2016 University of Hawaii Combined Research and Extension Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

The College of Tropical Agriculture and Human Resources (CTAHR) at the University of Hawaii at Manoa (UHM) is composed of six academic departments, the Center on the Family, and the Western Insular Pacific Sun Grant Subcenter. FY2016 was a time of change, as Dean Maria Gallo left the university and Dr. Rachel Novotny accepted the position of Interim Dean. J. Kenneth Grace continued as Associate Dean/Director for Research, Charles Kinoshita continued as Associate Dean for Academic and Student Affairs, and Kelvin Sewake continued as Interim Associate Dean/Director for Cooperative Extension.

CTAHR administration and faculty continued to work within the framework provided by the ten program areas described in this Annual Report. As the only tropical, island state in the USA, CTAHR has unique natural resource, specialty crop, and community needs. In recognition of this, the first five of our ten program areas address local issues and priorities; while program areas 6-10 are those areas identified as national priorities by USDA NIFA. In FY2017, we plan to reassess our program areas, with possible consolidation to further emphasize USDA priorities.

Although we continue to focus significant effort on the national priority areas, our five local program areas remain equally important due to the unique Pacific Ocean location, environment, and economics of an island state 2,500 miles from the continental United States and representing the most isolated island chain in the world. Hawaii has virtually every recognized soil type, rapid increases in elevation, annual rainfall variation from less than ten to over 400 inches, and the unique agricultural challenge of vog (volcanic fog). 63% of the state's 7,000 farms are less than 10 acres in size, and another 25% fall between 10-49 acres. Hawaii imports nearly 89% of its food, and our agricultural landscape includes specialty crops grown nowhere else in the USA. The Governor has proposed the aggressive goal of doubling local food production by 2020.

Hawaii is also unique it its social and cultural mix, with many first-generation immigrants entering agricultural and a wide range of cultural practices and dietary preferences in the population. The costs of land, labor, and energy exceed those found in other states, with fuel costs adding significantly to the costs of production, importing agrochemicals and animal feed, and exporting products. Greater local food production is a State goal, with targets ranging from 10-50% increase. The high costs of energy (largely dependent on imported oil) and animal feed are major challenges. Although livestock producers in Hawaii are making progress towards the goal of quality grass-finished products, virtually all calves are still shipped to mainland feedlots due to lack of economical local feed supplements. Invasive species and the attendant costs of pest and disease management, and export limitations imposed by quarantine regulations also impose additional burdens on Hawaii's farmers.

CTAHR faculty engage in a broad spectrum of research and extension activities, including increasing forest productivity and protection of watersheds and coastal resources, improved cultivation and processing of specialty crops and development of value-added products, management of invasive species constantly threatening the "gateway" state of Hawaii, plant and animal breeding and genetic improvement, biofuel development to address soaring energy costs and fossil fuel depletion, stresses related to drought and climate change, food safety and security, and the health (mental, physical and economic) of Hawaii's citizens and communities. As in past years, our FY2016 report documents program challenges and program successes, often incremental but sometimes transformational.

Research and extension faculty continued to show progress in all ten program areas. Initiatives

described in earlier years continued to progress in FY2015. Efforts continued to battle childhood obesity in the region, building upon the success of NIFA-funded Children's Healthy Living Program for Remote Underserved Minority Populations of the Pacific (CHL). Conservation of Hawaii's natural resources and native biota continued to be priorities, and included mitigation of climate effects. Research continued on lignocellulosic and oil biofuel crops, recognizing Hawaii's energy needs, including the effort to use insects (soldier blackflies) as a means of processing food waste for biodiesel production that was initiated in FY2015. Efforts also continued to combat the continual influx of invasive insect pests and associated plant diseases entering Hawaii. Food safety projects addressed both Good Agricultural Practices and Good Handling Practices training for farmers and processors, and development of processing and novel preservation methods for Hawaii's fresh produce, fish and meat. Reflecting our location in a Pacific island state, CTAHR continued to address issues associated with specialty regional and ethnic crops, including pest management, crop improvement, and documentation of dietary impacts and medicinal qualities.

Neither university budgets nor the deferred cumulative repair and maintenance (CDRM) situation at CTAHR facilities improved in FY2016. However, progress was made with the state Legislature in providing four new extension agent positions for food crops. Despite challenges, research continued to advance in FY2016, and extension engagement with the public remained strong, with continuing strong interest in the Master Gardener and 4H programs statewide. CTAHR is focused on assisting our stakeholders and providing the leadership required to move agriculture, resource management, and sustainable communities forward in the State of Hawaii.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	50.0	0.0	40.0	0.0
Actual	43.0	0.0	31.6	0.0

II. Merit Review Process

1. The Merit Review Process that was Employed for this year

- Internal University Panel
- External Non-University Panel
- Expert Peer Review

2. Brief Explanation

CTAHR continues to use expert peer review panels to review individual Plans of Work, projects, publications, promotion and tenure applications, and post tenure reviews. All reviewers are asked to determine if the program or project addresses the critical issues of strategic importance, including those identified by the stakeholders; utilize multi-disciplinary approaches and provide evidence of integration of research and extension; address the needs of underserved populations of the State; describe the expected outcomes and impacts; and result in improved effectiveness and/or efficiency.

CTAHR's peer project review process begins when a project proposal is submitted to a unit administrator. The unit administrator checks the proposal for completeness and format. A draft proposal that is ready for review is transmitted to the department's ad hoc Peer Review Committee. This committee is comprised of a minimum of three departmental members, supplemented by external reviewers as necessary, who are familiar with the issues addressed by the plan or project. The Peer Review Committee reviews the proposal for (1) significance, (2) need, (3) approach, (4) new knowledge of

programs to be generated, (5) potential for impact, (6) collaborative arrangements, (7) track record of the project leader(s), and (8) potential for success of the proposed project. After the committee completes its evaluation, the proposal and the peer evaluation forms are returned to the unit administrator, and anonymous reviews transmitted to the investigator. The revised project proposal is reviewed by the unit administrator, and passed, along with all reviews, to the appropriate Associate Dean/Director. CTAHR administrators, program leaders and faculty may serve as resources to clarify proposed projects and plans of work for reviewers. Final review for projects and plans of work occurs in the offices of the Associate Dean/Associate Director for Research and Associate Dean/Associate Director for Extension.

III. Stakeholder Input

1. Actions taken to seek stakeholder input that encouraged their participation

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Other (Social Media)

Brief explanation.

As a standard practice CTAHR includes stakeholders in search committees for faculty positions, including researcher, extension specialist and agent positions, county administrators, department chairs, and college administrators. CTAHR faculty work closely with industry groups and associations. This close working relationships provides a means for encouraging stakeholder participation and input on all matters of mutual concern. If CTAHR faculty is not available in a particular locale, stakeholders often call upon college administrators or the county administrators with their input and concerns. College administrators also confer often with officers and executive staff of relevant stakeholder associations, such as the Hawaii Farm Bureau Federation, and the Hawaii Farmers Union United.

Additionally, the college is increasingly soliciting and receiving stakeholder input through social media, including Facebook, Twitter, stakeholder blogs, and release of both iPhone and Android Apps. The Communications Services office and other college offices are active on Twitter.

2(A). A brief statement of the process that was used by the recipient institution to identify individuals and groups stakeholders and to collect input from them

1. Method to identify individuals and groups

- Use Advisory Committees
- Use Internal Focus Groups
- Use External Focus Groups
- Open Listening Sessions
- Needs Assessments
- Use Surveys

Brief explanation.

Stakeholders are considered by CTAHR to be anyone with an interest in, can be impacted by, or participates in the activity or issue. These typically include producers, processors, consumers, decision makers, students, alumni, community organizations, representatives of various State and federal agencies and members of the business community. Most of the commodities and program areas have one or more organizations representing their commodity or interests. Although input can be made by anyone and everyone, CTAHR prefers to listen to a spokesperson or organization that represents the majority of those affected by an issue.

2(B). A brief statement of the process that was used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Survey of traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals
- Meeting specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public
- Other (Social Media)

Brief explanation.

CTAHR employs a variety of methods including face to face discussions with industry representatives, participation in trade association meetings, participation on the State of Hawaii Board of Agriculture, Hawaii Invasive Species Council and other state boards and committees; participation in adhoc state task forces such as the Coffee Berry Borer Taskforce; consultation with the Hawai'i Farm Bureau Federation, and long standing "Industry Analysis" and "Strategic Planning" processes that are applied to for key industries.

Other techniques used to gather stakeholder inputs are surveys, commodity organization meetings, through feedback and input from the Farm Bureau or Farmers Union, and direct input from stakeholders. CTAHR faculty and administers regularly assist, facilitate and participate in strategic planning sessions for industry associations and organizations such as the Hawaii Association of Family and Consumer Education, Hawaii 4-H Foundation, Hawaii 4-H Livestock Association, Hawaii Coffee Growers Association, Hawaii Tropical Flowers and Shippers Association, Hawaii Tropical Fruit Growers Association, Hawaii Macadamia Nut Association, Hawaii Food Industry Associations, Hawaii Tea Society, and many others. CTAHR also receives many requests for research, outreach and other resources through emails, letters, meetings, and phone calls. Email list serve groups of CTAHR and external individuals are also used. Information, questions, and other exchanges take place on a regular basis.

Stakeholder input is increasingly solicited and received through Facebook, Twitter, and an increasing number of Apps released by CTAHR faculty for iPhone or Android use. Stakeholder blogs have been found to also be a useful means of obtaining timely information on needs and opportunities.

3. A statement of how the input will be considered

- In the Budget Process
- To Identify Emerging Issues
- Redirect Extension Programs
- Redirect Research Programs
- In the Staff Hiring Process
- In the Action Plans
- To Set Priorities

Brief explanation.

Input collected as described in the previous section is used in research, extension and instructional program planning. Stakeholder input is important for the review process for extension and research project proposals. If an investigator demonstrates that a project is a stakeholder priority, chances of funding are significantly greater. Through the Dean's Advisory Committee, stakeholders assisted CTAHR in maintaining relevance of overall programs and helped to assure program coordination among teaching, research and extension/outreach programs.

Brief Explanation of what you learned from your Stakeholders

College priorities and research and extension programs are in line with expressed stakeholder needs, although stakeholders from all industry groups would like to have increased support from CTAHR for their particular sector. Given past budget and staffing cuts, and restrictions on hiring, these requests will be difficult to satisfy in the next several years, although the State economy is now slightly better than in past years. CTAHR has an excellent relationship with the vast majority of its stakeholder groups, and these groups are working proactively through our elected state and federal officials to make their needs and the needs of the State of Hawaii known to NIFA through our elected officials.

Hawaii receives an average of 24 new insect introductions each year, and is the first port of call for pests that may well move on to attack agriculture in the continental USA. At this time, invasive agricultural pests such as the coffee berry borer, macadamia felted coccid, and the little fire ant are of grave concern to our stakeholders. They wish to see not only greater NIFA resources applied to these key pests of tropical agriculture and the American Pacific, but development of efficient and rapid means of bringing NIFA resources to bear, through CTAHR, on newly discovered invasive plant pests and diseases in Hawaii.

CTAHR stakeholders continue to join with those in Florida and the Caribbean in requesting that NIFA resurrect and fund the Tropical and Subtropical Agricultural Research program (TSTAR), or an equivalent program to address the unique needs of these regions. The small $6.2 million annual investment, defunded in FY2010, was of enormous benefit to Pacific and Caribbean stakeholders, and provided funds essential to address constant threats from invasive pests, and protect and develop the crops that are uniquely important in the US Affiliated Tropics.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
1391265	0	1636714	0

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	1532113	0	1614691	0
Actual Matching	1532113	0	1614691	0
Actual All Other	6366257	0	15492449	0
Total Actual Expended	9430483	0	18721831	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	0	0	0	0

V. Planned Program Table of Content

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	7%		14%	
111	Conservation and Efficient Use of Water	0%		5%	
112	Watershed Protection and Management	7%		3%	
121	Management of Range Resources	8%		2%	
123	Management and Sustainability of Forest Resources	29%		8%	
124	Urban Forestry	0%		4%	
133	Pollution Prevention and Mitigation	0%		10%	
135	Aquatic and Terrestrial Wildlife	0%		3%	
136	Conservation of Biological Diversity	0%		6%	
205	Plant Management Systems	21%		7%	
211	Insects, Mites, and Other Arthropods Affecting Plants	4%		2%	
212	Pathogens and Nematodes Affecting Plants	3%		2%	
213	Weeds Affecting Plants	7%		12%	
403	Waste Disposal, Recycling, and Reuse	0%		3%	
605	Natural Resource and Environmental Economics	0%		15%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	14%		4%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	4.0	0.0	6.0	0.0

Actual Paid	4.8	0.0	2.9	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**
227743	0	168338	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
227743	0	168338	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
443116	0	1281279	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research and extension efforts to promote harmony between agriculture and the environment, and to effectively manage Hawaii's natural resources, 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 to preserve, protect, and renew Hawaii's natural resources continue to be an area of focus.

Rapid Ohia Death (ROD) was a major focus of forestry research and extension efforts in FY2016. This devastating disease of ohia, Metrosideros polymorpha, is caused by two closely related fungal pathogens within the genus Ceratocystis. The disease was first identified in 2014, and has spread extremely rapidly on the Island of Hawaii, from 15,000 acres of ohia forest infected by the disease in 2014, to 50,000 acres in late 2016. Ohia is the dominant tree in at least 80% of Hawai'i's native forests, and makes up half the acreage, and half the woody biomass, of all the forests in Hawai'i. Research efforts focused on identification of the pathogens involved, detection via PCR for quarantine enforcement purposes, and determination of the means of spread of the disease, particularly the role of bark beetles in spreading fungal spores. The extension forestry program reached 597 stakeholders via direct contacts while the forestry extension website received 65,891 unique page views, with the most popular page linked to the Rapid Ohia Death problem plaguing Hawaii's native trees. Photo streaming on Flicker included 2,092 photos from the Pacific Region that were viewed 156,002 times.

The Wildland Fire Program worked to improve the available metrics on the impact of fire in Hawaii and the American Pacific, to train fire-fighting agencies in the use of fire models tuned to tropical, rather than temperate, conditions, and to increase collaboration and cooperation between managers and fire responders. In FY 2016, CTAHR's wildland fire extension program directly contributed to increased funding and resources for fire management in Hawaii. Information provided in a peer-reviewed publication regarding a long-term, spatially explicit analysis of wildfire occurrences was used by the Fire and Emergency Services program at the U.S. Army Pohakuloa Training area and by the Hawaii Division of Forestry and Wildlife, and resulted in additional funding of $0.2 million and $1.5 million, respectively, for fire management.

In FY2016, work continued on the use of the Genuine Progress Indicator (GPI) as an alternative to Gross Domestic Product (GDP) to assess the value of natural capital in Hawaii. As a result of the

international conservation conference hosted by Hawaii in FY2016, work was initiated with the State Environment Council and other parties to develop Hawaii Green Growth and Aloha Plus Challenge indicators as well.

Waste management and cleanup of environmental contaminants are serious issues in island ecosystems. In FY2016, work continued to refine a novel algal film bioreactor for sustainable wastewater treatment, carbon dioxide capture, and biofuel production. The bioreactor was found to consume significant amounts of nitrogen and phosphorus in wastewater, and generated a high density of algal biomass for biodiesel production. Research was also conducted on soil remediation, particularly with respect to arsenic, which is common in Hawaii soils due to past pesticide uses and strongly retained in high-clay soil. Applications of FeSO4 and FECl3 in conjunction with lime were found to reduce arsenic bioavailability.

The University of Hawaii Insect Museum (UHIM) supported by CTAHR grew by 14,000 specimens in FY2016, and digitized more than 41,000 specimens and associated data records to increase online availability to over 126,000 specimens. The UHIM hosted more than 250 visitors in FY2016, increasing public knowledge of Hawaii's native, introduced, and invasive insect fauna.

The Master Gardner Program provided outreach to thousands of people in the general public and to school children by providing information on small-scale food production, gardening, pest control, environmental sustainability, and more. This program leverages funding by effectively utilizing volunteers, including a total of 12,005 volunteer hours in answering Helplines, participating in educational exhibits, maintaining their website, creating school gardens, and maintaining demonstration gardens.

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

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	11684	203408	1972	150

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

Patent Applications Submitted

Year:	2016
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	2	21	23

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Grant proposals submitted.

Year	Actual
2016	58

Output #2

Output Measure

- Presentations at international and national meetings.

Year	Actual
2016	19

Output #3

Output Measure

- Number of workshops and other educational activities held

Year	Actual

2016 151

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
2016	892

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
All residents and visitors in the State of Hawaii enjoy the State's 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 resource contained in these watersheds are more sustainable.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
121	Management of Range Resources
123	Management and Sustainability of Forest Resources
124	Urban Forestry
133	Pollution Prevention and Mitigation

135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
403	Waste Disposal, Recycling, and Reuse
605	Natural Resource and Environmental Economics
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

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
2016	1798777

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 or 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
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
121	Management of Range Resources
123	Management and Sustainability of Forest Resources
124	Urban Forestry
133	Pollution Prevention and Mitigation
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
403	Waste Disposal, Recycling, and Reuse
605	Natural Resource and Environmental Economics
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

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 and fires are often destructive to natural resources such as reefs, water sheds, forests, indigenous species habitats, research plots or 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 installation. 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.

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Hawaii's Diversified Tropical Crop Systems for Sustainability and Competitiveness

☑ 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	9%		3%	
124	Urban Forestry	2%		2%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		7%	
202	Plant Genetic Resources	5%		7%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		3%	
204	Plant Product Quality and Utility (Preharvest)	0%		13%	
205	Plant Management Systems	40%		17%	
206	Basic Plant Biology	0%		2%	
211	Insects, Mites, and Other Arthropods Affecting Plants	4%		0%	
212	Pathogens and Nematodes Affecting Plants	6%		13%	
213	Weeds Affecting Plants	2%		0%	
215	Biological Control of Pests Affecting Plants	0%		1%	
216	Integrated Pest Management Systems	22%		12%	
502	New and Improved Food Products	0%		3%	
511	New and Improved Non-Food Products and Processes	0%		3%	
601	Economics of Agricultural Production and Farm Management	5%		3%	
604	Marketing and Distribution Practices	0%		7%	
903	Communication, Education, and Information Delivery	5%		4%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	11.0	0.0	9.0	0.0
Actual Paid	12.5	0.0	8.1	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**
530541	0	421750	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
530541	0	421750	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
2188453	0	3248311	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

A fundamental responsibility of the College of Tropical Agriculture and Human Resources is promotion of crop production in the State, both for local use and for export. Since 88% of the food consumed in Hawaii is imported, an important goal for local food security is to encourage import replacement through increased commercial as well as backyard and urban agricultural production. Likewise, promotion of diversified cropping helps to diversify the state's economy in the wake of sugarcane and pineapple plantation closures over the past several decades.

Research and extension efforts in FY2016 continued to include all areas of tropical agriculture: breeding of new ornamental varieties, variety selection for pest and disease resistance, pest and disease management in both conventional and organic farming, pesticide education, pesticide residue and registrations, identification and evaluation of potential new specialty crops and value-added processed foods, genetic modification and marker assisted selection, improved field and greenhouse cultivation methods, promotion of import replacement with locally grown produce, beef and livestock production, and aquaponics for sustainable no-soil agricultural production.

Successful farming requires economic stability as well a success in crop cultivation. This can be challenging in Hawaii, where all crops are considered Specialty Crops, and 63% of the state's 7,000 farms are less than 10 acres in size. Due to the cost of land and farming inputs in Hawaii, competition with imported produce and meat is stiff, and 88% of overall food consumed in Hawaii is imported. In FY2016, risk management workshops continued to be offered throughout the state to assist growers with crop diversification, management of pests and diseases, and navigation of financial, legal and labor issues. Agritourism is increasingly important to many of Hawaii's small farmers and ranchers as means of supplementing farm income, and a guide to agritourism development was made available on the CTAHR website. In research to increase agricultural productivity, lettuce hydroponic nutrient solution use was less and biomass production was found to be significantly greater under LED lighting than under fluorescent lighting.

Master Gardener volunteers statewide increased awareness of resources available to home gardeners through CTAHR, including fruit fly suppression, general plant pest and disease control, plant

propagation, nutrient management and environmentally sound gardening. Master Gardeners have become the "volunteer" public face of the Cooperative Extension Service at numerous events statewide, including county fairs, Plant Doctor booths at Farmers Markets, School Garden Training and Mini-certification Programs, and Second Saturday at the Garden. In FY2016, there were over 465 volunteers contributing over 12,500 hours of volunteer time and reaching 7,712 adults and 1,800 youth via direct contacts.

Important limiting factors to sustainability in crop production in Hawaii are insects and diseases. The landscape, turf , floriculture and nursery industries collectively have been the number one diversified crop in Hawaii over the past more than 20 years, once topping $108 million in wholesale value of sales. Yet, this industry has been increasingly plagued with invasive insects and diseases. CTAHR has led efforts to mitigate and manage these pests, representing Hawaii on the Western Regional Turfgrass Research Group (WERA-011) and also conducting research and extension efforts in Hawaii and the Pacific Region against ornamental pests such as the coconut rhinoceros beetle, gall wasps, lobate lac scale, and many more highly destructive insects.

CTAHR extension specialists continued to develop technology to assist growers and the public with release of the "Leaf Doctor" app for mobile phones, a tool for visual quantification of disease severity, that has been cited by six research manuscripts and has been used both nationally and internationally. CTAHR's digital outreach capabilities were further fortified by publishing several online Extension articles and new websites about anthurium blight and papaya ringspot. A Flickr gallery now houses more than 9,500 high-resolution photographs of plant pests, all of which are freely available. During this reporting period, 1.5 million views occurred for images in the Flickr gallery and totaling over 5 million views over the past five years. Downloads of Extension-style articles exceeded 100,000.

2. Brief description of the target audience

The target audience for this program area is primarily the diversified farming community, especially those growing commercial or home garden crops. Main commercial crop industries served by CTAHR include floriculture and nursery, tropical fruit trees and nuts, vegetables, melons, herbs, and root or tuber crops. Many of these crops are tropical and not commonly grown in the continental USA, and CTAHR research and extension efforts are very important to Hawaii producers. There is also a resurgence of interest in home and school gardening which is supported by CTAHR programs.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	17320	201665	3116	8207

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

Year:	2016
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	7	18	25

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of workshops, research/field day demonstrations conducted

Year	Actual
2016	294

Output #2

Output Measure

- Published information such as extension newsletters, fact sheets, videos, and other publications

Year	Actual
2016	14

Output #3

Output Measure

- Presentations at international and national meetings

Year	Actual
2016	10

Output #4

Output Measure

- Number of grant proposals submitted.

Year	Actual
2016	26

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of individuals completing non-formal education programs.
2	Number of people who adopt one or more recommended practices.
3	Total dollar value of grants and contracts obtained.

Outcome #1

1. Outcome Measures

Number of individuals completing non-formal education programs.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Increased awareness of best management practices to promote environmentally responsible agricultural and landscape management.

What has been done
Workshops, field days, demonstrations, presentations, websites and publications have been completed on a variety of topics that will help agricultural and home garden producers understand how to make the State more sustainable.

Results
Hawaii will be more sustainable and the agricultural producers will be more competitive.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
124	Urban Forestry
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
206	Basic Plant Biology

211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
502	New and Improved Food Products
511	New and Improved Non-Food Products and Processes
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices
903	Communication, Education, and Information Delivery

Outcome #2

1. Outcome Measures

Number of people who 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
2016	2434

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Moving from understanding of improved practice to actual adoption is obviously important to realizing the environmental, social and economic benefits associated with the improved practices.

What has been done
Developing improved practices (such as pest control, improved crop varieties, soil management, etc.) is done by research faculty, either in on-station or on-farm experiments. Adoptions usually require repeated instruction and follow up by extension educators, which is often done in conjunction with commodity associations. Also CTAHRS's Master Gardener programs involves repeated and in depth outreach to the general gardening public. This is done through fairs, phone hotlines and direct instruction of the public by the Master Gardener volunteers.

Results

Commercial crop and home garden production will be more productive and sustainable.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
124	Urban Forestry
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
206	Basic Plant Biology
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
502	New and Improved Food Products
511	New and Improved Non-Food Products and Processes
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices
903	Communication, Education, and Information Delivery

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
2016	959839

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
Extramural grants have been received and funding utilized in support of the program.

Results
Increased extramural funding has allowed CTAHR faculty and staff to conduct needed research and associated extension outreach activities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
124	Urban Forestry
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
206	Basic Plant Biology
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
502	New and Improved Food Products
511	New and Improved Non-Food Products and Processes
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices
903	Communication, Education, and Information Delivery

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. Annual crops suffer immediate, although not permanent damage, while orchard crops may sustain long term damage. Damage to research plots, and equipment can also occur. When the economy is poor, public and private funding decreases and is more difficult to obtain. When monies are short, public priorities that relate to health and safety are more visible and will compete for available funds. The increase in petroleum prices has increased production costs.

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.

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	11%		11%	
136	Conservation of Biological Diversity	0%		6%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		4%	
204	Plant Product Quality and Utility (Preharvest)	0%		5%	
205	Plant Management Systems	0%		2%	
211	Insects, Mites, and Other Arthropods Affecting Plants	11%		20%	
212	Pathogens and Nematodes Affecting Plants	11%		10%	
213	Weeds Affecting Plants	12%		12%	
215	Biological Control of Pests Affecting Plants	0%		15%	
216	Integrated Pest Management Systems	55%		3%	
312	External Parasites and Pests of Animals	0%		7%	
721	Insects and Other Pests Affecting Humans	0%		4%	
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures	0%		1%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	3.0	0.0	4.0	0.0
Actual Paid	1.4	0.0	1.8	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**
80758	0	156642	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
80758	0	156642	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
181708	0	3873493	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. In addition to their economic damages, invasives also threaten conservation efforts for native endangered plants and insects. CTAHR plays a significant role in developing and delivering information and technologies that minimize the impacts of invasive species.

The Hawaii Department of Agriculture has reported the introduction of 28 new insect invaders each year Effective trunk injection methods were developed for high value trees to control Chinese banyan stem and leaf gall wasps and lobate lac scale, and shared with the landscape industry. The landscape industry also benefited from research on light exclusion as a non-chemical means of weed control in turf renovation. Preliminary results indicate that two-month coverage with durable black woven plastic fully eliminated weeds and old turf without affecting beneficial insects and nematodes. Extensive research and extension efforts continued to monitor and control coconut rhinoceros beetles in palm crowns and mulch piles, including both novel insectidal methods, and potential biological control agents (entomopathogenic nematodes and fungi). Efforts also 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 to prevent movement of this pest into coffee on the island of Kauai. An early warning system was developed for Kauai coffee growers, while well-managed farms in Kona reported success in holding CBB damages to less than 5%.

In 2013, the tiger moth Secusio extensa was released in Hawaii for biological control of invasive fireweed, and field plots have been monitored every other month for the past three years to determine impact of this biocontrol release. Unfortunately, results through FY2016 indicate that Secusio does not thrive in open pastures on fireweed, the areas most in need of control, appears to prefer the alternate host plant cape ivy to fireweed. Thus, suppression of fireweed by Secusio appears to be negligible to date, although efforts to identify the factors limiting success are continuing.

Herbicide Ballistic Technology (HBT) and other alien species management strategies were presented at two major workshops in FY2016 for over 120 local weed management practitioners. HBT is a paintball gun-like technology that applies small, precise doses of herbicides to invasive plants in remote areas. In 2016, over 5,000 invasive plant targets were controlled with HBT. This resulted in the protection of over 49,421 acres of forested watershed by effectively eliminating over 19,000 invasive plant targets. By mitigating these plants from becoming mature, the estimated cost savings is over $380 million that would have been needed in extra management over the next four decades. A new telemetry system was developed and deployed to record projectiles discharged and precise plant target coordinates.

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 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

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	550	1000	0	0

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

Patent Applications Submitted

Year:	2016
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	3	11	14

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of workshops, field days, demonstrations held

Year	Actual
2016	44

Output #2

Output Measure

- Number of grant proposals submitted

Year	Actual
2016	34

Output #3

Output Measure

- Presentations at international and national meetings

Year	Actual
2016	11

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 Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	75

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. As a result, these people have then adopted one or more control practices.

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
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens 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
721	Insects and Other Pests Affecting Humans
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures

Outcome #2

1. Outcome Measures

Number of workshops implemented and demonstration installed for clientele education

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	44

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, resource managers 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
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens 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
721	Insects and Other Pests Affecting Humans
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures

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
2016	4184899

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
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens 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
721	Insects and Other Pests Affecting Humans
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures

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.

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Youth, Family and Community Development

☑ 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
124	Urban Forestry	0%		3%	
604	Marketing and Distribution Practices	8%		8%	
608	Community Resource Planning and Development	3%		9%	
724	Healthy Lifestyle	0%		6%	
801	Individual and Family Resource Management	12%		0%	
802	Human Development and Family Well-Being	35%		21%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	6%		13%	
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures	0%		13%	
805	Community Institutions, Health, and Social Services	0%		4%	
806	Youth Development	36%		13%	
903	Communication, Education, and Information Delivery	0%		10%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	15.0	0.0	4.0	0.0
Actual Paid	12.8	0.0	4.0	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**
316543	0	70932	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
316543	0	70932	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
1553293	0	925438	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

More than any other social institution, the family has profound influence on the health and well-being of its members, particularly its youth and elderly. CTAHR strengthens families in Hawai'i's rural and urban environments by providing assistance in areas such as family health and lifespan development, financial and time management, youth development, parenting, and caring for the elderly. Each of these areas of emphasis impact community conditions and societal well-being, and CTAHR takes responsibility for collecting and compiling current social indicator data on Hawaii communities, and making the results accessible to government agencies, nonprofits, and policy makers through the Data Center maintained by the Center on the Family. Colleagues from UH community colleges, nonprofit organizations, and government agencies are partners on a number of CTAHR projects.

Work by Center on the Family researchers and CTAHR extension faculty continued to focus on developing indicator briefs on topics relevant to the well-being of children and families in Hawaii, disseminating data and raising public awareness on the conditions and challenges of children and families in Hawaii for policy and program decision making affecting this population. A monthly e-bulletin, Hawaii Kids Count, provides 1,100 subscribers, including service providers, government agencies, and university faculty and students with useful data on youth. Training and technical assistance was provided to over 275 stakeholders, addressing evaluation frameworks, accurate data collection, and the use of evaluation data to improve program services in the areas of foster care, substance abuse prevention and treatment, homelessness, and behavioral health.

Child development and early childhood education continue to be important areas for CTAHR research and extension efforts. The Hui A'o Mua (HAM) Early Reading First program was developed to give preschool teachers a research-based literacy curriculum, supported by intensive workshops and in-class coaching, and including a weekly home curriculum. Further analysis of results in FY2016 supported teaching upper and lower case letters simultaneously with letter sounds, and that it is easier for children to first learn letters in their own names and letters where the letter name gives a clear cue about the associated sound (e.g., B and K). A statewide needs assessment of the early learning system was also conducted in FY2016, with results indicating that Hawaii has an insufficient number of childcare seats, with four children potentially competing for each seat. GIS-based maps were developed showing the location and capacity of childcare sites on all islands, as well as the density of childcare sites per capita of young child populations in 11 regions of the state. These maps indicate the location of unmet childcare needs.

The GENE-ius Day program is a partnership among CTAHR faculty in increasing awareness of and knowledge about science, genetics and agricultural concepts in the community by targeting K-12 students, their teachers, and their parents. This program includes classroom curricula, a GENE-ius Day school field trip program, and a year-long, family-based, Saturday GENE-ius Day series of classes.. During this

reporting period, 20 schools and 1,715 students participated successfully in this program.

2. Brief description of the target audience

As intended by the Land Grant perspective, CTAHR's "targeted" clients for this program in **instruction** are the undergraduate and graduate students in family and consumer sciences 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 Health and Social Services; adults (4-H leaders) and youth (ages 5-19) through the 4-H Youth Development program; young children and parents through the literacy programs; adults through the Family Education and Family Community Leadership Programs; home gardeners; and the elderly, extension staff in other CTAHR units and at sister institutions; and other members of the professional community who deal with family, youth and health issues. Clients for **extension agents** are children, youth and families "at risk" in targeted communities through the "New Community Projects" program, kindergartners and parents through the "KAMP" programs, adults (4-H leaders) and youth (ages 5-19) through the 4-H Youth Development program, young children and parents through the literacy programs, adults through the Family Education and Family Community Leadership Programs, home gardeners, and the elderly, extension staff in other CTAHR units and at sister institutions, and other members of the professional community who deal with family, youth and health issues.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	23822	89439	22989	4465

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

Patent Applications Submitted

Year:	2016
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	0	20	20

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of people completing non-formal education programs on parenting, youth development, and leadership development

Year	Actual
2016	0

Output #2

Output Measure

- Number of volunteer hours

Year	Actual
2016	113506

Output #3

Output Measure

- Presentations at international and national meetings.

Year	Actual
2016	13

Output #4

Output Measure

- Grant proposals submitted.

Year	Actual
2016	32

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of individuals who adopt at least one new practice learned.
2	Total dollar value of grants and contracts obtained.

Outcome #1

1. Outcome Measures

Number of individuals who adopt at least one new practice learned.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	15322

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Residents want a better quality of life.

What has been done
Workshops, demonstrations, presentations, website and publications gave residents the knowledge to have a better quality of life.

Results
Hawaii families in both rural and urban environments are assisted in areas such as family health and lifespan development, personal and family financial and time management, youth development, parenting, and caring for the elderly. This improves quality of life and productivity of Hawaii's residents and builds stronger communities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
124	Urban Forestry
604	Marketing and Distribution Practices
608	Community Resource Planning and Development
724	Healthy Lifestyle
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and

	Communities
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures
805	Community Institutions, Health, and Social Services
806	Youth Development
903	Communication, Education, and Information Delivery

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
2016	1507375

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Resources are needed for research and extension programs to assist Hawaii's families and communities.

What has been done
Extramural grants were received and funding utilized in support of the program.

Results
Hawaii economy was improved as external funds were received and Hawaii's communities are better off as a result of the research and extension programming.

4. Associated Knowledge Areas

KA Code	Knowledge Area
124	Urban Forestry
604	Marketing and Distribution Practices
608	Community Resource Planning and Development

724	Healthy Lifestyle
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures
805	Community Institutions, Health, and Social Services
806	Youth Development
903	Communication, Education, and Information Delivery

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

The economic downturn and cuts in social services over the past several years have place great strains on many social institutions and social safety nets (eg. counseling, social services, food banks, charitable organizations) with serious implications especially for disadvantaged populations. It is under these circumstances that community based volunteer organizations such as 4H Youth Development, Master Gardeners and intergenerational programs (eg Grandparents Raising Grandchildren) become especially important and valuable. CTAHR is one of the main supporters and proponents of these programs in Hawaii.

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.

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Health and Wellness of Hawaii's Families and Communities

☑ 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%		4%	
511	New and Improved Non-Food Products and Processes	0%		6%	
701	Nutrient Composition of Food	0%		12%	
702	Requirements and Function of Nutrients and Other Food Components	0%		13%	
703	Nutrition Education and Behavior	61%		3%	
704	Nutrition and Hunger in the Population	5%		0%	
723	Hazards to Human Health and Safety	5%		1%	
724	Healthy Lifestyle	13%		13%	
802	Human Development and Family Well-Being	14%		22%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	0%		6%	
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures	0%		16%	
806	Youth Development	2%		4%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	5.0	0.0	3.0	0.0
Actual Paid	3.8	0.0	2.8	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**
106177	0	151509	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
106177	0	151509	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
592557	0	363768	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

An aging population, economic duress, and social and cultural factors affecting food choice all contribute to social, environmental, and health stress in Hawaii. Iron deficiency, obesity, and diabetes are common conditions in Pacific populations; and appropriate choice, handling and preparation of locally available foods are topics requiring integrated research and extension efforts. Research focused on determining mineral content and a iron bioavailability in local foods such as different types of seaweed (limu) and locally-available shellfish, Blood clams were found to be significantly higher in heme-iron content than the benchmark beef liver. In addition, the cadmium content of Pacific oysters was found to be high enough to be of health concern if consumed regularly.

Taro is a staple food throughout the Pacific. In Hawaii, 90% of taro is processed into a paste form called poi, containing lactic acid bacteria (LAB) and yeast. LAB were isolated and identified from poi obtained from four manufacturers and were found to exhibit high tolerance to low pH and bile. Preliminary results suggest that bacteriocins produced by the isolates could offer a promising tool for the inhibition of pathogenic bacteria in food.

Management of psychological stress and substance abuse are as critical to society as health management. This is particularly important in a multicultural society like Hawaii, where individuals and families from diverse cultures, often with very different traditions and daily routines, live in close proximity and must work together to form functional communities. Research and extension efforts in FY2016 addressed aging, documenting the life-lessons in multiple domains of older adults as guides for life-planning in children and young adults. Increases in awareness and attitudes leading to paradigm shifts have enabled program participants to see their elders as individuals with needs and wants, feelings and emotions, and to treat them with respect and dignity. Better understanding of diseases such as Alzheimer's and dementia that control the afflicted person's behavior have resulted in participants with increased empathy for those people. In work with youth, mindfulness training has been found to improve social connections and empathy, and reduce aggressive behavior. In FY2016, a pilot intervention was conducted at the Hawaii Youth Correctional Facility, and five mindfulness modules were developed to shared and used at training sites.

2. Brief description of the target audience

The target clients are the general public. However, some programs, such as the expanded Food and Nutrition Program and the Supplemental Nutrition Assistance program were geared toward specific groups

such as low income families and families on food stamps. Specialized programs are also targeting seniors and youth. High risk groups include minority populations, Pacific Islanders, obese and diabetic individuals.

3. How was eXtension used?

The CTAHR Nutrition Education for Wellness (NEW) Program participates in the national eXtension project "Families, Food & Fitness" through which web based information is available from CES nationwide by incorporating the program's 6 focus messages in statewide training.

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	10800	22596	762	1524

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

Patent Applications Submitted

Year:	2016
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	0	6	6

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of outreach activities and events conducted

Year	Actual
2016	61

Output #2

Output Measure

- Presentations at international and national meetings.

Year	Actual
2016	12

Output #3

Output Measure

- Grant proposals submitted.

Year	Actual
2016	20

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of people who increased their knowledge in health and wellness through outreach activities
2	Total dollar value of grants and contracts obtained.

Outcome #1

1. Outcome Measures

Number of people who increased their knowledge in health and wellness through outreach activities

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	5985

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Health and wellness of families and communities requires that scientific information be presented to the public in ways that they can grasp and use to modify their behavior.

What has been done
Workshops, extension publications, informal training and we-based information has been developed and implemented.

Results
Hawaii's families and communities have the opportunity to achieve healthier lifestyle and improve wellness.

4. Associated Knowledge Areas

KA Code	Knowledge Area
404	Instrumentation and Control Systems
511	New and Improved Non-Food Products and Processes
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
723	Hazards to Human Health and Safety
724	Healthy Lifestyle

802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures
806	Youth Development

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
2016	1473389

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Extramural funding is needed to augment program funds for health and wellness.

What has been done
Extramural grants were received and funding utilized in support of the program.

Results
Health and wellness programs and extension outreach were expanded with the additional grant funds.

4. Associated Knowledge Areas

KA Code	Knowledge Area
404	Instrumentation and Control Systems
511	New and Improved Non-Food Products and Processes
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components

703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
723	Hazards to Human Health and Safety
724	Healthy Lifestyle
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures
806	Youth Development

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

- When the economy is weak, public and private funding decreases and is more difficult to obtain.
- When funding has decreased, other issues may be considered priorities and compete for available funds.

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.

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
102	Soil, Plant, Water, Nutrient Relationships	8%		6%	
121	Management of Range Resources	0%		4%	
131	Alternative Uses of Land	2%		0%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		6%	
202	Plant Genetic Resources	0%		6%	
204	Plant Product Quality and Utility (Preharvest)	0%		3%	
205	Plant Management Systems	24%		3%	
211	Insects, Mites, and Other Arthropods Affecting Plants	0%		3%	
212	Pathogens and Nematodes Affecting Plants	0%		18%	
216	Integrated Pest Management Systems	4%		6%	
301	Reproductive Performance of Animals	8%		1%	
302	Nutrient Utilization in Animals	0%		4%	
305	Animal Physiological Processes	30%		9%	
307	Animal Management Systems	0%		8%	
503	Quality Maintenance in Storing and Marketing Food Products	0%		4%	
511	New and Improved Non-Food Products and Processes	0%		6%	
601	Economics of Agricultural Production and Farm Management	4%		9%	
607	Consumer Economics	4%		4%	
608	Community Resource Planning and Development	8%		0%	
703	Nutrition Education and Behavior	8%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	8.0	0.0	8.0	0.0
Actual Paid	5.1	0.0	8.8	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**
234382	0	512839	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
234382	0	512839	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
871301	0	4435861	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 developing countries in the tropical and subtropical regions. This program utilizes integrated research, extension, and education projects to provide knowledge and technologies to generate and improve food products and processes for existing and expanded markets.

With virtually no local sources of animal feed, imported feed is extremely expensive due to transportation costs. The state exports approximately $17.4 million in live cattle to mainland feed lots, and conversely 90% of the beef consumed in Hawaii is imported. FY2016 livestock and feed efforts continued on cattle genetics and muscle development, biological indicators of stress, development of local animal feed sources, and best-management practices for drought-stricken pastures to assist the nascent grass-fed beef industry. Research on the relationship between cattle stocking density and grazing strategies to animal performance found that a medium density, long duration pasture rotation resulted in more rapid weight gain and final weight than continuous grazing or a high-density short-duration rotation.

Efforts of researchers and extension staff during FY2016 have continued in attempts to control invasive insect pests such as coffee berry borer, imported cabbage webworm, and diamond back moth; manage invasive weeds affecting livestock such as fireweed; and control diseases such as basil downy mildew that threaten food production and security. Integrated pest management work using non-chemical treatments of greenhouses for pest exclusion and using biologically based fungicides such Beauvaria bassiana have been initiated and information disseminated to farmers.

Global food security requires new farmers to help a growing need for more food and to provide farmers for the future as our existing farmer population ages. A Go Farms Hawaii - New Beginning Farmer Education Program in alliance with two community colleges has provided hands on education and training to encourage more new farmers as well as to assist existing farmers in sharpening their knowledge and farming skills. Participants take part in a comprehensive educational training session that covers all aspects of commercial farming.

Extension efforts have also focused on agricultural sustainability with natural and organic farming

systems due to the increasing interest in food security in our island state. Hawaii's Sustainable and Organic Agricultural Program (SOAP) is leading the way to provide in-service training to our government partnering agencies and to farmers by providing extensive educational programs in crop production and pest management, while exploring and adopting economically viable organic crop production methodologies, testing new potential crops, and protecting culturally important crops such as taro (Colocasia esculenta). Taro is thought to be a crop with significant value for local as well as global food production potential since it is productive and highly nutritious (a high protein staple crop with gluten free and highly digestible starch). CTAHR maintains taro germplasm collections on research stations on the islands of Kauai, Oahu, Molokai and Hawaii.

The Hawaii Expanded Food and Nutrition Education Program (EFNEP) collaborated with our Hawaii CES SNAP-Ed Program based on the national NIFA Community Nutrition Logic Model (community nutrition education for limited income audiences). EFNEP is also a part of Extension's Hawaii Nutrition Education for Wellness (NEW) program providing mutual benefits of assistance and support amongst both team members.These collaborative arrangements worked synergistically, producing significant improvements in food resource management, nutrition practices, and food safety practices as reported by stakeholders. There was a total of 2,449 contacts among adults and youth. Data was collected based on pre- and post family records of 299 adults and 310 youths. Adults that reported improvements were as follows: in one or more food resource management practices (78%); in one or more nutrition practices (83%); in one or more food safety practices (68%); in being physically active (29%); and positive change (any food group) (91%). Youth that reported improvements were as follows: in one or more diet quality practices (88%); in one or more food safety practices (58%); in one or more physical activity practices (62%); in one or more food security practices (33%); and in one or more food resource management practices (58%).

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,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 increasingly interested in food sustainability issues, the audience can include large segments of the population.

3. How was eXtension used?

Aquaculture and livestock faculty participated in development of eXtension through national committee membership, and are active users.

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	2590	4630	1085	994

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

Year:	2016
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	8	41	49

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of workshops, field days and demonstrations.

Year	Actual
2016	103

Output #2

Output Measure

- Presentations at international and national meetings

Year	Actual
2016	21

Output #3

Output Measure

- Grant proposals submitted

Year	Actual
2016	32

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
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	2553

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 people's 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
121	Management of Range Resources
131	Alternative Uses of Land
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources

204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
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
601	Economics of Agricultural Production and Farm Management
607	Consumer Economics
608	Community Resource Planning and Development
703	Nutrition Education and Behavior

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
2016	1248966

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Funds are needed to undertake research and extension activities to assist agricultural producers and home gardeners.

What has been done
Extramural grants have been received and funding utilized in support of the program.

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
121	Management of Range Resources
131	Alternative Uses of Land
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
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
601	Economics of Agricultural Production and Farm Management
607	Consumer Economics
608	Community Resource Planning and Development
703	Nutrition Education and Behavior

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.

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
101	Appraisal of Soil Resources	0%		20%	
102	Soil, Plant, Water, Nutrient Relationships	0%		15%	
122	Management and Control of Forest and Range Fires	0%		15%	
131	Alternative Uses of Land	0%		15%	
132	Weather and Climate	0%		18%	
213	Weeds Affecting Plants	0%		17%	
	Total	0%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	1.0	0.0	2.0	0.0
Actual Paid	0.0	0.0	0.5	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	5188	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	5188	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	536583	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research efforts in FY2016 focused on measurement and management of changes in vegetation, soils, and carbon cycling as a result of regional and global climate change. Models were derived from two field studies of carbon and greenhouse gas balance to describe the ecosystem properties controlling the accumulation of soil organic carbon under multiple management regimes of irrigation, conservation tillage, and land use change from intensive cultivation to zero-tillage perennial grasses. These results were shared with stakeholders in meetings and through participation in APRISE 2016, the Asia Pacific Resilience Innovation Summit & Expo at Joint Base Pearl Harbor-Hickam.

The Wildland Fire Program published the first long-term, spatially explicit analysis of wildfire occurrence in Hawaii, demonstrating a four-fold increase in the spatial area burned annually in Hawaii over the past several decades, and linking that increase to human activity, the decline in agricultural production, and the expansion of non-native grasslands in the state. The Program developed two new technical guides, three fact sheets and three general articles on fire preparedness, which were downloaded 192 times from the Pacific Fire Exchange website PacificFireExchange.org, which received over 3,000 unique visits in FY2016.

With respect to mitigating effects of climate change on agricultural production, extension agents were surveyed with respect to stakeholder issues and educational needs, and planning was initiated for a regional extension conference on mitigation of climate variability to be held in FY 2017.

2. Brief description of the target audience

Efforts to measure and mitigate the impact of climate variability on forests and soils target both government agencies and NGOs concerned with resource management and private landowners. Agricultural producers are addressed in work with extension agents to develop tools to explain climate impacts and recommendations for mitigation. Private and public landowners, and all parties involved in wildfire management in the Pacific are addressed through the Wildland Fire Program and the Pacific Fire Exchange.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	20	0	0	0

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

Patent Applications Submitted

Year:	2016
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	3	8	11

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of workshops, field days, or demonstrations conducted

Year	Actual
2016	1

Output #2

Output Measure

- Presentations at national and international meetings.

Year	Actual
2016	15

Output #3

Output Measure

- Grant proposals submitted.

Year	Actual
2016	27

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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

Outcome #1

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	20

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The impact of climate change on Pacific islands can be severe, and extension staff need to provide information on mitigation measures to stakeholders.

What has been done
A workshop was organized for extension staff, and several extension faculty participated in national and regional workshops to gain expertise to extend to Hawaii.

Results
Faculty sent to national and regional workshops organized a comparable workshop for Hawaii extension staff, and prepared materials for use in extension education on climate change impacts and mitigation.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
122	Management and Control of Forest and Range Fires
131	Alternative Uses of Land
132	Weather and Climate
213	Weeds Affecting Plants

Outcome #2

1. Outcome Measures

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
2016	844076

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 agricultural sectors 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
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
122	Management and Control of Forest and Range Fires
131	Alternative Uses of Land
132	Weather and Climate
213	Weeds Affecting Plants

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 developing program for the college. Higher resolution data needs to be obtained to track coastal sediment plumes over time. Models of fire behavior developed in temperate regions are not necessarily transportable to the tropics, and there is a need for improved tropical models.

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.

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
102	Soil, Plant, Water, Nutrient Relationships	0%		25%	
402	Engineering Systems and Equipment	0%		25%	
404	Instrumentation and Control Systems	0%		25%	
511	New and Improved Non-Food Products and Processes	0%		25%	
	Total	0%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	1.0	0.0	1.0	0.0
Actual Paid	0.0	0.0	0.9	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	29384	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	29384	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	279662	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. Research continued with field trials across the state in FY2016 to evaluate perennial grasses grown on marginal lands as feedstock for ethanol production. The feasibility of combining biofuel and animal forage production via napier grass / pearl millet crosses with drought resistance and high biomass yield continued to be explored.

Research on several other new sources of local energy production was initiated in FY2016, including invasive algae, black soldier fly larvae fed on food waste, and fruit waste from agricultural production. In work discussed in local news media, black soldier fly larvae and prepupae were found to be both an excellent source of pressed cake and meal for animal feed, and of oil containing a high 67% concentration of medium chain saturated fatty acids and low 13% concentration of polyunsaturated fatty acids. This is an ideal substrate for producing high-quality biodiesel. Fruit juice and waste from culled papayas was also found to be a potential low-cost energy source for remote regions, through development of a novel 37% efficient sugar-air alkaline battery (SAAB).

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., Zeachem 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, Washington State University and Texas A&M University are collaborators in current efforts and audiences for improved biofuel production technologies.

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3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year:	2016
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	0	6	6

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Grant proposals submitted

Year	Actual
2016	18

Output #2

Output Measure

- Presentations at national and international meetings.

Year	Actual
2016	2

Output #3

Output Measure

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

Year	Actual
2016	0

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 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1

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
Effects of age were evaluated with Napier grass, a high yielding perennial feedstock. Three candidate biofeedstocks were evaluated for methane yield via anaerobic digestion, and microbial community analyses conducted to evaluate their synergetic action in biodegradation. Additonally, a project utilizing soldier blackfly larvae for biodiesel production from food waste was initiated.

Results
It was found that Napier grass cellulose content does not change with age. Inoculation of bioreactors with rumen content for co-digestion of Napier grass and cow manure produced high archaea/bacteria diversity and could enhance biodegradation of Napier grass.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
402	Engineering Systems and Equipment
404	Instrumentation and Control Systems
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 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	188815

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 was conducted to assist stakeholders.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
402	Engineering Systems and Equipment
404	Instrumentation and Control Systems
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. Funding for the Sun Grant program has been drastically reduced since FY2010.

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.

Key Items of Evaluation

None.

V(A). Planned Program (Summary)

Program # 9

1. Name of the Planned Program

Childhood Obesity

☑ 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
702	Requirements and Function of Nutrients and Other Food Components	0%		11%	
703	Nutrition Education and Behavior	50%		56%	
724	Healthy Lifestyle	50%		11%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	0%		22%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	1.0	0.0	2.0	0.0
Actual Paid	1.0	0.0	0.3	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**
6613	0	44511	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
6613	0	44511	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
107128	0	1137	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Health and wellness have long been issues for Hawaii's communities. The high cost of living in Hawai'i and the resulting need for multiple incomes in the household reduce time and energy available for food preparation, leading to greater consumption of fast food. In addition, cultural practices in Hawai'i place emphasis on food consumption as a part of virtually all social activities, and the local diet is high in starch (e.g., white rice, macaroni salad) and fat (e.g., processed meat products, fried items). Health and wellness programming in CTAHR focuses on bothadults and children, particularly in response to concerns over childhood obesity. For example, the rate of obesity in children in Hawai'i ages 6 to 11 is twice the national average, and recent research identified 35% of eight-year olds as obese. CTAHR faculty participate in regional and national efforts to identify the factors contributing to weight gain in young children, particularly in low-income households in order to develop obesity prevention programs.

Today's hectic lifestyles often lead parents and caregivers to make less-than-desirable food choices for meals. The Children's Healthy Living Program for Remote Underserved Minority Populations of the Pacific (CHL), supported by a five-year CAP grant from USDA, was a major effort to integrate research on diet and obesity promoting factors in native Pacific populations with culturally appropriate community-scale interventions in Hawaii, American Samoa, Northern Marianas, Guam, Palau, Micronesia and Alaska. In FY2016, a multistate project was developed in order to maintain and build upon the collaborations and networks created in the CHL program, which evaluated 5,200 children across the Pacific region. In Hawaii, the added sugar in commercial fruit juice was identified as a major source of calories, and the Head Start program adopted the CHL recommendation to revise their meal vendor contract to replace fruit juice with real fruit, in addition to incorporating other recommendations to reduce fat and calorie content of school meals. CHL Hawaii transitioned the US Affiliated Pacific Food Guide: A Children's Healthy Living Program Resource for Nutrition from a pdf into a website: http://manoa.hawaii.edu/ctahr/pacificfoodguide. This resource was previously developed for instructional purposes, but is now used as an extension resource and is referenced in the updated Hawaii Diet Manual being developed by the Hawaii Academy of Nutrition and Dietetics for use by over 300 practicing Dieticians in the State of Hawaii. It provides freely accessible nutrition and contextual information on the wide range of fruits, vegetables, seafood, and other meat sources available and specific to the Pacific region. This resource is complementary to other online resources on regional foods. CHL initiated a CHL Summer Institute program integrating Extension and Instructional programs by transforming specialized curriculum in child obesity prevention, health and measurement. The CHL Summer Institute 2016 educated 102 students and brought in $50,000 in tuition via the UH Outreach College. The revenue generated from fees will contribute to the continued delivery of this program ensuring greater longevity and community benefits. Efforts are underway to develop a certificate program for students and health professionals to receive specialized training in childhood obesity prevention.

Work was also initiated to examine the impact of parental / caregiver attitudes and actions on adolescent eating and exercise behaviors, and identification of culturally appropriate parental best practices. Cohabiting extended families are also common in Hawaii and Pacific populations, and older adults were selected for interviews, recording of reminiscence films, and subsequent construction of "life advice" films to promote healthy adolescent behaviors.

2. Brief description of the target audience

Target audiences are food producers and retailers, caregivers, and members of the public (particularly those from Pacific lineages at risk from diabetes), both in the community at large (as in schools and after-school programs) or participating in community wellness programs and community development programs such as 4H. Current programs focus on children and families from at-risk native populations in communities in Hawaii, and across the Pacific region.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	636	429	43	79

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

Patent Applications Submitted

Year:	2016
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	0	14	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of workshops, filed days, or demonstrations conducted.

Year	Actual
2016	6

Output #2

Output Measure

- Presentations at national and international meetings.

Year	Actual

2016	4

Output #3

Output Measure

- Grant proposals submitted.

Year	Actual
2016	3

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of stakeholders who increased knowledge in at least one issue.
2	Dollar value of grants and contracts obtained.

Outcome #1

1. Outcome Measures

Number of stakeholders who increased knowledge in at least one issue.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	322

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Information is needed by children, parents and health professionals on best means of reducing childhood obesity in Hawaii and the Pacific Region.

What has been done
Stakeholders have received appropriate information on reducing childhood obesity through improved diet and increased exercise through workshops, demonstrations, extension publications and nutrition website. Partnerships have been established with other Pacific basin jurisdictions.

Results
Children in Hawaii have begun to change their behavior and are losing weight in a healthy manner. Infrastructure is being developed with collaborating jurisdictions to sustain and continue to expand the children's healthy living (CHL) program throughout the Pacific Region.

4. Associated Knowledge Areas

KA Code	Knowledge Area
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
724	Healthy Lifestyle
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

Outcome #2

1. Outcome Measures

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
2016	279931

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Resources are needed to organize and implement healthy living and obesity prevention programs for children in Hawaii and the Pacific Basin.

What has been done
Extramural resources were solicited to promote healthy living and develop and implement methods and tools to combat childhood obesity.

Results
Resources were obtained to promote healthy living and develop and implement methods and tools to combat childhood obesity.

4. Associated Knowledge Areas

KA Code	Knowledge Area
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
724	Healthy Lifestyle
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

This is relatively new program area with limited faculty, and requires developing relationships with community-based organizations. State and federal regulations governing the inclusion of children in research can cause delays in program initiation and implementation.

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.

V(A). Planned Program (Summary)

Program # 10

1. Name of the Planned Program

Food Safety

☑ 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
212	Diseases and Nematodes Affecting Plants	0%		19%	
402	Engineering Systems and Equipment	0%		6%	
404	Instrumentation and Control Systems	0%		7%	
501	New and Improved Food Processing Technologies	0%		21%	
511	New and Improved Non-Food Products and Processes	0%		7%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	10%		7%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	40%		26%	
723	Hazards to Human Health and Safety	15%		7%	
903	Communication, Education, and Information Delivery	35%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	1.0	0.0	1.0	0.0
Actual Paid	1.7	0.0	1.5	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**
29356	0	53598	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
29356	0	53598	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
428701	0	546917	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Policies on Good Agricultural Practices and Good Handling Practices (GAP & GHP) have been developed to minimize the risk of food borne illnesses and insure a safe food supply. Pending implementation of the Food Safety Modernization Act (FSMA) is putting edible crop producers' agricultural practices under close scrutiny, and raising anxiety among producers over the costs associated with implementation. Increased food safety measures may minimize hazards related to microbial food borne illnesses and increase consumer confidence in the safety of locally produced fruits and vegetables, but producers and processors are in need of training and assistance to bear the requirements and costs of improved practices and navigate the regulations.

CTAHR continued to intensify efforts to educate growers about FSMA regulations regarding food safety practices on-farm and in packing areas with educational workshops and continued improvements to a comprehensive food safety website with a pre-audit checklist. In addition, CTAHR extension faculty offered workshops for socially disadvantaged producers on risk management, correct handling and application of pesticides, fertilizer/pesticide monitoring and record keeping, and sanitation requirements to reduce the risk of food borne illness. CTAHR faculty also conducted food handling workshops for employees in food processing facilities in Hawaii and throughout the American Pacific. Multistate activities included developing Extension food policy and food safety courses for food inspectors for Temporary Food Establishment Food Safety. Ethnic Foods Safety course materials were initiated this year. CTAHR will develop more of these types of add-on curricula to address clientele needs that are not addressed by standardized curricula. In particular, for Hawaii and the Pacific region, food safety principals must be logically and practically integrated with cultural and regional norms and with sustainable and organic agricultural practices.

Research efforts continued to focus on detection of pesticide residues, contaminants and pathogens in fresh produce, and improved/alternative methods of sterilization processing. Risks to consumers from pesticide contamination were addressed in pesticide residue evaluations under the IR-4 program to establish guidelines for pesticide registrations for use in minor crops. Research to develop simple, hand-held methods for detection of environmental pathogens in the field was advanced by development and validation of an open-source, hand-held, versatile high-precision potentiostat with Bluetooth and WiFi capability. Development of a common platform for wireless data acquisition and control systems is expected to accelerate the commercialization of field-based analytical techniques based on nanotechnology.

A method for post-harvest microbial decontamination of fresh produce surfaces was developed using a pulsed carbon dioxide laser in combination with conjugated gold nanoparticles applied to the fruit surface, and was found to be effective in achieving a 90% microbial reduction from the surface of mango and other heat-sensitive foods. Work also continued to refine the use of lime and orange juices as safe

antimicrobial preservatives for fresh produce, and java plum juice was found to have strong antimicrobial activity.

2. Brief description of the target audience

This program reaches from farms to food processing facilities; to consumers, hospitals and research facilities. Prevention, detection and mitigation of food-borne pathogens is a critical concern for local farms and processing facilities, home gardeners, medical facilities, and retailers of food products.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	363	2500	100	50

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

Patent Applications Submitted

Year: 2016

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	0	12	12

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of workshops, field days and demonstrations

Year	Actual
2016	24

Output #2

Output Measure

- Presentations at national and international meetings.

Year	Actual
2016	7

Output #3

Output Measure

- Grant proposals submitted.

Year	Actual
2016	3

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of people adopting one or more practices which result in improved food safety.
2	Dollar value of grants and contracts obtained.

Outcome #1

1. Outcome Measures

Number of people adopting one or more practices which result in improved food safety.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	320

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Protection of food safety is both an individual and well as a societal responsibility. Farms, food processors, markets, restaurants as well as the individual consumer all have their respective responsibilities in maintaining a safe food supply. The need for research and training has been increased by adoption of the Food Safety Modernization Act (FSMA). CTAHR has the responsibility to provide science-based information on food safety to all these groups.

What has been done
Training of farmers and food processors has been accomplished through individual coaching, extension publications, websites, workshops and non-formal education. Individuals have reported adoption of practices learned.

Results
The safety of Hawaii's fresh and processed foods has been improved through these activities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
212	Diseases and Nematodes Affecting Plants
402	Engineering Systems and Equipment
404	Instrumentation and Control Systems
501	New and Improved Food Processing Technologies
511	New and Improved Non-Food Products and Processes

711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #2

1. Outcome Measures

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
2016	163193

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Improved food safety practices by food producers, processors and consumers are needed to protect public health. Funding is needed to support these programs, as well as research on improving food safety.

What has been done
Extramural funds have been obtained in support of research and educational programs in food safety.

Results
Hawaii's food supply is safer, and Hawaii's agricultural industry is more competitive and better prepared for the Food Safety Modernization Act and compliance programs required by retailers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
212	Diseases and Nematodes Affecting Plants
402	Engineering Systems and Equipment
404	Instrumentation and Control Systems
501	New and Improved Food Processing Technologies

511	New and Improved Non-Food Products and Processes
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Retailers and consumers have a strong interest in food safety, but processors and farmers face difficulties due to the costs associated with food safety certification compliance. Food safety regulations and buyer expectations are changing over time. Thus, extramural funding in support of this program, and public/client and political interest is inconsistent.

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.

VI. National Outcomes and Indicators

1. NIFA Selected Outcomes and Indicators

Childhood Obesity (Outcome 1, Indicator 1.c)	
0	Number of children and youth who reported eating more of healthy foods.
Climate Change (Outcome 1, Indicator 4)	
1	Number of new crop varieties, animal breeds, and genotypes whit climate adaptive traits.
Global Food Security and Hunger (Outcome 1, Indicator 4.a)	
25553	Number of participants adopting best practices and technologies resulting in increased yield, reduced inputs, increased efficiency, increased economic return, and/or conservation of resources.
Global Food Security and Hunger (Outcome 2, Indicator 1)	
1	Number of new or improved innovations developed for food enterprises.
Food Safety (Outcome 1, Indicator 1)	
1	Number of viable technologies developed or modified for the detection and
Sustainable Energy (Outcome 3, Indicator 2)	
0	Number of farmers who adopted a dedicated bioenergy crop
Sustainable Energy (Outcome 3, Indicator 4)	
0	Tons of feedstocks delivered.