V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Hawaii's Diversified Tropical Crop Systems for Sustainability and Competitiveness

☑ 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	12%		8%	
124	Urban Forestry	0%		2%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		6%	
202	Plant Genetic Resources	2%		6%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	3%		3%	
204	Plant Product Quality and Utility (Preharvest)	4%		7%	
205	Plant Management Systems	22%		22%	
206	Basic Plant Biology	0%		1%	
211	Insects, Mites, and Other Arthropods Affecting Plants	14%		4%	
212	Pathogens and Nematodes Affecting Plants	13%		12%	
213	Weeds Affecting Plants	6%		0%	
214	Vertebrates, Mollusks, and Other Pests Affecting Plants	4%		0%	
215	Biological Control of Pests Affecting Plants	0%		5%	
216	Integrated Pest Management Systems	13%		6%	
502	New and Improved Food Products	0%		4%	
511	New and Improved Non-Food Products and Processes	0%		6%	
601	Economics of Agricultural Production and Farm Management	0%		3%	
604	Marketing and Distribution Practices	7%		3%	
903	Communication, Education, and Information Delivery	0%		2%	
	Total	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	16.0	0.0	10.0	0.0
Actual Paid Professional	12.4	0.0	12.9	0.0
Actual Volunteer	1.2	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
667890	0	329164	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1414992	0	3240373	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
480583	0	1049197	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

A fundamental responsibility of the College of Tropical Agriculture and Human Resources is promotion of crop production in the State. Since most food consumed in Hawaii is imported, an important goal is to encourage import replacement through increased commercial as well as backyard and urban agricultural production. Likewise, promotion of diversified cropping helps to diversify the state's economy in the wake of sugarcane and pineapple plantation closures over the past several decades. Research and extension efforts in F2013 included all areas of tropical agriculture: breeding of new ornamental varieties, variety selection for pest and disease resistance, pest and disease management in both conventional and organic farming, identification and evaluation of potential new specialty crops and value-added processed foods, genetic modification and marker assisted selection, improved field and greenhouse cultivation methods, promotion of import replacement with locally grown produce, and aquaponics for sustainable no-soil agricultural production.

Master Gardener volunteers statewide increased awareness of resources available to home gardeners through CTAHR, including fruit fly suppression, general plant pest and disease control, plant propagation, nutrient management and environmentally sound gardening. Master Gardeners have become the "volunteer" public face of the Cooperative Extension Service at numerous events statewide, including county fairs and Plant Doctor booths at Farmers Markets. The UH Master Gardener website was completely redeveloped in 2013 to include home gardener information, as well as pages representing each individual program throughout the State (Kauai, Oahu, Maui, Kona, and Hilo), www.ctahr.hawaii.edu/UHMG. This site received 11,489 visitors and 34,884 page views during this reporting period, with 58% new visitors and 42% returning viewers. Recently added is a School Garden Resources page with information on grants and resources for the increasing population of school garden educators and volunteers.

Aquaponics (soil-less plant and fish co-cultivation) is an increasingly popular agricultural method in Hawaii. However, many aquaponic and hydroponics growers are faced with poor plant growth despite adequate nutrition present in grow beds. By developing a water quality-monitoring program, CTAHR researchrs identified low oxygen levels in the affected grow beds. Findings showed despite adequate dissolved oxygen (DO) levels in nutrient tanks, low oxygen levels in grow beds result in poor crop production and yields. Low DO levels increased pythium growth on roots, which led to poor nutrient uptake and ultimately poor plant growth. Growers were advised to pump oxygen into grow beds to increase DO levels, and aquaponic and hydroponic crops of participating growers who installed oxygen lines have now doubled in size.

CTAHR faculty coordinated and provided technical support to an international network of tissue culture labs to meet the demand for new plants for international markets. Services provided included tissue culture protocol development, technology transfer, mentoring, tutoring, and problem for a variety of crops: coffee, coconut, Anthurium, pitcher plants, dracaena, blueberries, day lilies, carnation, Heliconia, Phalaenopsis, peach palm, cedar, and oil palm.

Analysis of food production in Hawaii in FY2013 revealed that 88% of available food is sourced from imports. Thus, import replacement, promotion of new crops (such as blueberries and tea), and identified additional sources of revenues for Hawaii farmers is a matter of food security. Important limiting factors in crop production in Hawaii are pests and diseases. In FY2013, for example, a new fungal disease was found on Basil, and three new Fusarium species were discovered infecting dendrobium orchids. New hand-held assays for rapid detection of bacterial pathogens in the field were deployed in Guam and Hawaii. Registrations for two fungicides effective against ti leaf spot were submitted through the IR-4 program. Sunn hemp was demonstrated to be an effective cover and border crop for trapping out plant feeding pests.

Research on locally-sourced soil amendments to improve soil quality focused on biochar and green manures. In experiments with wood-based, corn cob, and sewage sludge biochars, the latter two increased biomass greatly when applied to infertile Oxisol soil, but had no impact on plant growth in a fertile Mollisol; and the wood-based biochar had no effect in either soil. Clearly, correlations between biochar application and plant growth are more complicated than is often assumed.

2. Brief description of the target audience

The target audience for this program area is mainly the diversified farming community, especially those growing commercial or home garden crops. Main commercial crop industries served by CTAHR include floriculture and nursery, tropical fruit trees and nuts, vegetables, melons, herbs, and root or tuber crops. Many of these crops are tropical not commonly grown in the mainland US, so that research and extension outreach is very important to Hawaii producers. There is also a resurgence of interest in home and school gardening which is supported by CTAHR programs.

3. How was eXtension used?

Aquaculture faculty are active in use of eXtension and service on national committees.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	24522	207777	1672	1909

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	38	46	84

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of workshops, research/field day demonstrations conducted

Year	Actual
2013	194

Output #2

Output Measure

- Published information such as extension newsletters, fact sheets, videos, and other publications

Year	Actual
2013	52

Output #3

Output Measure

- Presentations at international and national meetings

Year	Actual
2013	49

Output #4

Output Measure

- Number of grant proposals submitted.

Year	Actual
2013	30

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increased awareness of best management practices to promote environmentally responsible agricultural and landscape management
2	Number of people who adopt one or more recommended practices
3	Total dollar value of grants and contracts obtained.

Outcome #1

1. Outcome Measures

Increased awareness of best management practices to promote environmentally responsible agricultural and landscape management

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	12724

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Increased awareness of best management practices to promote environmentally responsible agricultural and landscape management

What has been done
Workshops, field days, demonstrations, presentations, websites and publications have been completed on a variety of topics that will help agricultural and home garden producers understand how to make the State more sustainable.

Results
Hawaii will be more sustainable and the agricultural producers will be more competitive.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
206	Basic Plant Biology
211	Insects, Mites, and Other Arthropods Affecting Plants

212	Pathogens and Nematodes Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
502	New and Improved Food Products
604	Marketing and Distribution Practices

Outcome #2

1. Outcome Measures

Number of people who adopt one or more recommended practices

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	1720

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Moving from understanding of improved practice to actual adoption is obviously important to realizing the environmental, social and economic benefits associated with the improved practices.

What has been done
Developing improved practices (such as pest control, improved crop varieties, soil management, etc.) is done by research faculty, either in on-station or on-farm experiments. Adoptions usually require repeated instruction and follow up by extension educators, which is often done in conjunction with commodity associations. Also CTAHRS's Master Gardener programs involves repeated and in depth outreach to the general gardening public. This is done through fairs, phone hotlines and direct instruction of the public by the Master Gardener volunteers.

Results
Commercial crop and home garden production will be more productive and sustainable.

4. Associated Knowledge Areas

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

203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
502	New and Improved Food Products
511	New and Improved Non-Food Products and Processes
604	Marketing and Distribution Practices

Outcome #3

1. Outcome Measures

Total dollar value of grants and contracts obtained.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	3533031

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Funds are needed to undertake research and extension activities to assist producers.

What has been done
Grant funds have been received.

Results
Increased extramural funding has allowed CTAHR faculty and staff to conduct needed research and associated extension outreach activities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
124	Urban Forestry
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
206	Basic Plant Biology
211	Insects, Mites, and Other Arthropods Affecting Plants
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601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices
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

Brief Explanation

Natural disasters such as hurricanes, typhoons, floods, fires, often are destructive to crops. Annual crops suffer immediate, although not permanent damage, while orchard crops may sustain long term damage. Damage to research plots, and equipment can also occur. When the economy is poor, public and private funding decreases and is more difficult to obtain. When monies are short, public priorities that relate to health and safety are more visible and will compete for available funds. The increase in petroleum prices have increased production costs.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

All projects conducted under this program were peer-reviewed before initiation. Annual progress reports were collected and evaluated by the Associate Deans for research and extension. Funds are not released for those projects which did not show tangible progress.

Key Items of Evaluation

None.