

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Invasive Species Education and Management

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
112	Watershed Protection and Management	0%		4%	
136	Conservation of Biological Diversity	0%		5%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		1%	
204	Plant Product Quality and Utility (Preharvest)	0%		6%	
205	Plant Management Systems	0%		2%	
211	Insects, Mites, and Other Arthropods Affecting Plants	11%		8%	
212	Diseases and Nematodes Affecting Plants	0%		13%	
213	Weeds Affecting Plants	12%		21%	
215	Biological Control of Pests Affecting Plants	0%		18%	
216	Integrated Pest Management Systems	55%		11%	
312	External Parasites and Pests of Animals	0%		9%	
721	Insects and Other Pests Affecting Humans	0%		2%	
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures	22%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	3.0	0.0	5.5	0.0
Actual Paid	2.3	0.0	3.0	0.0
Actual Volunteer	27.0	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
46650	0	211170	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
256557	0	570856	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	879849	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Invasive species threaten the quality of agricultural products, the health of farming businesses and the surrounding natural and urban ecosystems. Sound management of agroecosystems in Hawaii depends on mitigating the effects of alien invasive species. Invasive species threaten our native plant heritage and economically important plants, pastures, rangelands, forests, and critical watersheds. In addition to their economic damages, invasives also threaten conservation efforts for native endangered plants and insects. Invasive biology and conservation biology are opposite sides of the same coin. CTAHR plays a significant role in developing and delivering information and technologies that minimize the impacts of invasive species.

Hawaii nurseries shipping ornamental potted plants both within the state and out-of-state continued to need a variety of quarantine treatments for different agricultural products. As an alternative to the previously developed hot water shower treatment for potted plants, in FY2014, cold air treatment for 30 hours at 3.3 C was found to kill all stages of the coqui frog (*Eleutherodactylus coqui*). This is compatible with the common practice of shipping plants in refrigerated containers, and work is ongoing with the State of Hawaii to formalize this method of quarantine treatment.

A novel approach to the development of selective, "soft" pesticides investigated the use of peptides from a marine snail that actively hunts and kills other snails with these compounds. Methods were developed to enhance peptide production, and selectivity demonstrated with both naturally derived and bioengineered peptides. Degradation of the peptides, necessary for crop applications, was found to occur after 20 days. In other targeted insect control research, the use of imidacloprid tablets and/or spirotetramat drench in potting media was found effective as an alternative to broad-spectrum foliar sprays to eliminate anthurium whitefly and thrips.

Efforts continued to mitigate the impact of the coffee berry borer (CBB) in the Kona and Kau regions of the island of Hawaii, with annual compilation of research results into a manual of Hawaii-centric best management practices for farmers, and continued evaluation of the efficacy of both entomopathogenic fungi and alternatives practices. Research to combat the macadamia felted coccid in FY2014 focused both on evaluation of novel insecticide treatments, and on conservation and enhancement of predatory insect enemies of the coccid in Hawaii macadamia orchards.

In FY2014, over 50 aerial missions were completed to eliminate invasive weeds such as Miconia in natural systems using the Herbicide Ballistic Technology (HBT), a paintball gun technology for targeted applications of very small quantities of herbicide (reducing aerial application costs by 50%). Suppression of weeds along roadways focused on the use of the native Hawaiian species Pili grass (*Heteropogon contortus*), and treatments were developed to relieve seed dormancy and facilitate seed production.

2. Brief description of the target audience

Target audiences include farmers, consumers, and rural citizens who can appreciate reduced pesticide inputs as we come to rely more on biological means of pest control. Scientists who study invasive species, and in particular fruit flies work with extension educators to delivery best management practices to agricultural and residential clientele. Natural resource managers (including those responsible for forestry, rangeland and conservation lands) depend on CTAHR researchers and extension to develop and deliver technologies for improved control and management of invasive plants in Hawaii's landscapes.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	3499	2075	41	33

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

Patent Applications Submitted

Year: 2014
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	3	28	31

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of workshops, field days, demonstrations held

Year	Actual
2014	57

Output #2

Output Measure

- Number of grant proposals submitted

Year	Actual
2014	32

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Awareness created
2	Number of workshops implemented and demonstration installed for clientele education
3	Total dollar value of grants and contracts obtained.

Outcome #1

1. Outcome Measures

Awareness created

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	3500

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Residents are not aware of the problems associated with invasive species. Increased awareness of best management practices is the first step in implementing improvements in invasive species control and management.

What has been done

Workshops, demonstrations, field days, presentations and publications make residents aware of the problems associated with invasive species and control practices which are most successful.

Results

Farmers and residents will be more likely to assist in controlling invasive species.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
136	Conservation of Biological Diversity
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Diseases and Nematodes Affecting Plants

213	Weeds Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
312	External Parasites and Pests of Animals

Outcome #2

1. Outcome Measures

Number of workshops implemented and demonstration installed for clientele education

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	783

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Residents are unaware of how to control invasive species.

What has been done

Demonstration projects have been installed.

Results

Farmers and residents better understand how to control invasive species and Hawaii is better protected from crop destruction and ecosystem damage caused by invasive plants and animals.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
136	Conservation of Biological Diversity
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants

212	Diseases and Nematodes Affecting Plants
213	Weeds Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems

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
2014	2513346

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Funding is needed to conduct research and extension activities to augment that accomplished with formula funds.

What has been done

Extramural grants have been received and funding utilized.

Results

Hawaii has been able to better accomplish meaningful and comprehensive invasive species control.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
136	Conservation of Biological Diversity
205	Plant Management Systems

211	Insects, Mites, and Other Arthropods Affecting Plants
212	Diseases and Nematodes Affecting Plants
213	Weeds Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
721	Insects and Other Pests Affecting Humans

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

- Intentional introductions of invasive species
- Lack of funding, different priorities in extramural grant programs
- Difficulty in coordination with external agencies and partners

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.