

# Plants and Their Systems-research

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

### 1. Name of the Planned Program

Plants and Their Systems-research

## 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%	
202	Plant Genetic Resources	10%	10%	10%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	10%	10%	10%	
204	Plant Product Quality and Utility (Preharvest)	10%	10%	10%	
205	Plant Management Systems	10%	10%	10%	
206	Basic Plant Biology	10%	10%	10%	
211	Insects, Mites, and Other Arthropods Affecting Plants	10%	10%	10%	
212	Pathogens and Nematodes Affecting Plants	10%	10%	10%	
213	Weeds Affecting Plants	10%	10%	10%	
215	Biological Control of Pests Affecting Plants	10%	10%	10%	
	<b>Total</b>	100%	100%	100%	

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

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

Year: 2007	Extension		Research	
	1862	1890	1862	1890
<b>Plan</b>	0.0	0.0	156.0	0.0
<b>Actual</b>	0.0	0.0	148.9	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
0	0	2872807	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	2901116	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	22354976	0

**V(D). Planned Program (Activity)****1. Brief description of the Activity**

- Conduct Research Experiments
- Partnering

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

Florida citizens with an interest in plants and plant science

May include among others:

- growers
- producers
- general public

**V(E). Planned Program (Outputs)****1. Standard output measures****Target for the number of persons (contacts) reached through direct and indirect contact methods**

	<b>Direct Contacts Adults</b>	<b>Indirect Contacts Adults</b>	<b>Direct Contacts Youth</b>	<b>Indirect Contacts Youth</b>
<b>Year</b>	<b>Target</b>	<b>Target</b>	<b>Target</b>	<b>Target</b>
<b>Plan</b>	0	0	0	0
2007	0	0	0	0

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

**Year Target**

**Plan: 1**

2007: 19

**Patents listed**

Tissue-Specific Targeting Of Ethylene Insensitivity In Transgenic Plants

Maltose as a Chloroplast Protective Compatible Solute in Response to Acute Temperature Shock

Materials and Methods for Providing Resistance to Plant Pathogens in Non-Transgenic Plant Tissue

Using a Specially Calibrated Referenced Time-Temperature Integrator Provides Useful Information About Quality of Thermal Handling of Temperature Sensitive Products

Increased Stress Tolerance and Enhanced Yield in Plants

Strategy for Nitrogen Fixation in Non-Legumes

Effects of Juvenile Hormone Analogs on Survival and Reproductive Status of the Glassy-winged Sharpshooter, Homalodisca coagulata

A Method for Transformation of Tomato via Pollen

Carbohydrate Based Cellulase Inhibitors as Feeding Stimulants in Termites

Citrus Tristeza Virus Resistance Genes And Methods Of Use

Materials and Methods for Modulating Seed Size in Plants

Use of Esterase Expressed in Plants for the Control of Gram-Negative Bacteria

Identification of an Oviposition-Deterring Pheromone for Anthonomus eugenii

Materials and Methods for Efficient Alanine Production

Materials and Methods for Efficient Succinate and Malate Production

A Method to Reduce Citrus Fruit Peel Pitting and Senescence

Structure, Synthesis and Activity of the Monoterpene Parectadial

Recombinant Cells that Highly Express Chromosomally-Integrated Heterologous Genes-Divisional OF UF#10414

**3. Publications (Standard General Output Measure)****Number of Peer Reviewed Publications**

	<b>Extension</b>	<b>Research</b>	<b>Total</b>
<b>Plan</b>			
2007	0	754	0

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

**Output Target**

**Output #1**

**Output Measure**

{No Data Entered}

*Not reporting on this Output in this Annual Report*

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	{No Data Entered}	{No Data Entered}

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

<b>O No.</b>	<b>Outcome Name</b>
1	New solutions to critical need areas related to plants and their systems will be developed.
2	Improving Integrated Pest Management Systems
3	Improving plant management systems
4	Increasing plant genome, genetics and genetic mechanisms
5	Improving techniques to fight insects, mites, and other arthropods affecting plants

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

**Issue (Who cares and Why)**

**What has been done**

**Results**

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
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**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**

Florida has been under a serious economic crisis for almost 8 months. Although to this point Extension programs have been in most cases able to function, the amount of stress and strain affecting state faculty is evident. Appropriation changes have required pay backs of state funding that are expected to increase and continue through 2009. Problems leading to the the crisis include the mortgage crisis, recession, and a reduction in tourism due to increased gas prices.

## 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)

Time series (multiple points before and after 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 program intensity.

Comparison between locales where the program operates and sites without program intervention

### Evaluation Results

Plants and their systems

Because temperatures and soil types are so different in Florida compare to other parts of the United States research in the area of plants and their systems are a critical part of the Florida IFAS research initiative. Over 59% of regular hatch dollars are used for plant related research and 35% of Hatch multistate projects concentrate on plant production and/or plant protection. 148.9 research FTEs are assigned to this project and funds from Hatch, matching 1862 funds and others including many grants is at approximately \$28.1 million.

In a state with three major ports Florida is estimated to receive one new pest, disease or invasive plant per month. Florida must be vigilante in staying at the cutting edge with research that not only helps solve existing plant related problems but is prepared for those that will eventually reach our shores and could potentially spell disaster for plant production in the state. In 2007 research faculty working in this planned program area produced over 754 peer-reviewed articles that help provide solutions for plant related problems. Areas in which they have been particularly successful follow:

Plant diseases

Gadsden County Florida is bigger in tomatoes than most states. In fact, Florida accounts for 65% of the \$1 billion value of the U.S. tomato crop. Tomato disease can cut into profits. When bacterial spot, which can cause losses of up to 100% of a crop became an issue researchers had to find out how. It was discovered that the contamination was occurring from irrigation and groundwater and surface water, the first time this had been seen. Within 15 days of targeting the source of the problem researchers met with farmers and came up with a solution—adding a small amount of chlorine to irrigation water reduced prevented the source of the infection and saved the crops. Additional research is still taking place to reduce bacterial wilts and spot.

Citrus Canker is a serious problem that is affecting most states and countries that grow citrus. Florida researchers are working in collaboration with researchers in Argentina and Brazil where canker has been a problem for over 20 years. This interaction has created best management practices for both the grove area and the harvesting and packing plant to reduce and control the spread of this serious threat to the citrus industry.

International collaboration helps in solving citrus greening – Florida citrus growers face citrus greening, a potentially devastating disease. Citrus growers in Brazil have been dealing with the disease longer than Florida producers. IFAS faculty are learning from, and collaborating with, Brazilian colleagues to help the citrus industries in both countries fight the disease.

Plant Stress

Climate change impacts – Studies on rice and sorghum in sunlit, controlled-environmental chambers revealed that elevated temperatures reduced pollen production, pollen viability, seed-set, yield, and harvest index. In addition, rice varieties responded differently to the high temperatures. These studies document the possible negative impact of global climate change – stress on rice and sorghum production.

Plant Genetics

Gene discovery boosts corn yield – A new gene for starch biosynthesis has the potential to triple seed yield in corn. In its quest to develop better corn seed, Syngenta has licensed this technology generated by UF/IFAS scientists. The new hybrid seed has higher starch content, which helps the plant get off to a better start, leading to more vigorous plants and greater corn yields.

New cultivars

Tropical peach cultivars have been developed by UF/IFAS researchers and are now being grown around the world. To date Florida has released three new cultivars. It is hoped that this peach varieties can be used to replace some of the agricultural land lost to citrus canker as a new value crop from growers. Researchers see the potential for peaches to move south, spreading to about 10,000 acres eventually, especially with some canker-weary citrus growers showing an interest in peach orchards.

### **Key Items of Evaluation**

Adapting to change – IFAS economists found that urban growth increases the return to agriculture by shifting crops from low-value (those grossing \$2,000 per acre such as corn, soybean, hay, pasture, etc.) to high-value crops (those grossing \$10,000 per acre such as nursery, greenhouse crops, certain vegetables, specialty crops, foliage plants, etc.). This means agriculture can remain strong, even as Florida becomes more urban.

Finding higher value crops, economic niches –New, higher value crops and those that provide increased nutrition or better return on the dollar are shifting the face of agriculture in many counties. For example, IFAS researchers created a new blueberry variety for Florida to help growers "time" the market by growing berries that ripen in time to reach stores before other producers. The state's new blueberry production industry has now surpassed \$40 million in sales. In 2005-2007, UF/IFAS released 44 new cultivars and 33 invention disclosures to help the future of Florida agriculture. IFAS developed the "Festival" strawberry, a global favorite with more than \$50 million in sales in three years, not including plant sales.

Improving the flavor of tomatoes– IFAS faculty have isolated the flavor- and aroma-enhancing genes of the tomato, and can now grow tomatoes with enhanced flavor and aroma. This research will help the Florida tomato industry place premium-quality tomatoes in the marketplace.

Improving yield and germination of sweet corn – An IFAS researcher has discovered new genes that enhance starch content of corn seeds. For sweet corn growers, these new seeds mean faster and more complete crop germination. This means greater yields and more uniform maturity, and better quality for the consumer.

Virus-resistant plants – IFAS researchers using biotechnology have produced a tomato that is resistant to begomoviruses, a major pathogen which causes great economic loss. The genetic manipulation results in eliciting a natural defense system in the tomato which lessens the use of pesticides.

Disease resistant grapes –IFAS researchers have used molecular techniques to develop a grape resistant to Pierce's disease. This breakthrough will make it possible to grow new grapes in Florida for the table grape and wine industries.

Measuring shifts in agricultural production – IFAS completed an assessment of future prospects for the Florida citrus industry in 2006, aiding industry decision making. Historic economic analysis of individual counties reveals a shift to higher value, less land intensive crops, such as nursery and sod, when urbanization pressures are great. The value of nursery crops increased to more than \$15 billion in 2005, due in part to IFAS breeding and research programs.