

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Sustain, Protect, and Manage Hawaii's Natural Resources and Environment

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	18%		13%	
111	Conservation and Efficient Use of Water	6%		7%	
112	Watershed Protection and Management	10%		6%	
121	Management of Range Resources	13%		4%	
123	Management and Sustainability of Forest Resources	10%		4%	
124	Urban Forestry	0%		3%	
125	Agroforestry	5%		3%	
131	Alternative Uses of Land	0%		3%	
133	Pollution Prevention and Mitigation	11%		8%	
135	Aquatic and Terrestrial Wildlife	0%		3%	
136	Conservation of Biological Diversity	0%		8%	
205	Plant Management Systems	17%		6%	
211	Insects, Mites, and Other Arthropods Affecting Plants	0%		6%	
212	Pathogens and Nematodes Affecting Plants	0%		6%	
402	Engineering Systems and Equipment	0%		6%	
403	Waste Disposal, Recycling, and Reuse	5%		3%	
404	Instrumentation and Control Systems	0%		6%	
605	Natural Resource and Environmental Economics	5%		0%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	0%		5%	
	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	3.0	0.0	6.0	0.0
Actual Paid Professional	3.2	0.0	7.2	0.0
Actual Volunteer	2.6	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
116569	0	208233	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
385125	0	1590993	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
36779	0	748984	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research and extension efforts to promote harmony between agriculture and environment continue to be a priority for CTAHR. Areas addressed by research and extension projects include agricultural waste management, forest resource management, agroforestry, range management, fire science, nutrient management, soil erosion, soil quality and bioremediation, biological diversity, rehabilitation of degraded and idle lands, handling of hazardous materials, and water quality. Research and extension efforts at preserving, protecting, and renewing Hawaii's natural resources continue to be an area of focus.

The CTAHR sponsored Agriculture and Environmental Awareness Day continued to enjoy great popularity in FY2012 on the islands of Kauai, Oahu, and Maui. Participating students (primarily fifth and sixth graders) investigate how agriculture and environmental science affect their lives and shape their future. Students explore issues such as food sustainability in Hawaii and globally, ecosystem protection, and bioenergy needs. With respect to job creation, they are introduced to a broad variety of agricultural and environmental career choices.

The forestry extension program made direct contacts with 573 forest landowners, managers, and professionals through email and telephone in FY2012. Visits to the forestry extension website (<http://www.ctahr.hawaii.edu/forestry>) increased 9% from last year, with 46,845 unique visitors. The Tropical Hardwood Tree Improvement and Regeneration Center, a cooperative effort with Purdue University and numerous state and federal agencies, nonprofits, and private entities, was initiated in October 2011, with over \$400,000 in funding commitments. The Pacific Fire Exchange consortium, a complementary activity, was also established in FY2012 to promote improved efforts to model and manage wildfires on Pacific islands. In other forestry work to develop silvicultural systems for Koa management, timber volume of over 700 trees in a young Koa stand were measured, and 31 young Koa trees were harvested, assessed for defects, milled, and distributed to local woodworkers to evaluate consumer perceptions of wood quality. Another common tree in Hawaii (and throughout the

possible source of genes conferring tolerance to stresses, since it is highly tolerant to drought and virtually disease free. Several genes that appear to be related to stress tolerance were isolated in FY2012, and their functions are currently being determined. These may offer a route to drought tolerance in agricultural crops, an issue of increasing importance globally due to climate change.

Water management is a critical issue in an island ecosystem with competing demands from urban growth, agriculture, and natural and coastal resources. In FY2012, CTAHR staff developed prototype software for modeling water usage under different scenarios as a decision support tool; and continued research on micro-irrigation as an agricultural water conservation measure. Two novel bioreactors for wastewater treatment and reclamation were also designed: an Immobilized Bioprocess (IBP) and Bio-Entrapped Membrane Reactor (BEMR). Both are simple in operation and design, and require less maintenance than existing biological wastewater treatment options. Another approach to waste management of great potential value was found to be conversion of sewage sludge to biochar. This process converts toxic sludge to a safe product, can produce energy from the conversion process, and produces a highly effective soil amendment. In experiments on corn growth, one of the tested biochar plus fertilizer treatments improved biomass production by greater than 3-fold.

Research on an Assimilating Probe for rapid detection in the field of multiple human and plant/animal pathogens by detecting DNA amplicons replicated isothermally focused on enhancing the value of this \$600 production cost, handheld device. Successful field trials were conducted in Guatemala in December 2011, to detect a quarantine bacterial wilt pathogen; and in cooperation with US FDA in 2012, for detection of Salmonella on food samples. This device is adaptable to a variety of environmental, plant and public health pathogens, and has a broad range of applications due to its cost, portability, accuracy, and multiplexing abilities.

Finally, CTAHR faculty are increasingly active in efforts to protect and conserve Hawaii's resources and endangered biota, including research on the impacts of animals and human interactions on natural environments, evaluation of biological control efforts post-implementation, such as release of an herbivorous moth for fireweed control, and conservation of endangered native plants and insect species. The University of Hawaii Insect Museum (UHIM) supported by CTAHR catalogued over 11,290 specimens for a digital database in FY2012, and welcomed 300 visitors, from visiting scientists to local school children learning about invasive and native insects and Hawaii's ecosystem. UHIM researchers documented the impact of urbanization on the declining range of the native Hawaiian moth genus *Omiodes*.

2. Brief description of the target audience

As intended by the Land Grant perspective, CTAHR's "targeted" clients for this program in teaching are the undergraduate and graduate students in agriculture, natural resource management, and allied fields. Targeted clients for research are peers and extension specialists. Clients for extension specialists are CTAHR's county extension agents and the counterpart professional personnel of sister state and federal agencies (such as the Hawai'i State Departments of Agriculture, Health, and Land and Natural Resources, and the USDA Natural Resources Conservation Service, NRCS). Clients for extension agents are land users and commodity producers and their organizations (such as the Hawai'i Association of Soil and Water Conservation Districts, Hawai'i Forestry Industry Association, and the Hawai'i Farm Bureau), extension staff in other CTAHR units and at sister institutions, and other members of the professional community who deal with managing land, soil and water resources especially in tropical agro-ecosystems. Interfacing with other professional and community groups who can provide new and useful knowledge to facilitate making decisions is an important expectation for effectively meeting its commitments.

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	4897	138115	215	1

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

Patent Applications Submitted

Year: 2012
 Actual: 1

Patents listed

Rima,J., Q. X. Li,L. Lizette. 2011. Generation of free radicals, analytical methods, bacterial disinfections, and oxidative destruction of organic chemicals using zero valent iron and other metals. US Patent 8,048,317 (Nov. 1, 2011).

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	5	45	50

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Grant proposals submitted.

Year	Actual
2012	33

Output #2

Output Measure

- Presentations at international and national meetings.

Year	Actual
2012	31

Output #3

Output Measure

- Number of workshops and other educational activities held

Year	Actual
2012	49

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of people who actually adopt one or more recommended practices
2	Total dollar value of grants and contracts obtained.

Outcome #1

1. Outcome Measures

Number of people who actually adopt one or more recommended practices

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	67

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

All residents and visitors in the State of Hawaii enjoy the State natural environment and will suffer should it not be sustained. Many residents also rely on the environment to support the tourism industry and provide employment for residents.

What has been done

Various stakeholders were educated about how to better manage Hawaii's open ranges, forest and urban landscapes using workshops, demonstrations, field days websites, publications and other outreach activities.

Results

Hawaii's watersheds and all the resources contained in these watersheds are more sustainable.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
121	Management of Range Resources
123	Management and Sustainability of Forest Resources
125	Agroforestry
133	Pollution Prevention and Mitigation
135	Aquatic and Terrestrial Wildlife

205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
402	Engineering Systems and Equipment
403	Waste Disposal, Recycling, and Reuse

Outcome #2

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	1732416

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Protecting Hawaii's natural resources preserves the islands unique environments and native species, enhances the well being of Hawaii residents, and promotes the main economic engine of the state, which is tourism.

What has been done

Forest conservation and restoration activities have taken place throughout the state, but particularly on the Big Island of Hawaii, where preservation and restoration of endangered native bird habitat has been enhanced by koa forest restoration. Invasive species control is being promoted by CTAHR faculty, particularly through collaboration with other agencies and private organizations. Soil and water conservation remain important activities statewide, along with animal waste management.

Results

Through a variety of research and extension programs, Hawaii residents and visitors are more aware of the environmental impacts of their activities. Many are increasingly adopting more sustainable and environmentally responsible practices.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
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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
- Other (Quarantine procedures)

Brief Explanation

- Natural disasters such as hurricanes, typhoons, floods, fires, often are destructive to natural resources such as reefs, water quality, forests, indigenous species, research plots and equipment.
- When the economy is poor, public and private funding decreases and is more difficult to obtain.
- Current and new quarantine and inspection procedures for imported materials affect the rate of new introductions of invasive species into the State.

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.