

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%		4%	
124	Urban Forestry	0%		2%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		5%	
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%		6%	
205	Plant Management Systems	22%		18%	
206	Basic Plant Biology	0%		5%	
211	Insects, Mites, and Other Arthropods Affecting Plants	14%		5%	
212	Pathogens and Nematodes Affecting Plants	13%		13%	
213	Weeds Affecting Plants	6%		0%	
214	Vertebrates, Mollusks, and Other Pests Affecting Plants	4%		0%	
215	Biological Control of Pests Affecting Plants	0%		4%	
216	Integrated Pest Management Systems	13%		6%	
502	New and Improved Food Products	0%		7%	
511	New and Improved Non-Food Products and Processes	0%		7%	
601	Economics of Agricultural Production and Farm Management	0%		2%	
604	Marketing and Distribution Practices	7%		5%	
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: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	16.0	0.0	10.0	0.0
Actual Paid Professional	11.4	0.0	8.0	0.0
Actual Volunteer	4.8	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
382803	0	288170	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1213445	0	2197875	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
417090	0	475142	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. Linkages with programs in other states and island territories assist CTAHR in these efforts. Research and extension efforts in FY2012 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.

Urban horticulture clientele and 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. Statewide interest in Master Gardener programs continued to expand. In recognition of increasing public interest in home food gardens, as well as ornamental plants, CTAHR consulted with residents and the Neighborhood Board in the windward community of Waimanalo, on the opposite side of the island of Oahu from Honolulu on their interest in home food production, and a trial Master Gardener-like training program in this area is planned for FY2013.

Transgenic Rainbow papaya is well accepted by consumers, and recognized by a large percentage of growers in Hawaii as necessary to avoid the ravages of Papaya Ringspot Virus (PRSV). More than

82% of the papaya acreage planted in 2010-2011 consisted of Rainbow. In FY2012, following deregulation of Rainbow papaya for export to Japan, the first shipments were made to Japan, and this variety has been well accepted by the Japanese consumer market. On behalf of the Hawaii papaya industry, CTAHR collaborated with USDA-ARS and the Hawaii Department of Agriculture in submissions requesting deregulation by the People's Republic of China in FY2012, and this application is currently under consideration. Although research on genetic modification represents a very small portion of the overall research effort in CTAHR, transgenic banana lines are under field evaluation against banana bunchy top virus (BBTV), and transgenic tomato lines developed by USDA-ARS are similarly being evaluated to combat tomato spotted wilt virus (TSWV). In both cases, conventional selection efforts with non-transgenic banana clones from tissue culture and with locally-grown tomato varieties are also underway. It is possible that these efforts may complement each other and lead to development of lines with multiple (stacked) resistance factors. Separate research in CTAHR to identify the genes responsible for induction of disease by fungal plant pathogens may lead to very specific and targeted control methods.

Locally-grown avocados have been considered a logical target for replacement of imported produce for several years, but inconsistent supply due to lack of coordination among growers and consumer difficulty in differentiating locally-grown produce from exports were identified as obstacles to acceptance. Consumer studies in FY2012, however, demonstrated that focusing on more preferred avocado varieties and addition of a locally-grown label could substantially overcome these barriers. Other work in FY2012 identified the potential of blueberries as a greenhouse crop, avoiding fungal rust problems; and the potential value of a nutritional byproduct of tofu manufacture, "okara," in baking. A value-added okara shortbread cookie was developed by students, commercially produced at a local food manufacturing plant, and is now sold at all University of Hawaii Rainbowtique outlets, creating a value-added product from previously discarded material.

Tropical ornamentals are an important segment of commercial agriculture in Hawaii. Five new varieties of *Dracaena* were introduced to growers through the Hawaii Export Nursery Association (HENA), and economical bioreactor and tissue culture protocols were transferred to local tissue culture laboratories, with the result that 1,000 clones of each new variety has been produced by commercial laboratory on the island of Hawaii. Effects of different wavelengths of light on plant growth was also evaluated, and red and blue light-emitting diodes (LEDs) found to be efficient alternatives to fluorescent lights.

Aquaponics (soil-less plant and fish co-cultivation) is an increasingly popular agricultural method in Hawaii, suitable both for commercial vegetable production, and urban gardening at homes, schools, shelters where soil is rare or absent, mental health facilities, correctional facilities, and many other possible locations. The largest commercial aquaculture producer in the state, Maris Garden, produces 20,000 heads of lettuce and 500-800 pounds of tilapia and Chinese catfish monthly. Websites, extension materials and workshops are extremely popular with Hawaii residents. Research in this area in FY2012 focused on increased understanding of mechanisms in aquaponics, such as the value of different modes of pH mediation in soil-less cultivation of Chinese taro. The low inputs required for home aquaponics, and the ability to simultaneously produce both vegetables and protein make this an attractive food production system for the 21st century, particularly in island environments where land is limited.

The Local Immigrant Farmer Education (LIFE) program is a risk management training program for limited resource and underserved Filipino, Southeast Asian and other minority growers in Hawaii, which operates with the assistance of the USDA Risk Management Agency. LIFE has established a solid reputation for delivering timely, useful, quality outreach and education to Hawaii's producers. The program operates through grass roots efforts in reaching socially disadvantaged growers with small acreage and remote rural locations, such as recent Asian immigrants with limited English capabilities and little experience in diversified crop production. LIFE's educational program focuses on responsible farming, business management, and cost of production, risk management, and environmental stewardship. Information is delivered to growers in a manner respectful of their diverse cultures and backgrounds. A

total of 75 outreach events (workshops, fielddays, and demonstrations) were held statewide in FY2012. Workshop evaluations indicated growers learned an average of 7 new practices with potential on farm application.

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?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	22161	332690	1287	78733

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

Patent Applications Submitted

Year: 2012
 Actual: 1

Patents listed

Cho, J. 2011. Colocasia plant named "Kona." US Patent No. PP22,420 (Dec. 27, 2011).

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	30	9	39

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of workshops, research/field day demonstrations conducted

Year	Actual
2012	306

Output #2

Output Measure

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

Year	Actual
2012	50

Output #3

Output Measure

- Presentations at international and national meetings

Year	Actual
2012	28

Output #4

Output Measure

- Number of grant proposals submitted.

Year	Actual
2012	41

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
2012	16646

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Increased awareness of environmentally responsible agricultural and landscape management is the first step toward better decision making and improved practices.

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
213	Weeds Affecting Plants
214	Vertebrates, Mollusks, and Other Pests 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
2012	4875

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
213	Weeds Affecting Plants
214	Vertebrates, Mollusks, and Other Pests 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
2012	5220008

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
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
213	Weeds Affecting Plants
214	Vertebrates, Mollusks, and Other Pests Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
502	New and Improved Food Products

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.