

V(A). Planned Program (Summary)

Program # 8

1. Name of the Planned Program

Sustainable Energy

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
404	Instrumentation and Control Systems	0%		10%	
501	New and Improved Food Processing Technologies	0%		12%	
502	New and Improved Food Products	0%		8%	
511	New and Improved Non-Food Products and Processes	0%		70%	
	Total	0%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	1.5	0.0
Actual Paid Professional	0.0	0.0	2.6	0.0
Actual Volunteer	0.0	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
0	0	17719	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	690949	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	2607531	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Hawaii has the highest energy costs in the nation, due to dependence upon imported fossil fuels for power and transportation. The goals of CTAHR programs in this area are to (1) efficiently grow perennial crops on marginal lands as feedstock for biofuels; (2) develop and promote the use of these locally produced biofuels as alternatives to imported fossil fuels; (3) identify useful and commercially-viable co-products of biofuel cultivation and processing; and (4) develop energy efficient methods for production and processing of agricultural produce.

To determine the optimal lignocellulosic substrate for ethanol production in Hawaii, and optimal cultivation practices, napiergrass, energycane, sweet sorghum and sugarcane plots were established at three elevations with three irrigation regimes. In FY2012, sweet sorghum yielded four harvests per year, each of 19-21 tons/hectare independent of the irrigation regime; while energycane yielded one harvest that dropped from 48 tons/hectare with 100% plantation irrigation to 34 tons/hectare at 50% irrigation. Preliminary results on conversion of napiergrass to biofuel indicated that energy usage ranged from 78-357 kilojoules/hectare per year, depending upon the efficiency and local availability of commercial-scale biorefineries. Edible fungi grown on fermentation residue from ethanol production may have value as fish/animal feed, or in human nutrition.

Another source of bioenergy is *Jatropha curcas*, a tropical tree that produces a nut with great potential as a source of oil for conversion into biodiesel. Trials with 12 *Jatropha* varieties indicated that adequate nutrients and water are essential to produce high oil yields. Preliminary data with biochar produced by carbonization of *Jatropha* residue applied as a plant nutrient indicate potential as a co-product.

Other efforts to develop and promote applications that are not fossil-fuel dependent included adaption of a solar dehydrator developed for dehydration of taro slices to breadfruit flour production in Hawaii and Western Samoa. Taro and breadfruit have similar starch composition, and both are important Pacific island foods.

2. Brief description of the target audience

Hawaiian Electric Company is a target for improved energy production, and partially supports this research. The DOD Office of Naval Research is also interested in providing the military with clean, renewable transportation fuel. Private firms such as Hawaiian Commercial and Sugar Company (HC&S) (grasses), Pacific Biodiesel Inc., Zechem Inc., and Hawaii Pure Plant Oil (HPPO) (*Jatropha*) are partners and target audiences for these efforts. Lastly, the Hawaii Agricultural Research Center (HARC), Hawaii Natural Resources Institute, College of Micronesia, University of Guam, Oregon State University, and Washington State University are both collaborators in current efforts and audiences for improved biofuel production technologies.

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	8	0	0	200

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	1	2	3

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Grant proposals submitted

Year	Actual
2012	6

Output #2

Output Measure

- Presentations at national and international meetings.

Year	Actual
2012	6

Output #3

Output Measure

- Number of workshops and other educational/outreach activities held.

Year	Actual
2012	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Identified types of bioenergy crops suitable for Hawaii environment.
2	Dollar value of grants and contracts received

Outcome #1

1. Outcome Measures

Identified types of bioenergy crops suitable for Hawaii environment.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	8

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Hawaii is dependent on imported fossil fuels and has the highest energy costs in the nation. Biofuel production with locally grown biomass or oil crops is necessary for energy sustainability in Hawaii.

What has been done

Eight middle school teachers were directly trained in bioenergy basics in a workshop in summer 2012, including review of the grasses and oil crop (Jatropha) under investigation in CTAHR. A manual for teachers was also produced and made available.

Results

Teachers trained in the workshop, and those using the manual each reach approximately 25 (or more) middle and high school students each year in their classrooms, extending knowledge of bioenergy and crop research in Hawaii.

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes

Outcome #2

1. Outcome Measures

Dollar value of grants and contracts received

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	6135424

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Resources are needed to conduct research and extension programs to assist stakeholders.

What has been done

Resources were obtained and programs were conducted.

Results

Hawaii's economy benefited from external funds and programming to assist stakeholders was conducted.

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes

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 area for the college, and faculty numbers are limited due to both retirements and competing program needs.

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.