematodes Affecting Plants	10%	10%	10%	10%
213	Weeds Affecting Plants	10%	10%	10%	10%
216	Integrated Pest Management Systems	10%	10%	10%	10%
402	Engineering Systems and Equipment	5%	5%	5%	5%
601	Economics of Agricultural Production and Farm Management	10%	10%	10%	10%
903	Communication, Education, and Information Delivery	5%	5%	5%	5%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

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

Year: 2008	Extension		Research	
	1862	1890	1862	1890
Plan	14.1	5.5	28.1	3.9
Actual	12.6	1.4	23.5	3.0

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

Extension		Research	
Smith-Lever 3b & 3c 469059	1890 Extension 127888	Hatch 365455	Evans-Allen 242624
1862 Matching 387472	1890 Matching 127888	1862 Matching 245060	1890 Matching 242624
1862 All Other 455056	1890 All Other 161060	1862 All Other 210672	1890 All Other 454170

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research and extension programs will target: (1) Agronomic, Vegetable and Horticultural Crop Production - improving varietal selection, disease and pest resistance, seed technology, cultural production practices, and marketing practices and skills for the many and diverse types of crop producers in Delaware; (2) Culinary Herbs and Essential Oils - management practices for propagation of plants of flavor, fragrance, and medicine will be developed and techniques for production, harvesting, and distillation will be demonstrated and disseminated; the Herb Research Center, along with the Claude E. Phillips Herbarium, will continue to analyze living plants, dried botanicals, and essential oils to help small farmers, processors, and distributors of these products when they otherwise have no means of certifying their products as safe in the American food supply; a national collection scheme of living herbs will be continued, as formulated under the aegis of the Herb Society of America, to not only preserve germplasm but also to provide correctly labeled material to gardeners, farmers, nurseries, and researchers. We will also continue to be the primary source of information on herbs and nomenclature for a worldwide audience, including manufacturers of culinary herbs and dietary supplements; (3) New Crops - financial and environmental impacts of growing new varieties of existing crops (Fordhook lima beans), new crops (greenhouse vegetables, crowder peas, garbanzo beans), horticultural varieties (herbaceous perennials), and turfgrass will be investigated. The potential of organic production of crops for processing will be evaluated; (4) Value-added Agricultural By-Products - we will evaluate the feasibility of using agricultural by-products (crop residues, manures, municipal composts, yard wastes, biosolids, and industrial materials) for fuel, feed, and litter for poultry houses; (5) Integrated Pest Management - improved methods for control of insect pests, weeds, and plant pathogens, understanding pesticide movement and interactions within the soil, and identifying herbicide combinations that improve weed control and reduce active ingredient application are priorities; (6) Nutrient Management - nutrient recommendations and nutrient management best management practices will be reviewed and research will be targeted at improving the efficiency of nitrogen and phosphorus use by agronomic, vegetable, and horticultural crops will be priorities; (7) Engineering Technologies - improvements in mechanical harvesting and automated guidance systems for harvesters will be sought and water resource protection will be enhanced by research on irrigation management and will develop irrigation scheduling strategies that are effective and easy to implement. Advances in remote sensing, tillage, and pesticide application are emerging research priorities; (8) Plant Breeding, Crop Genomics, Proteomics, and Bioinformatics to Genetically Engineer Plants - research that improves our understanding of plant genomes and the application of genomic information for crop improvement and crop protection will be continued and expanded. Basic studies on how plants adapt to their environments and manage stress, including disease, will be conducted. Studies that address soil microorganism-plant symbiotic relationships and plant/soil interfacial reactions, such as rhizosphere effects, to enhance crop growth and quality will be undertaken. The feasibility of growing genetically engineered crops and greenhouse plants in Delaware will be evaluated; (9) Urban/Suburban Horticulture - developing guidelines for safe establishment of community gardens in impoverished neighborhoods will be a priority, particularly for areas where soils may be contaminated by heavy metals such as lead and arsenic; demonstration gardens, workshops, and training programs for agriculture science teachers will focus on landscape diversity, exotic invasive species, water quality and conservation; (and 10) Pasture and Forage Management - research on animal production systems in pastures will expand with an emphasis on meat goats and beef cattle and forage research will emphasize improving biological control systems for alfalfa.

2. Brief description of the target audience

Existing and prospective crop producers, mixed (animal and crop production, e.g., dairy, horse) farms, trade associations (e.g., Delaware Herb Growers & Marketers Association), the "green industry" (e.g., horticulture, nurseries, landscapers), certified crop advisors, private agricultural consultants, state (DDA, DNREC, DELDOT) and federal agencies (USDA), national laboratories (e.g., Argonne), chemical/seed/fertilizer companies, agricultural equipment companies, peer scientists, growers, processors, marketers of plants of flavor, fragrance, and medicine in Delaware, educators, policy-makers, the U.S., and international countries.

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	**Target**	**Target**	**Target**	**Target**
Plan	4415	11500	1250	3450
2008	20450	269215	7070	1330

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

Patent Applications Submitted

Year	Target
Plan:	0
2008:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	4	26	
2008	8	13	21

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

Number of Competitive Grants Submitted

Year	Target	Actual
2008	13	45

Output #2

Output Measure

Number of Competitive Grants Awarded

Year	Target	Actual
2008	4	24

Output #3

Output Measure

Number of Research Projects Completed

Year	Target	Actual
2008	2	122

Output #4

Output Measure

Number of Undergraduate Researchers

Year	Target	Actual
2008	4	24

Output #5

Output Measure

Number of M.S. Graduate Students

Year	Target	Actual
2008	4	10

Output #6

Output Measure

Number of Ph.D. Graduate Students

Year	Target	Actual
2008	6	13

Output #7

Output Measure

Number of Post-doctoral Research Associates

Year	Target	Actual
2008	4	3

Output #8

Output Measure

Number of Refereed Journal Articles

Year	Target	Actual
2008	30	21

Output #9

Output Measure

Number of Books and Book Chapters

Year	Target	Actual
2008	3	3

Output #10

Output Measure

Number of Technical Reports

Year	Target	Actual
2008	14	15

Output #11

Output Measure

Number of Extension Bulletins and Factsheets

Year	Target	Actual
2008	45	35

Output #12

Output Measure

Number of Invited Presentations

Year	Target	Actual
2008	35	111

Output #13

Output Measure

Number of Volunteered Presentations

Year	Target	Actual
2008	50	193

Output #14

Output Measure

Number of Websites Established

Year	Target	Actual
2008	1	9

Output #15

Output Measure

Number of Workshops Conducted

Year	Target	Actual
2008	20	150

V(G). State Defined Outcomes

O No.	Outcome Name
1	Increased number of farmers, other producers, and land managers aware of latest advances in cultural management practices, crop varieties, irrigation technologies, and integrated pest management strategies for agronomic, vegetable, and horticultural crop production.
2	Targeted educational programs for farmers focused on cultural practices, marketing, and environmental aspects of new, high value cropping systems for niche markets, such as culinary herbs and essential oil plants, greenhouse grown pharmaceutical and nutriceutical plants, and plants grown as renewable bioenergy sources.
3	Educational programs for K-12 teachers and youth on advances in plant molecular biology and applications of the basic plant sciences to the production of plants used for food, fiber, landscaping, timber, bioenergy, and pharmaceutical and nutriceutical purposes.
4	Increased adoption of new innovations in marketing and risk management for farmers and other producers of plants and plant-based products.
5	Increased number of farmers adopting new crop varieties and integrating innovations in cultural practices, biological and chemical pest management, harvesting equipment, and irrigation management into their production systems.
6	Increase in the number of farmers implementing comprehensive nutrient management plans that are profitable and protective of ground and surface water quality.
7	Increased adoption of recommended practices for plant production, management, and environmental protection by the "Green Industry" (greenhouses, nurseries, landscapers).
8	Increased amount of land used to produce high value, niche market crops, such as culinary herbs, spices and essential oils.
9	Expansion in amount of land and increased adoption of best management practices for pasture and forage production systems for the beef, goat, and equine industries.
10	Commercial scale feasibility studies of greenhouses to produce high value plants that have been genetically modified, such as those intended for pharmaceutical or nutriceutical uses.
11	Plant Biology: 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.
12	Agronomic and Vegetable Crops: 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.
13	Horticultural Systems: Extension programs will provide guidance on management practices for horticultural plants produced and installed by the "Green Industry" and for homeowners, important because of the rapid conversion of farmland to urban and suburban uses.
14	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 nutriceutical 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.

PLANT BIOLOGY AND CROP PRODUCTION SYSTEMS
Outcome #1

1. Outcome Measures

Not reporting on this Outcome for this Annual Report

2. Associated Institution Types

3a. Outcome Type:

3b. Quantitative Outcome

Year	Quantitative Target	Actual

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area

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 and Data Collection)

1. Evaluation Studies Planned

Retrospective (post program)
During (during program)

Evaluation Results

Key Items of Evaluation