V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Global Food Security and Hunger

☑ 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
101	Appraisal of Soil Resources	0%		5%	
102	Soil, Plant, Water, Nutrient Relationships	15%		5%	
131	Alternative Uses of Land	4%		0%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		4%	
204	Plant Product Quality and Utility (Preharvest)	0%		7%	
205	Plant Management Systems	16%		12%	
211	Insects, Mites, and Other Arthropods Affecting Plants	0%		6%	
212	Pathogens and Nematodes Affecting Plants	6%		15%	
213	Weeds Affecting Plants	0%		3%	
301	Reproductive Performance of Animals	18%		0%	
305	Animal Physiological Processes	10%		10%	
306	Environmental Stress in Animals	8%		4%	
307	Animal Management Systems	12%		7%	
502	New and Improved Food Products	2%		4%	
503	Quality Maintenance in Storing and Marketing Food Products	0%		3%	
511	New and Improved Non-Food Products and Processes	0%		11%	
601	Economics of Agricultural Production and Farm Management	3%		2%	
607	Consumer Economics	3%		2%	
608	Community Resource Planning and Development	3%		0%	
	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	8.0	0.0	22.0	0.0
Actual Paid Professional	6.7	0.0	12.6	0.0
Actual Volunteer	1.4	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**
407410	0	565499	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
606849	0	2833648	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
387539	0	688700	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

CTAHR can play a pivotal role in supporting the national priorities in global food security and hunger because Hawai'i has an environment that is similar to that of other developing countries in the tropical and subtropical regions. This program area utilizes integrated research, extension, and education projects to provide knowledge and technologies to generate and improve products and processes for existing and expanded markets.

Hawaii aquaculture researchers and extension specialists have developed educational opportunities in the area of aquaponics, the production of hydroponic crops using fish effluent. Through this partnership, growers obtain access to starter fish and educational resources to produce fish and edible crops successfully in a safe and cost effective manner. Educational workshops were held to educate growers about aquaponics and the benefits of creating a sustainable system to produce fish and edible crops successfully in a safe and cost effective manner. Workshops were hands-on grower field days to show interested growers how to set up an aquaponic system using local sources of materials and supplies. Aquaponics utilizes the waste from the fish to supplement the nutritional needs of the plants. Participants were able to see the parts, plumbing, pumps, and other supplies needed to get started in aquaponics, and assemble grow beds. A new challenge being encountered by aquaponic producers is the rejection of third party food safety certification of this emerging technology due to the direct association of the "manure" from fish with plant crops. This results in an automatic failure when based on terresterial standards irrespective of the differences between warm and cold blooded animals. CTAHR have countered concerns being raised about food safety, to the satisfaction of the Hawaii Department of Agriculture allowing Food Safety Certification to be granted to aquaponic producers.

Aquaculture (fish cultivation) is also being furthered in Hawaii by CTAHR research on improved shrimp propagation and diet, and identification of genetic markers for tilapia lines and other commercial fish. In FY2012, researchers demonstrated that native Hawaiian spiny lobsters can be cultured, opening

the path to commercial culture of these desirable species. An evaluation of production costs and profitability of the entire aquaculture industry in Hawaii was completed, and mollusk and crustacean farms were found to perform the strongest. Labor costs in aquaculture are about 3.5-fold greater than those in the continental USA, with 58% of aquafarms generating a profit in 2007 (the base study year), but 39% unable to cover expenses.

In land-based agriculture, researchers and extension specialists dealt with global pest and disease problems reaching Hawaii, including developing a pilot unit for heat treatment of coffee beans to eliminate the coffee berry borer, and identifying a new pepper mottle virus attacking tomatoes. Sunn hemp was found to be a particularly effective "green manure," suppressing nematode populations; and producing grape tomato yields equivalent to use of organic fertilizer when integrated with Korean "Natural Farming" methods incorporating indigenous microogranisms (IMO). Sunn hemp was also among the green manures found to be promising with dryland taro. Research emphasized crops of particular importance in the Pacific region, and the popular virus-free Rainbow papaya was deregulated for sale in Japan, and shipments initiated. Five taro cultivars were identified as partially resistant to taro leaf blight and corm rots, suggesting that conventional selection and breeding will be useful in combating this severe taro disease.

Efforts with livestock emphasized pasture management, selection of appropriate cattle genetics, and development and evaluation of bioactive myostatin-inhibiting molecules, which were demonstrated to improve muscle growth. A protein produced through recombinant bacterial technology was evaluated, with results suggesting this may be a cost-effective approach to an improved animal nutrient. A new website was developed to extend effective methods of Tropical Pasture and Livestock Management: http://manoa.hawaii.edu/ctahr/tpalm/indes.html. Hawaii and other Pacific islands are unique in employing long-distance shipping in the livestock industry, and preliminary results of animal welfare research indicate that shipping does not induce environmental stress in calves, although transit holding pen conditions and the condition of ranch facilities receiving the animals are potentially critical points.

In fragile Pacific Island ecosystems plagued by food insecurity, collaborative work by CTAHR to establish the Marianas Grazing Academy has provided a foundation to show that there are viable local options to enhance community food security and protect the environment. Results show that strategic management of pasture lands will enhance the availability of local meat products and simultaneously enhance soil quality and C sequestration, two invaluable ecosystem services. Our initial work measuring land use effects on soil fertility and C stocks indicates that traditional agricultural systems not only provide various nutrient dense crops, but they require low inputs and little mechanical disturbance of the soil, which protect soil resources for the long term.

The dry litter technology (DLT), a nutrient management system for small-scale hog operations, was developed by CTAHR in partnership with local, state and federal partners involved in reducing pollution threats for the improvement of water quality. The dry litter waste management system has been called "a model for the Pacific" in American Samoa. There are now more than ninety (90) installations of the DLT system in the western and south Pacific basin, including Hawaii, Territories of American Samoa and Guam, Commonwealth of the Northern Mariana Islands, Republic of Palau, Republic of the Marshall Islands and Federated States of Micronesia-Pohnpei State. Additional funding (USDA NIFA, $30,000) was received allowing continued work with partners in the Western and South Pacific Land Grant institutions to provide technical expertise on small scale piggery waste management. Multi-state institution collaboration include: American Samoa Community College, Northern Marianas College, College of the Marshall Islands, College of Micronesia-FSM, Palau Community College, University of Arizona and the University of Nevada at Reno. Freshwater and marine water baseline data were collected in cooperation with the Pohnpei Environmental Protection Agency. The strategic water sampling protocol brought tremendous awareness of the negative impacts of piggery operations on the water resources of the island, as has been found in all other Pacific Islands studied. Other studies in Hawaii, American Samoa and the Northern Marianas have shown the value of improved piggery waste management in reducing the incidence of the

bacterial disease leptospirosis in humans.

2. Brief description of the target audience

This program audience is quite diverse, encompassing ranchers and commercial and hobbyist livestock producers in Hawaii and the American-affiliated Pacific Islands, aquaculturists, food industries and marketers, as well as scientists, students, and educators involved in knowledge generation and dissemination. Since the general public in the Pacific Islands is increasing interested in food sustainability issues, the audience can include large segments of the population.

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	6013	16502	1197	1469

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	22	65	87

V(F). State Defined Outputs

Output Target

<u>Output #1</u>

Output Measure

- Number of workshops, field days and demonstrations.

Year	Actual
2012	123

Output #2

Output Measure

- Presentations at international and national meetings

Year	Actual
2012	19

Output #3

Output Measure

- Grant proposals submitted

Year	Actual
2012	44

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 practices.
2	Total dollar value of grants and contracts obtained

Outcome #1

1. Outcome Measures

Number of people that adopt one or more recommended practices.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	919

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
People need to be more competitive in reducing costs and/or increasing revenues. Currently many farmers and ranchers are struggling to stay in business and produce food for global consumers. At the same time increased food production in home gardens and backyards can be an important supplement to incomes and local food sufficiency. Better food processing and marketing practices will leader to greater profitability, food availability and food safety.

What has been done
Workshops demonstrations, field days, presentations, websites, and publications have changed many peoples knowledge and behavior so they can better achieve their sustainable food production goals.

Results
Hawaii and Pacific Island farmers, ranchers and residents are more competitive and the local supplies of food will be more abundant and secure.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
205	Plant Management Systems
305	Animal Physiological Processes
307	Animal Management Systems
503	Quality Maintenance in Storing and Marketing Food Products
511	New and Improved Non-Food Products and Processes

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	2440938

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
The information needed by the public will be provided and the size of Hawaii's economy will increase if more external funds are received and more assistance can be provided to producers and the public.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
205	Plant Management Systems
301	Reproductive Performance of Animals
305	Animal Physiological Processes
306	Environmental Stress in Animals
307	Animal Management Systems
511	New and Improved Non-Food Products and Processes
601	Economics of Agricultural Production and Farm Management

607 Consumer Economics

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, livestock operations, and home garden production. When these events occur, local food production can be temporarily disrupted and island residents become increasingly dependent on imported foods. If transportation facilities are also impaired, local food shortages occur. Under normal conditions, island food production and processing is greatly impacted by mainland and foreign producers with greater economies of scale. This leads local producers and processors to specialize in niche markets, which leads to a high percentage of imported foods, particularly for many staple food materials. Also fragile island environments have led to many government regulations on land use, food production and pollution control, which are perceived by producers as stifling their productivity and profitability. When local economies experience downturns, public priorities that relate to health and safety can be stressed, causing less funding to be available to on-going research, education and public outreach.

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 Associate Deans for research and extension. Funds were not released for those projects which did not show tangible progress.

Key Items of Evaluation

None.