V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Climate Change

☑ 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	0%		10%	
104	Protect Soil from Harmful Effects of Natural Elements	0%		10%	
111	Conservation and Efficient Use of Water	50%		13%	
112	Watershed Protection and Management	17%		13%	
122	Management and Control of Forest and Range Fires	25%		0%	
123	Management and Sustainability of Forest Resources	0%		20%	
132	Weather and Climate	0%		7%	
133	Pollution Prevention and Mitigation	8%		10%	
136	Conservation of Biological Diversity	0%		7%	
405	Drainage and Irrigation Systems and Facilities	0%		10%	
	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	1.0	0.0	1.0	0.0
Actual Paid Professional	0.8	0.0	0.7	0.0
Actual Volunteer	0.2	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**
49545	0	78802	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
60510	0	122352	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
1986	0	285961	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Global climate change will continue to affect Hawai'i's tropical, island environment as well as other Pacific Islands. The availability of water is of great concern, particularly in rural areas where water-delivery systems that used to be maintained by the large plantations have fallen into disrepair. Water catchment systems are a common solution; however, water quality is affected by many variables. For example, acid rain caused by volcanic gas (VOG) is a major concern in the state, particularly on Hawai'i Island where long-term volcanic eruptions continue. Increased urbanization also contributes to global warming, and researchers and extension personnel are pursuing mitigation efforts via urban horticulture and forestry. Continuing activities in this area are to (1) conduct a needs assessment for stakeholders in urban and rural areas; (2) develop and deliver educational programs directed at catchment systems and urban horticulture in order to mitigate or prevent the negative effects of global warming; (3) develop remote sensing methods to monitor land-based pollution influences on the coastal environment; and (4) gain a better understanding of the fuel, climatic, and fire behavior components of the grass/wildfire cycle in Hawaii.

Methodology was developed and verified to analyze the cross-sensor compatibility of multi-sensor data. In addition, a method to cross-calibrate spectral vegetation data from multi-sensor data was established. These methodologies greatly improve the resolution of analyses of the impacts of atmospheric pollution such as VOG on the coastal environment in Hawaii. The Pacific Fire Exchange consortium was established to promote research on wildfire behavior, impacts and management on Pacific islands. First efforts of the PFE include developing a fire risk index for Community Wildfire Protection Plans in Hawaii.

Research efforts in FY2012 did not focus solely on natural ecosystems. In an additional project, management of the impact of climate change and changing irrigation needs in agricultural and landscape settings in Hawaii was facilitated by comparison of two decision support systems in Honolulu, Hawaii and Maricopa County, Arizona. This work resulted in irrigation schedules for several different landscape situations in Honolulu.

A series of workshops were conducted throughout the Pacific Islands addressing topics in soil fertility, soil diversity, nutrient management, soil quality, and organic farming. The target audiences included Master Gardner training sessions (Kona, Oahu), New Farmer trainings (Hamakua, Maui), Kauai Taro Growers Association (Kauai), Aloha Arborists Association (Oahu), MA`O organic farm interns (Oahu), and ranchers, farmers and agricultural professionals in the Northern Marianas Islands, Palau, and Pohnpei. Soil research activities across the Pacific Islands included a field experiment comparing different fertilizers for wetland taro production (Hawaii), demonstration plots assessing improved pasture species on soil fertility and carbon storage (Guam and the Northern Marianas), comparison of feedstock ingredients

on compost quality, and compost beneficial use experiments (Pohnpei). The taro fertilizer experiment showed no difference in N availability or yield of taro from fish/bone meal, urea, or slow release fertilizer. Soil analysis of demonstration plots established on four ranches on Guam, Rota, Tinian, and Saipan showed that improved forage grasses increase soil organic carbon (C) stocks. Preliminary results suggest that in addition to improving cattle nutrition with higher quality forages, the improved grasses provide other ecosystem services such as enhanced soil quality and the potential to increase C sequestration. In the composting experiments nitrogen availability was highest and C:N ratios lowest with the 1/3 pig manure & 2/3 wood chips feed stocks, which mimics dry litter pig waste management systems. Locally made composts produced equivalent or better crop yields than commercial fertilizers.

The Rainwater Catchment Education and Research program in Hawaii focuses on both improving water quality for domestic use catchment systems and mitigating the effects of variable rainfall through conservation activities. The program maintains a website (http://www.ctahr.hawaii.edu/hawaiirain/) providing information on system design, maintenance and safety. Testing supplies and kits are also distributed. Since 2011, the program has developed significant national and international collaborations with other rainwater catchment associations in Taiwan, China, Europe, Australia and the continental USA. Collaboration with these international groups will facilitate sharing of information on safe and efficient rainwater harvesting methods. Also, starting in 2012, the Rainwater Catchment program has become a collaborative effort of CTAHR with Hawaii Sea Grant.

2. Brief description of the target audience

The rainwater catchment program and irrigation support research are aimed at the general public. Remote sensing activities target government agencies and NGOs concerned with coastal pollution monitoring and management; and pasture and forest ecosystem studies are addressed to government, NGOs and private land managers, particularly those involved in wildfire management, as well as being actively incorporated into instructional activities.

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	980	4500	0	0

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

Patent Applications Submitted

Year:	2012
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	2	10	12

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of workshops, field days, or demonstrations conducted

Year	Actual
2012	5

Output #2

Output Measure

- Presentations at national and international meetings.

Year	Actual
2012	4

Output #3

Output Measure

- Grant proposals submitted.

Year	Actual
2012	9

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of people that adopt one or more recommended practice.
2	Number of people who increase their knowledge or complete non-formal education on climate change related issues.
3	Dollar value of grants and contracts obtained.

Outcome #1

1. Outcome Measures

Number of people that adopt one or more recommended practice.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	800

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Rain catchment systems for domestic water use are impacted by low or variable rainfall distribution and by poor water quality. Drought and rainfall variation also can cause problems with watershed management, ecosystem restoration and wild fires.

What has been done
A domestic rainwater catchment program provides educational information to Hawaii residents statewide as well as internationally. Programs are being initiated to improve watershed and fire management.

Results
Rainwater catchment users have improved their domestic water quality.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
122	Management and Control of Forest and Range Fires
123	Management and Sustainability of Forest Resources
133	Pollution Prevention and Mitigation

Outcome #2

1. Outcome Measures

Number of people who increase their knowledge or complete non-formal education on climate change related issues.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Dollar value of grants and contracts obtained.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	372505

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Extramural funding is necessary to determine the impacts of climate change on Hawaii and other Pacific Island natural resources, and the agriculture and communities supported by those resources.

What has been done
Funds were solicited from extramural agencies.

Results
Funding obtained enables further research on the issues associated with climate change in the Pacific Basin.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water

112	Watershed Protection and Management
122	Management and Control of Forest and Range Fires
123	Management and Sustainability of Forest Resources
132	Weather and Climate
133	Pollution Prevention and Mitigation

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

This is a relatively new program for the college, and a difficult economic climate for obtaining extramural funding. Higher resolution data needs to be obtained to track coastal sediment plumes over time; and models of fire behavior developed in temporate regions are not necessarily transportable to the tropics.

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.