

# 2018 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, The Center for Tropical and Subtropical Aquaculture, and the Western Insular Pacific Sun Grant Subcenter. Dr. Nicholas Comerford continued as Dean and Director for Research and Cooperative Extension effective September 2017. Dr. Comerford was previously the director of North Florida Research and Education Center in the University of Florida, where he was a professor in the Soil and Water Science Department. Mr. Kelvin Sewake continued as the Interim Associate Dean and Associate Director for Cooperative Extension since September 2015. Dr. Ania Wieczorek also continued as Interim Associate Dean for Academic and Student Affairs since January 2017. Dr. Jinzeng Yang, a professor of animal science, ended his term as the Interim Associate Dean and Associate Director for Research effective December 2018. He was replaced by Dr. Walter Bowen as of late February 2019.

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 and located in the middle of Pacific Ocean, CTAHR's programs have been focused on Hawaii's unique natural resources, specialty crops, livestock, invasive species, leadership development in both youth and adults, health, and community needs. The first five of our ten program areas address local issues and priorities, while program areas 6-10 are those areas that had been identified as national priorities by USDA-NIFA. In FY2018, we reassessed our program areas for possible consolidation to further emphasize USDA priorities in the future. This change will be reflected in the upcoming Plan of Work.

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 intermittent volcanic activity, e.g. vog (volcanic fog) and lava flows. During 2018, lava flows from eruption of the Kilauea volcano in East Hawaii on the Big Island destroyed about 60% of our papaya production and much of our dendrobium orchid production. A major storm also damaged 80% of the wetland taro produced on Kauai that is used to make poi, a Hawaiian staple food. Farmers are struggling with recovery from both the lava and the flood.

Hawaii has 7,000 farms of which 63% are less than 10 acres in size, and another 25% of farms fall between 10-49 acres in land size. Although the cost of ocean transportation is not cheap, Hawaii imports nearly 90% of its food due to the lower and more competitive prices of food coming from the Mainland US and Asian countries. Nevertheless, Hawaii's agricultural sector includes specialty crops grown nowhere else in the USA. Furthermore, Hawaii's Governor has proposed an ambitious goal of doubling local food production by 2020, presenting CTAHR with a huge challenge in trying to meet that goal.

It is evident that Hawaii's challenges are many. Hawaii is unique in its social and cultural mix, with many first-generation immigrants entering agricultural production with a wide range of cultural practices and dietary preferences in the population. Communication with our immigrant farmers is difficult and requires translation services in our extension programs. Fortunately, the state legislature has been supportive of our college by providing some funding for translation. They have also provided 10 new extension agent

positions which will help increase our capacity for outreach. The costs of land, labor, and energy exceed those found in most other states. Higher fuel costs add significantly to the costs of production, importing agrochemicals and animal feed, and exporting products to distant markets. The high costs of energy and lack of skilled labor and interest in farming are major challenges. Although livestock producers in Hawaii are making progress towards the goal of grass-finished healthy beef, virtually all calves are still shipped to the mainland feedlots due to lack of economic local feed. Lack of affordable slaughterhouses for livestock is another challenge for small livestock producers and the promoting of local meat production. Invasive species and the attendant costs of insect, disease, and weed management, and export limitations imposed by plant quarantine regulations also place additional burden on Hawaii's farmers.

CTAHR faculty rise to these challenges by engaging in a broad spectrum of research and extension activities, including management of invasive species that constantly threaten the "gateway" state of Hawaii, improved cultivation and processing of specialty crops, development of value-added products, increasing forest productivity, protection of forests, watersheds and coastal resources, plant and animal breeding and genetic improvement, biofuel development to address soaring energy costs and fossil fuel depletion, plant stresses related to drought and climate change, food safety and security, the health (mental, physical, and financial) of Hawaii's citizens and communities, human nutrition programs, and fundamental agricultural sciences such as plant and animal genetics, physiology and pathology. As in past years, our FY2018 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 FY2018. Efforts continued to battle childhood obesity in the region, building upon the success of a NIFA-funded Children's Healthy Living Program (CHL) for Remote Underserved Minority Populations of the Pacific. Conservation of Hawaii's natural resources and native biota continued to be priorities, and included mitigation of climate effects. Food safety projects addressed the FDA's Food Safety Modernization Act enhancing Good Agricultural Practices and Good Handling Practices training for farmers and processors, and developing processing and novel preservation methods for Hawaii's fresh produce, fish and meat. Research continued on lignocellulosic and oil biofuel crops, recognizing Hawaii's energy needs, including the use of 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. Reflecting on our location in a Pacific island-state, CTAHR continued to address issues associated with specialty regional and ethnic crops, including related work on pest management, crop improvement, and documentation of dietary and health impacts.

In FY2018, CTAHR's large backlog of cumulative deferred repair and maintenance (CDRM) of its buildings and research facilities remained unaddressed. Although these issues had been discussed with the State of Hawaii and the University of Hawaii, there was no significant progress in funding the CDRM projects nor planning for such activities. Further worsening the situation was flood damage to our Komohana facility in Hilo due to a major storm. However, it seems that CTAHR will be receiving FEMA assistance. Regarding faculty positions, tremendous progress was made with the state Legislature in providing 10 new extension agent positions for agriculture in food, ornamentals, livestock, finance and economics. The college was able to fill 8 out of 10 of these positions so far and will complete the last two hires soon. Other new faculty hired this year was the result of salary savings from retirements and resignations. Despite challenges, research continued to advance in FY2018, and extension engagement with the public and farming communities remained strong, with continuing strong interest in the Master Gardener program, the 4-H Youth Leadership Development program, and beginning farming GoFarm 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: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	50.0	0.0	39.0	0.0
Actual	56.3	0.0	46.6	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 under-served 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 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 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 or local external professionals in position search committees for faculty positions, including professor, 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 relationship provides a means for stakeholder participation and input on all matters of mutual concerns and interests. If CTAHR faculty is not available in a particular local issue, 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. The Dean of CTAHR has a monthly meeting with the Director of the Hawaii Department of Agriculture. In recent years, there have been an increasing numbers of legislative bills related to agriculture, food production, and marketing in Hawaii. CTAHR's Dean and Associate Deans for Research and Extension have been a resource for information for different agriculture groups on related issues. 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 communities or associations. Most of the commodities and program areas have one or more organizations representing their commodities 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 and community association meetings, participation on the State of Hawaii Board of Agriculture, Hawaii Invasive Species Council and other state boards and committees; participation in ad hoc state task forces such as the Coffee Berry Borer Taskforce, Governor's Taskforce on Vog, Governor's Task Force on Rat Lungworm Disease; consultation with the Hawaii Farm Bureau Federation, and long standing "Industry Analysis" and "Strategic Planning" processes that are applied to key industries.

Other techniques used to gather stakeholder inputs are surveys, commodity organization meetings, facilitated meetings, through feedback and input from the Farm Bureau or Farmers Union United, and direct input from stakeholders and the Hawaii legislature. CTAHR faculty and administrators 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 Floriculture and Nursery Association, Hawaii Orchid Growers Association, Hawaii Tropical Fruit Growers Association, Hawaii Macadamia Nut Association, Hawaii Cattlemen's 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 social media via 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.**

CTAHR is stakeholder-need driven. Stakeholder 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. A recent important stakeholder with which we engage regularly are elected representatives of the Hawaii legislature. This is done through office visits and testimony before committees.

### **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 that upcoming retirements, past budget and staffing cuts, and some restrictions on hiring, these requests will be difficult to satisfy. However, in the next several years, as the State economy is now slightly better than in past years and coupled with faculty retirement salary savings and a favorable state legislature to CTAHR, CTAHR is poised to begin hiring once again in high priority positions following years of little to no faculty hiring. Furthermore, CTAHR has an excellent relationship with the vast majority of its stakeholder groups, and these groups are working proactively through their elected state and federal officials to make their needs and the needs of the State of Hawaii known to NIFA. As an example, we have heard from a wide-range of stakeholders that Hawaii must be more involved with aquaculture and protected agriculture. CTAHR, in response, is organizing its hiring prospects to meet these research and extension needs.

Hawaii receives an average of 24 new insect introductions to the Islands 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, the little fire ant, and rat lungworm disease for food safety are of great concern to our stakeholders and food producers. They wish to see not only greater NIFA funding and program resources applied to these key pests and diseases 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 diseases, and protect and develop the crops that are uniquely important in the US Affiliated Tropics.

**IV. Expenditure Summary**

<b>1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)</b>			
<b>Extension</b>		<b>Research</b>	
<b>Smith-Lever 3b &amp; 3c</b>	<b>1890 Extension</b>	<b>Hatch</b>	<b>Evans-Allen</b>
{No Data Entered}	{No Data Entered}	{No Data Entered}	{No Data Entered}

<b>2. Totaled Actual dollars from Planned Programs Inputs</b>				
	<b>Extension</b>		<b>Research</b>	
	<b>Smith-Lever 3b &amp; 3c</b>	<b>1890 Extension</b>	<b>Hatch</b>	<b>Evans-Allen</b>
<b>Actual Formula</b>	1341984	0	1498928	0
<b>Actual Matching</b>	1341984	0	1498928	0
<b>Actual All Other</b>	1041602	0	2780484	0
<b>Total Actual Expended</b>	3725570	0	5778340	0

<b>3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous</b>				
<b>Carryover</b>	373676	0	528942	0

**V. Planned Program Table of Content**

S. No.	PROGRAM NAME
1	Sustain, Protect, and Manage Hawaii's Natural Resources and Environment
2	Hawaii's Diversified Tropical Crop Systems for Sustainability and Competitiveness
3	Invasive Species Education and Management
4	Youth, Family and Community Development
5	Health and Wellness of Hawaii's Families and Communities
6	Global Food Security and Hunger
7	Climate Change
8	Sustainable Energy
9	Childhood Obesity
10	Food Safety

**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

<b>KA Code</b>	<b>Knowledge Area</b>	<b>%1862 Extension</b>	<b>%1890 Extension</b>	<b>%1862 Research</b>	<b>%1890 Research</b>
102	Soil, Plant, Water, Nutrient Relationships	8%		13%	
111	Conservation and Efficient Use of Water	0%		5%	
112	Watershed Protection and Management	5%		4%	
121	Management of Range Resources	22%		3%	
122	Management and Control of Forest and Range Fires	3%		0%	
123	Management and Sustainability of Forest Resources	0%		7%	
124	Urban Forestry	0%		5%	
131	Alternative Uses of Land	0%		4%	
132	Weather and Climate	0%		4%	
133	Pollution Prevention and Mitigation	3%		11%	
204	Plant Product Quality and Utility (Preharvest)	0%		4%	
205	Plant Management Systems	8%		3%	
212	Diseases and Nematodes Affecting Plants	0%		10%	
213	Weeds Affecting Plants	6%		4%	
215	Biological Control of Pests Affecting Plants	0%		5%	
216	Integrated Pest Management Systems	13%		0%	
306	Environmental Stress in Animals	16%		2%	
307	Animal Management Systems	16%		2%	
605	Natural Resource and Environmental Economics	0%		10%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	0%		4%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)**

**1. Actual amount of FTE/SYs expended this Program**

Year: 2018	Extension		Research	
	1862	1890	1862	1890
<b>Plan</b>	4.0	0.0	6.0	0.0
<b>Actual Paid</b>	2.4	0.0	1.8	0.0
<b>Actual Volunteer</b>	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
214903	0	170573	0
<b>1862 Matching</b>	<b>1890 Matching</b>	<b>1862 Matching</b>	<b>1890 Matching</b>
265548	0	230760	0
<b>1862 All Other</b>	<b>1890 All Other</b>	<b>1862 All Other</b>	<b>1890 All Other</b>
270013	0	280631	0

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

Hawai'i has a very unique, diverse, and fragile ecosystem. Therefore, research and extension efforts on effective natural resources management continue to be a high priority of CTAHR. Active projects include efficient agricultural chemical use, waste management, forest resource management, agroforestry, range management, wildland 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. To preserve, protect, and renew Hawaii's natural resources, we have also developed programs to provide farming and environmental education to the public with emphasis on schools, youth groups, home gardeners, urban/residential communities, land managers, and local government and private partners. We are also highly involved in international partnerships and collaborations on management of agricultural and natural resources.

Research within this program is focusing on an array of issues that impact on sustainable resource management, ecosystem health, and economic prosperity. For example, research on "green accounting" has led to wealth estimates that explicitly include environmental and social costs, thus linking the market economy to the underlying ecosystem. Other research is helping communities understand how to manage common pool resources (e.g., harvesting seaweed) for sustainable and resilient production. Research at different scales, from the field plot to the watershed level, is being conducted to improve our understanding of how to better manage plant and animal production, control or eradicate invasive species, minimize the potential negative impact of nutrient and agrochemical use on the environment, improve soil health, and ensure water quality is maintained or improved.

A recent pest introduction, the Two-lined Spittlebug (TLSB) was identified in Kona, Hawai'i. The damage was extensive and threatened the beef cattle industry since this insect feeds on kikuyu and pangola grass that helps feed 70% of the state's beef cattle. To assist livestock producers, a Hawai'i Grazing and Livestock Management Academy was offered by Extension. As a result, producers implemented one or more grazing management strategies over 1,500 acres of ranch lands. Much of Extension's natural

resource management efforts have been provided to the public through the Master Gardener (MG) program. The MG program reaches thousands of students and adults statewide annually. This year, MG-supporting faculty partnered with the USDA Natural Resources Conservation Service and the Department of Education to provide workshops and tours to students on conservation practices, watershed and pollution control. An AGventure 4-H program also provided information to over 550 local 4<sup>th</sup> graders.

**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**

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	9224	8726	3735	967

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

**Patent Applications Submitted**

Year: 2018  
 Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2018	Extension	Research	Total
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<b>Actual</b>	4	116	120
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**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Grant proposals submitted.

<b>Year</b>	<b>Actual</b>
2018	98

**Output #2**

**Output Measure**

- Presentations at international and national meetings.

<b>Year</b>	<b>Actual</b>
2018	20

**Output #3**

**Output Measure**

- Number of workshops and other educational activities held

<b>Year</b>	<b>Actual</b>
2018	127

**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**

<b>Year</b>	<b>Actual</b>
2018	741

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

Protecting Hawaii's natural resources preserves the islands unique environments and native species, enhances the well-being of Hawaii residents, and promotes the main economic engine of the state, the tourism industry. The beauty of nature, ocean and beaches, and mountain are important attractions for visitors to see Hawaii.

#### **What has been done**

Forest conservation and restoration activities have taken place throughout the state, but particularly on the Big Island of Hawaii, where Rapid Ohia Death has been detected and its statewide spread prevented, and 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, especially in the movement of unwanted diseases, insects, and weeds that impact Hawaii's native forests. Many are increasingly adopting more sustainable and environmentally responsible practices. The education and outreach programs from CTAHR have positive impacts on the communities.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
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102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
121	Management of Range Resources
122	Management and Control of Forest and Range Fires
123	Management and Sustainability of Forest Resources
124	Urban Forestry
133	Pollution Prevention and Mitigation
205	Plant Management Systems
213	Weeds Affecting Plants
216	Integrated Pest Management Systems
306	Environmental Stress in Animals
307	Animal Management Systems

## **Outcome #2**

### **1. Outcome Measures**

Total dollar value of grants and contracts obtained.

Not Reporting on this Outcome Measure

### **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.
- Government regulations on environment impacts and pesticide uses for agricultural use may prevent farms from controlling plant diseases.
- When the economy is poor and tourism industry is not doing well, public and private funding decreases and it is more difficult to obtain funding for research and educational programs.
- 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**

N/A

**Key Items of Evaluation**

N/A

**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

<b>KA Code</b>	<b>Knowledge Area</b>	<b>%1862 Extension</b>	<b>%1890 Extension</b>	<b>%1862 Research</b>	<b>%1890 Research</b>
102	Soil, Plant, Water, Nutrient Relationships	6%		3%	
124	Urban Forestry	0%		4%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		8%	
202	Plant Genetic Resources	0%		8%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		3%	
204	Plant Product Quality and Utility (Preharvest)	5%		9%	
205	Plant Management Systems	25%		15%	
211	Insects, Mites, and Other Arthropods Affecting Plants	8%		0%	
212	Pathogens and Nematodes Affecting Plants	5%		11%	
213	Weeds Affecting Plants	1%		5%	
215	Biological Control of Pests Affecting Plants	0%		3%	
216	Integrated Pest Management Systems	25%		11%	
307	Animal Management Systems	7%		2%	
311	Animal Diseases	7%		0%	
501	New and Improved Food Processing Technologies	0%		4%	
502	New and Improved Food Products	0%		2%	
601	Economics of Agricultural Production and Farm Management	3%		2%	
604	Marketing and Distribution Practices	3%		2%	
701	Nutrient Composition of Food	0%		5%	
903	Communication, Education, and Information Delivery	5%		3%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)****1. Actual amount of FTE/SYs expended this Program**

Year: 2018	Extension		Research	
	1862	1890	1862	1890
<b>Plan</b>	11.0	0.0	10.0	0.0
<b>Actual Paid</b>	4.0	0.0	4.4	0.0
<b>Actual Volunteer</b>	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
536001	0	391845	0
<b>1862 Matching</b>	<b>1890 Matching</b>	<b>1862 Matching</b>	<b>1890 Matching</b>
536001	0	391845	0
<b>1862 All Other</b>	<b>1890 All Other</b>	<b>1862 All Other</b>	<b>1890 All Other</b>
197044	0	338639	0

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

Hawaii imports about 90% of its food. Because of this, Hawaii's Governor set a goal a few years ago to double local production of food by 2020. CTAHR has a long history of working to diversify the state's agriculture economy, especially since the 1970's due to the demise of sugarcane and pineapple plantations. CTAHR has conducted basic and applied research to increase production, efficiency, and profitability of diversified agricultural industries while protecting the environment. Research and extension efforts in FY2018 continued to include all areas of tropical agriculture: breeding and crop improvement; variety selection for pest and disease resistance; pest and disease management in both conventional and organic farming; pesticide education; pesticide residue and registration; identification and evaluation of potential new specialty crops; promotion of import replacement with locally grown produce; beef and livestock production; and aquaponics and hydroponics for sustainable soil-less agricultural production. Research efforts across the state are helping growers diversify and take advantage of commercial opportunities for alternative crops, improved varieties, integrated pest management, and post-harvest techniques that reduce losses and improve quality in both ornamental and food production systems. By combining conventional breeding with molecular techniques, researchers are developing and introducing crops and ornamentals that have better resistance to pests and diseases while also possessing the quality characteristics that make them more attractive on the market. Research to better understand other issues such as emerging pests and diseases, a documented decrease in bee pollinators, and the role of the Hawaiian soil microbiome are all contributing to the diversification, sustainability, and competitiveness of Hawaiian agriculture and related industries.

Extension programs offer science-based information and best management practices to current farmers and provided excellent training opportunities for new farmers. Swine problems were identified and producers educated such that 63% use parasite control products, 63% provide iron for piglets, and 52% use vaccines resulting in a significant increase in hogs to market. Fruit fly management education resulted in the reduction of infestation rates and crop losses, and a reduction in use of organophosphates. Due to conservation stewardship practices, the USDA Natural Resources Conservation Service reported that 9,000 acres of agricultural lands in Hawaii have been improved.

**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 crops, 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, therefore 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**

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	29074	138909	8744	6885

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

**Patent Applications Submitted**

Year: 2018

Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2018	Extension	Research	Total
<b>Actual</b>	48	19	67

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number of workshops, research/field day demonstrations conducted

<b>Year</b>	<b>Actual</b>
2018	387

**Output #2**

**Output Measure**

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

<b>Year</b>	<b>Actual</b>
2018	83

**Output #3**

**Output Measure**

- Presentations at international and national meetings

<b>Year</b>	<b>Actual</b>
2018	52

**Output #4**

**Output Measure**

- Number of grant proposals submitted.

<b>Year</b>	<b>Actual</b>
2018	135

**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.

Not Reporting on this Outcome Measure

**Outcome #2**

**1. Outcome Measures**

Number of people who adopt one or more recommended practices.

Not Reporting on this Outcome Measure

**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**

<b>Year</b>	<b>Actual</b>
2018	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**

<b>KA Code</b>	<b>Knowledge Area</b>
102	Soil, Plant, Water, Nutrient Relationships
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
216	Integrated Pest Management Systems
307	Animal Management Systems
311	Animal Diseases
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**

**V(I). Planned Program (Evaluation Studies)**

**Evaluation Results**

{No Data Entered}

**Key Items of Evaluation**

{No Data Entered}

**V(A). Planned Program (Summary)**

**Program # 3**

**1. Name of the Planned Program**

Invasive Species Education and Management

Reporting on this Program

**V(B). Program Knowledge Area(s)**

**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
112	Watershed Protection and Management	0%		13%	
202	Plant Genetic Resources	0%		4%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		2%	
204	Plant Product Quality and Utility (Preharvest)	0%		6%	
205	Plant Management Systems	0%		3%	
211	Insects, Mites, and Other Arthropods Affecting Plants	40%		19%	
212	Pathogens and Nematodes Affecting Plants	30%		13%	
213	Weeds Affecting Plants	0%		25%	
215	Biological Control of Pests Affecting Plants	0%		1%	
216	Integrated Pest Management Systems	30%		4%	
721	Insects and Other Pests Affecting Humans	0%		5%	
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures	0%		5%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)**

**1. Actual amount of FTE/SYs expended this Program**

Year: 2018	Extension		Research	
	1862	1890	1862	1890
<b>Plan</b>	4.0	0.0	5.0	0.0
<b>Actual Paid</b>	0.3	0.0	1.6	0.0
<b>Actual Volunteer</b>	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
51310	0	111599	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
51310	0	111599	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
4092	0	264817	0

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

In Hawaii, the introduction and establishment of invasive species represents a constant threat to agricultural production, farm profitability, and Hawaii's surrounding natural and urban ecosystems. The Hawaii Department of Agriculture has reported the introduction of 28 new insect invaders each year. This alarming fact prompted the creation of a Hawaii Interagency Biosecurity Plan for the State of Hawaii, in which CTAHR plays a significant role in developing detection and mitigation technologies and providing extension education to help minimize the impacts of invasive species. CTAHR coordinates activities with partner agencies, community groups, and other interested stakeholders, and conducts research on the biology and control of invasive insects, plant diseases, and weedy plant species, including studying their impacts on farms, native biota, and local ecosystems, and developing integrated pest management strategies. Integrated research and extension is leading to the development, testing and implementation of comprehensive approaches to the control of invasive species that are based on scientific understanding and participatory methods in both monitoring and control actions. For example, research into peptide toxin cyclotides is resulting in bioengineered pesticides that demonstrate potent phyla-selectivity while having no lasting environmental residual impact. Additionally, research into allelopathic compounds (root phytochemicals) of locally available plant species and agricultural byproducts hopes to result in specific weed-killing compounds that are more environmentally friendly. Integrated research and extension has also provided a framework for confronting the Coffee Berry Borer that is based on prevention (education), detection (early warning), delimitation (SWAT team approach) and response (pruning, sanitation, insecticides). Furthermore, CTAHR's Extension has developed a hot shot team approach to grower education about newly introduced pests and diseases. This team was designed to quickly mobilize to problem locations to provide farmer education on pest biology, management, and control strategies. In addition, a statewide team has the responsibility for leadership in invasive species and conducting meetings and an annual conference on invasive species.

**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**

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	180	0	45	0

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

**Patent Applications Submitted**

Year: 2018

Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2018	Extension	Research	Total
<b>Actual</b>	0	11	11

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number of workshops, field days, demonstrations held

Year	Actual
2018	0

**Output #2**

**Output Measure**

- Number of grant proposals submitted

<b>Year</b>	<b>Actual</b>
2018	26

**Output #3**

**Output Measure**

- Presentations at international and national meetings

<b>Year</b>	<b>Actual</b>
2018	8

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

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

**Outcome #1**

**1. Outcome Measures**

Awareness created

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2018	0

**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, residents, land owners and government conservation management will be more likely to assist in controlling invasive species.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems

**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
2018	0

**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
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems

**Outcome #3**

**1. Outcome Measures**

Total dollar value of grants and contracts obtained.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2018	0

**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**

<b>KA Code</b>	<b>Knowledge Area</b>
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems

**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 by tourists and returning residents.
- Lack of funding, different priorities in extramural grant programs
- Difficulty in coordination with external agencies and partners
- Natural disasters such as flood and weather extremes.

**V(I). Planned Program (Evaluation Studies)**

**Evaluation Results**

N/A

**Key Items of Evaluation**

N/A

**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
131	Alternative Uses of Land	3%		0%	
205	Plant Management Systems	4%		0%	
602	Business Management, Finance, and Taxation	0%		2%	
604	Marketing and Distribution Practices	0%		2%	
608	Community Resource Planning and Development	0%		11%	
703	Nutrition Education and Behavior	2%		0%	
724	Healthy Lifestyle	5%		6%	
802	Human Development and Family Well-Being	22%		25%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	8%		22%	
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures	0%		7%	
805	Community Institutions, Health, and Social Services	10%		7%	
806	Youth Development	40%		7%	
903	Communication, Education, and Information Delivery	6%		11%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)**

**1. Actual amount of FTE/SYs expended this Program**

Year: 2018	Extension		Research	
	1862	1890	1862	1890
<b>Plan</b>	15.0	0.0	4.0	0.0
<b>Actual Paid</b>	1.8	0.0	0.4	0.0
<b>Actual Volunteer</b>	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
211029	0	45640	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
211029	0	45640	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
379849	0	128232	0

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

CTAHR recognizes that the family has a profound influence on the health and well-being of its members, particularly its youth and elderly. CTAHR strengthens families in Hawaii by providing assistance in areas such as family health, intergenerational programs, youth development, and parenting. Research and extension focus on families and community well-being, with results used for continuous program improvement, resource allocation decisions, and advocacy. Well-integrated research and extension initiatives have been developed to improve diet and nutrition in Hawaii's multi-ethnic population, addressing such issues as diabetes, obesity and weight management. CTAHR programs evaluate locally-grown commodities that are underutilized, yet are of high nutritional value. Its outreach programs strengthen its stakeholders' ability to make educated decisions to improve their health, wellness, and overall quality of life.

CTAHR plays a key role in collecting, compiling, and reporting to legislators, government agencies and non-profit organizations on current social indicator data for Hawaiian families and communities. Center on the Family researchers and CTAHR extension faculty work together to develop indicator briefs on topics relevant to the well-being of children and families in Hawaii, disseminate data, and raise public awareness on the conditions and challenges of children and families in Hawaii. These reports have resulted in the 2018 state legislature providing \$12.1 million to the base budget for departments responsible for senior care programs and contributed to the passage of SB2990 that appropriated \$350,000 for an actuarial study as the next step towards a paid family leave program.

Through the Family and Community Education (FCE) organization in Hawaii, CTAHR has provided leadership and support for its mission of "living the Aloha Spirit to strengthen individuals, families and communities through Continuing Education, Developing Leadership, and Community Action." Its 250 members have multiplied Extension's outreach capacity tremendously by providing over 52,000 hours of volunteer time worth \$1.3 million (2016 FCE Annual Report) in community education focused in the major areas of Home/Community/Environment, Youth Education, International, Health and Leadership. These same members have benefited from CTAHR's programs in that: 50% adopted healthy food choices, exercise regularly, and use current communication technology; 65% utilize meeting and organizational skills learned; and 50% collaborate with other organizations to initiate projects, plan and acquire resources for implementation.

The 4-H Youth Leadership program continued its focus on healthy living, science, citizenship, volunteer development, and marketing and public relations. These programs and clubs were supported by 398 adult volunteers serving an average of 128 hours per volunteer. Based on Hawaii's value of \$25.40 per hour for volunteers, the value of the 4-H volunteers is \$1.3 million per year. Thus, Hawaii continued to strengthen its volunteer base to ensure a strong 4-H 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**

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	18476	2387130	17632	18364

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

**Patent Applications Submitted**

Year: 2018

Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2018	Extension	Research	Total
<b>Actual</b>	2	7	9

**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

<b>Year</b>	<b>Actual</b>
2018	22847

**Output #2**

**Output Measure**

- Number of volunteer hours

<b>Year</b>	<b>Actual</b>
2018	138385

**Output #3**

**Output Measure**

- Presentations at international and national meetings.

<b>Year</b>	<b>Actual</b>
2018	11

**Output #4**

**Output Measure**

- Grant proposals submitted.

<b>Year</b>	<b>Actual</b>
2018	73

**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**

<b>Year</b>	<b>Actual</b>
2018	8746

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

**What has been done**

**Results**

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
205	Plant Management Systems
703	Nutrition Education and Behavior
724	Healthy Lifestyle
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
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**

<b>Year</b>	<b>Actual</b>
2018	0

**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**

<b>KA Code</b>	<b>Knowledge Area</b>
131	Alternative Uses of Land
205	Plant Management Systems
703	Nutrition Education and Behavior
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
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 inter-generational 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**

N/A

### **Key Items of Evaluation**

N/A

**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
302	Nutrient Utilization in Animals	0%		1%	
502	New and Improved Food Products	0%		4%	
701	Nutrient Composition of Food	0%		10%	
702	Requirements and Function of Nutrients and Other Food Components	0%		9%	
703	Nutrition Education and Behavior	33%		2%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	5%		0%	
724	Healthy Lifestyle	13%		20%	
801	Individual and Family Resource Management	0%		8%	
802	Human Development and Family Well-Being	46%		21%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	0%		8%	
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures	0%		17%	
805	Community Institutions and Social Services	3%		0%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)**

**1. Actual amount of FTE/SYs expended this Program**

Year: 2018	Extension		Research	
	1862	1890	1862	1890
<b>Plan</b>	5.0	0.0	3.0	0.0
<b>Actual Paid</b>	0.4	0.0	0.2	0.0
<b>Actual Volunteer</b>	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
55099	0	21243	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
55099	0	21243	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
61744	0	6483	0

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

Factors including economic constraints, Hawaii's aging population, and social and cultural backgrounds affect food choice and thereby influence health and wellness in Hawaii. Obesity and diabetes are common medical problems in Pacific populations. A Center for Disease Control and Prevention study stated that native Hawaiians are in worse health than many other Americans, and that they were more likely to suffer from asthma, diabetes, and obesity. The study indicated that nearly 40% of native Hawaiians are obese. While conducting research on the impact of local diets on Hawaiian populations, CTAHR researchers also take advantage of the National Health and Nutrition Examination Survey (NHANES) and the What We Eat in America (WWEIA) database to explore and derive additional insight that may be useful for improving our understanding of how diet may influence health. Thus far, CTAHR researchers have examined the optimal amount and type of dietary protein for good health, and have also been able to show that dietary changes are resulting in greater consumption of trace minerals like manganese (Mn) that may be having a negative impact on human health.

Activities in Extension have continued focusing on translating current science-based nutrition information and disseminating it broadly to the public. A weekly "Health Options" column in the major local newspaper has a readership of over 264,000 adults on the island of Oahu alone, not including the other islands or youth. A "Got Nutrients" website with "Daily Tips" provided information on nutrition, exercise or health-related topics to over 2,000 subscribers. This website serves health professionals, extension personnel, dietitians, physicians, and individuals from many walks of life. Subscribers come from over 60 universities around the country and world.

Wellness of Hawai'i's families also includes proper childhood education for the 106,000 children under the age of six who are served in many different settings from public to private programs. Hawai'i lags the nation in terms of offering an affordable and quality coordinated early learning system. The Hawai'i Early Learning Needs Assessment (HELNA) collected and analyzed assessment data. Findings indicated 22,455 "hits" or page views on project publications. These findings were used in the state's early learning strategic plan, the Early Childhood Action Strategy Strategic Plan, and the 2019-2021 Childcare and Development Fund plan. Early childhood professionals, advocates, state agency staff and the general public increased their knowledge on the availability, cost, and quality of childcare and early learning programs in the state.

**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?**

eXtension was not used in this program

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	2186	488913	504	50

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

**Patent Applications Submitted**

Year: 2018

Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2018	Extension	Research	Total
<b>Actual</b>	0	4	4

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number of outreach activities and events conducted

Year	Actual
2018	72

**Output #2**

**Output Measure**

- Presentations at international and national meetings.

<b>Year</b>	<b>Actual</b>
2018	5

**Output #3**

**Output Measure**

- Grant proposals submitted.

<b>Year</b>	<b>Actual</b>
2018	32

**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 Knowledge Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2018	235

**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**

<b>KA Code</b>	<b>Knowledge Area</b>
703	Nutrition Education and Behavior
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
724	Healthy Lifestyle
802	Human Development and Family Well-Being
805	Community Institutions and Social Services

**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**

<b>Year</b>	<b>Actual</b>
2018	0

**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**

<b>KA Code</b>	<b>Knowledge Area</b>
703	Nutrition Education and Behavior
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
724	Healthy Lifestyle
802	Human Development and Family Well-Being
805	Community Institutions and Social Services

**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**

N/A

**Key Items of Evaluation**

N/A

**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

<b>KA Code</b>	<b>Knowledge Area</b>	<b>%1862 Extension</b>	<b>%1890 Extension</b>	<b>%1862 Research</b>	<b>%1890 Research</b>
102	Soil, Plant, Water, Nutrient Relationships	0%		6%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		8%	
202	Plant Genetic Resources	0%		7%	
204	Plant Product Quality and Utility (Preharvest)	0%		3%	
205	Plant Management Systems	0%		3%	
212	Pathogens and Nematodes Affecting Plants	0%		16%	
216	Integrated Pest Management Systems	0%		4%	
301	Reproductive Performance of Animals	0%		4%	
302	Nutrient Utilization in Animals	0%		9%	
305	Animal Physiological Processes	2%		8%	
306	Environmental Stress in Animals	5%		5%	
307	Animal Management Systems	21%		5%	
311	Animal Diseases	8%		2%	
315	Animal Welfare/Well-Being and Protection	2%		0%	
404	Instrumentation and Control Systems	0%		4%	
511	New and Improved Non-Food Products and Processes	0%		3%	
703	Nutrition Education and Behavior	11%		3%	
704	Nutrition and Hunger in the Population	29%		7%	
724	Healthy Lifestyle	11%		0%	
801	Individual and Family Resource Management	11%		3%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)****1. Actual amount of FTE/SYs expended this Program**

Year: 2018	Extension		Research	
	1862	1890	1862	1890
<b>Plan</b>	6.0	0.0	6.0	0.0
<b>Actual Paid</b>	0.4	0.0	6.6	0.0
<b>Actual Volunteer</b>	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
99508	0	528672	0
<b>1862 Matching</b>	<b>1890 Matching</b>	<b>1862 Matching</b>	<b>1890 Matching</b>
99508	0	528672	0
<b>1862 All Other</b>	<b>1890 All Other</b>	<b>1862 All Other</b>	<b>1890 All Other</b>
14322	0	1285620	0

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

CTAHR strongly supports this national priority; it is our program area with the largest number of projects. Integrated research and extension efforts continue to address food security issues by providing critical scientific knowledge and technologies to sustainably produce and improve food products and processing for new and existing local and export markets.

Basic research is being carried out to better understand how mechanisms at the molecular level control growth processes in both plant and animal systems, and how high-throughput sequencing methods can be used to identify and exploit genes and allelic variation for developing improved germplasm. Examples thus far include the identification of key genes that contribute to skeletal muscle growth in farm animals (swine, beef, chicken), genetic selection of fast-growing strains of Pacific white shrimp, identification of the genes and proteins that influence the negative impact of heat stress on egg formation (chicken), new technology for next-generation gene/trait stacking in plant systems, and the identification of new genetic resources that can be used in selection and breeding programs for banana, papaya, taro, and sweet potato. Basic research is also helping to develop virus detection assays for the identification of newly emerging viruses. Applied research with links to extension is helping to assess the likely environmental impact of potential changes in the food crops that are grown locally in Hawaii (compared to imported food), as well as the development of best management practices for the sustainable productivity of Hawaii's range and pasturelands. Research to better understand the potential of indigenous farming methods is also underway.

The Hawaii Expanded Food and Nutrition Education Program (EFNEP) is part of CTAHR's Nutrition Education for Wellness Program (NEW). NEW is a collective community nutrition endeavor that includes EFNEP, SNAP-ED, and the Hawaii Child Care Nutrition Program. NEW has provided much-needed education via educational materials, curricula, resources, and special projects, and has brought about significant improvements in food resource management, nutrition practices, and food safety practices. In 2018, there was a total of 2,192 direct and indirect contacts among adults and youth. Data was collected based on pre- and post-family records of adults and youths. Adults reported that they have made positive changes as follows: 93% in diet quality, 66% in physical activity, 75% in food safety, 46% in food security,

and 74% in food resource management. Youth reported making positive changes as follows: 88% in diet quality, 58% in food safety, 66% in physical activity, 40% in food security, and 52% in food resource management.

CTAHR's Integrated Tilapia Aquaculture Research and Education Program, through science-based information provided to the Hawai'i Department of Agriculture Board and decision makers, was able to reverse a long-standing restriction on the importation of Nile tilapia. This change would allow the growth and commercialization of the Nile tilapia in Hawai'i and make the aquaculture industry more competitive in the future.

**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?**

eXtension was not used in this program

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	573	2319	619	542

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

**Patent Applications Submitted**

Year: 2018  
 Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2018	Extension	Research	Total
<b>Actual</b>	1	41	42

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number of workshops, field days and demonstrations.

<b>Year</b>	<b>Actual</b>
2018	25

**Output #2**

**Output Measure**

- Presentations at international and national meetings

<b>Year</b>	<b>Actual</b>
2018	24

**Output #3**

**Output Measure**

- Grant proposals submitted

<b>Year</b>	<b>Actual</b>
2018	28

**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**

<b>Year</b>	<b>Actual</b>
2018	603

### **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 lead 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**

<b>KA Code</b>	<b>Knowledge Area</b>
212	Pathogens and Nematodes Affecting Plants
305	Animal Physiological Processes
306	Environmental Stress in Animals
307	Animal Management Systems
311	Animal Diseases

315	Animal Welfare/Well-Being and Protection
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle
801	Individual and Family Resource Management

**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**

<b>Year</b>	<b>Actual</b>
2018	0

**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**

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
305	Animal Physiological Processes
306	Environmental Stress in Animals
307	Animal Management Systems
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection

511	New and Improved Non-Food Products and Processes
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle
801	Individual and Family Resource Management

**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**

N/A

**Key Items of Evaluation**

N/A

**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	20%		20%	
102	Soil, Plant, Water, Nutrient Relationships	14%		15%	
122	Management and Control of Forest and Range Fires	15%		15%	
131	Alternative Uses of Land	15%		15%	
132	Weather and Climate	18%		17%	
213	Weeds Affecting Plants	18%		18%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)**

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
<b>Plan</b>	1.0	0.0	1.0	0.0
<b>Actual Paid</b>	0.5	0.0	0.5	0.0
<b>Actual Volunteer</b>	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
56063	0	35022	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
7205	0	30526	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	232854	0

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

Integrated research and extension efforts in FY2018 continued to focus on quantifying changes in carbon storage, carbon cycling, and carbon flux in Hawaiian terrestrial systems as a result of land use dynamics, non-native invasive species, wildfire, and climate change. The CTAHR scientists doing this research have developed significant partnerships for sharing data and methods with other academic institutions in the Pacific and on the U.S. mainland, and with regional groups such as the Pacific Island Climate Change Cooperative (PICCC) and the USDA SW Climate Hub. One is also a member of the Hawaii State Planning Office Greenhouse Gas Sequestration Task Force and the Carbon Farming Task Force. CTAHR has become recognized as a valued resource among the fire and land management community in Hawaii and the Pacific through the outputs and relationships developed by the Wildland Fire Program. The program regularly fields requests for technical assessments and advice on mitigation and post-fire response projects, participation in and facilitation of multi-agency wildfire meetings and coordinating groups, and providing syntheses of existing data and expertise on novel analyses. Through development and management of the Pacific Fire Exchange (PFX; with partners at the US Forest Service and Hawaii Wildfire Management Organization) the Wildland Fire Program has created a platform for delivering science-based best practices, creating opportunities for new collaborations and partnerships through field tours, workshops and workshops, and established an infrastructure for tracking stakeholder needs and program success.

**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 by work with extension agents to develop tools that 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**

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	0	0	0	0

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

**Patent Applications Submitted**

Year: 2018

Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2018	Extension	Research	Total
Actual	0	15	15

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number of workshops, field days, or demonstrations conducted

Year	Actual
2018	0

**Output #2**

**Output Measure**

- Presentations at national and international meetings.

Year	Actual
2018	4

**Output #3**

**Output Measure**

- Grant proposals submitted.

Year	Actual
2018	17

**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.

Not Reporting on this Outcome Measure

**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**

<b>Year</b>	<b>Actual</b>
2018	0

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

**What has been done**

**Results**

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
122	Management and Control of Forest and Range Fires

**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 transferable to the tropics, and there is a need for improved tropical models.

**V(I). Planned Program (Evaluation Studies)**

**Evaluation Results**

N/A

**Key Items of Evaluation**

N/A

**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%		17%	
204	Plant Product Quality and Utility (Preharvest)	0%		10%	
402	Engineering Systems and Equipment	0%		16%	
511	New and Improved Non-Food Products and Processes	0%		50%	
604	Marketing and Distribution Practices	0%		7%	
	<b>Total</b>	0%		100%	

**V(C). Planned Program (Inputs)**

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
<b>Plan</b>	1.0	0.0	1.0	0.0
<b>Actual Paid</b>	0.0	0.0	0.9	0.0
<b>Actual Volunteer</b>	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	94912	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	80396	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	131488	0

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

Hawaii has the highest energy costs in the nation, due to dependence on imported fossil fuels for power and transportation. There is an urgent need to develop renewable energy alternatives. One area being investigated by CTAHR is the use of locally grown feedstocks that are converted to biofuels. Limited field trials and the evaluation of small-scale conversion technologies have indicated the potential for a range of feedstocks, including eucalyptus, culled papaya fruit waste, and algae.

**2. Brief description of the target audience**

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

**3. How was eXtension used?**

eXtension was not used in this program

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	0	0	0	0

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

**Patent Applications Submitted**

Year: 2018

Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

<b>2018</b>	<b>Extension</b>	<b>Research</b>	<b>Total</b>
<b>Actual</b>	0	4	4

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Grant proposals submitted

<b>Year</b>	<b>Actual</b>
2018	4

**Output #2**

**Output Measure**

- Presentations at national and international meetings.

<b>Year</b>	<b>Actual</b>
2018	1

**Output #3**

**Output Measure**

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

<b>Year</b>	<b>Actual</b>
2018	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 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Actual
2018	0

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

**What has been done**

**Results**

**4. Associated Knowledge Areas**

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

**Outcome #2**

**1. Outcome Measures**

Dollar value of grants and contracts received

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2018	0

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

**What has been done**

**Results**

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
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**

**V(I). Planned Program (Evaluation Studies)**

**Evaluation Results**

{No Data Entered}

**Key Items of Evaluation**

{No Data Entered}

**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
703	Nutrition Education and Behavior	38%		62%	
704	Nutrition and Hunger in the Population	49%		0%	
724	Healthy Lifestyle	13%		38%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)**

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
<b>Plan</b>	1.0	0.0	1.0	0.0
<b>Actual Paid</b>	0.0	0.0	1.1	0.0
<b>Actual Volunteer</b>	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
9494	0	63855	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
7707	0	22680	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	4472	0

**V(D). Planned Program (Activity)**

1. Brief description of the Activity

Continued Extension efforts in the implementation of the Food Safety Modernization Act (FSMA) along with workshops on Good Agricultural Practices and Good Handling Practices have been offered to minimize the risk of food borne illnesses and insure a safe food supply. Increased food safety measures are designed to minimize hazards related to microbial food borne illnesses and increase consumer confidence in the safety of locally produced fruits and vegetables. Presently, Hawaii is facing a serious problem of Rat Lung Worm Disease (RLWD), which is due to produce contaminated with slugs carrying the RLWD nematode that causes severe neurological problems for the victim when ingested accidentally. In addition to on-farm food safety educational programs, CTAHR faculty also developed supplemental courses on The Principals of Food Hygiene and Food Safety and the Sanitary Transportation for Human and Animal Foods to address technical principles for preventive controls for employees in food processing facilities throughout Hawaii. Furthermore, add-on curricula were developed for those clientele that were not addressed by standardized curricula. Upon completion of training, companies formed their own food safety teams and developed food safety plans. However, due to the small size of most companies in Hawaii, the implementation actions were more difficult to carry out. This is where the add-on curricula assisted these companies resulting in high audit scores.

Research under this program obtained information on the antimicrobial properties of coffee cherry and ohelo berry extracts. In comparison testing, ohelo berry demonstrated more significant antimicrobial activity than coffee cherry. Other research showed that supercooling technologies could be used to avoid microbial contamination in beef steaks while maintaining the same quality as its fresh counterparts. A CTAHR team also implemented an approach that integrates research and extension so that scientific questions originating through extension activities were addressed directly in laboratory studies.

**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 4-H. 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**

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	155	1216	0	0

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

**Patent Applications Submitted**

Year: 2018

Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2018	Extension	Research	Total
Actual	0	9	9

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

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

Year	Actual
2018	2

**Output #2**

**Output Measure**

- Presentations at national and international meetings.

Year	Actual
2018	20

**Output #3**

**Output Measure**

- Grant proposals submitted.

Year	Actual
2018	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.

Not Reporting on this Outcome Measure

**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**

<b>Year</b>	<b>Actual</b>
2018	0

**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**

<b>KA Code</b>	<b>Knowledge Area</b>
703	Nutrition Education and Behavior

**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 a 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. Therefore, CTAHR is reviewing using faculty across departments and using faculty from its Center on the Family to possibly assist in research, population data collection, and web mapping needy communities.

**V(I). Planned Program (Evaluation Studies)**

**Evaluation Results**

N/A

**Key Items of Evaluation**

N/A

**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%		7%	
402	Engineering Systems and Equipment	0%		10%	
501	New and Improved Food Processing Technologies	0%		25%	
607	Consumer Economics	10%		0%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	0%		13%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	20%		32%	
723	Hazards to Human Health and Safety	15%		13%	
724	Healthy Lifestyle	20%		0%	
903	Communication, Education, and Information Delivery	35%		0%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)**

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
<b>Plan</b>	2.0	0.0	2.0	0.0
<b>Actual Paid</b>	0.8	0.0	0.6	0.0
<b>Actual Volunteer</b>	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
108577	0	35567	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
108577	0	35567	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
114538	0	107248	0

## V(D). Planned Program (Activity)

### 1. Brief description of the Activity

Continued Extension efforts in the implementation of the Food Safety Modernization Act (FSMA) along with workshops on Good Agricultural Practices and Good Handling Practices have been offered to minimize the risk of food borne illnesses and insure a safe food supply. Increased food safety measures are designed to minimize hazards related to microbial food borne illnesses and increase consumer confidence in the safety of locally produced fruits and vegetables. Presently, Hawaii is facing a serious problem of Rat Lung Worm Disease (RLWD), which is due to produce contaminated with slugs carrying the RLWD nematode that causes severe neurological problems for the victim when ingested accidentally. In addition to on-farm food safety educational programs, CTAHR faculty also developed supplemental courses on The Principals of Food Hygiene and Food Safety and the Sanitary Transportation for Human and Animal Foods to address technical principles for preventive controls for employees in food processing facilities throughout Hawaii. Furthermore, add-on curricula were developed for those clientele that were not addressed by standardized curricula. Upon completion of training, companies formed their own food safety teams and developed food safety plans. However, due to the small size of most companies in Hawaii, the implementation actions were more difficult to carry out. This is where the add-on curricula assisted these companies resulting in high audit scores.

Research under this program obtained information on the antimicrobial properties of coffee cherry and ohelo berry extracts. In comparison testing, ohelo berry demonstrated more significant antimicrobial activity than coffee cherry. Other research showed that supercooling technologies could be used to avoid microbial contamination in beef steaks while maintaining the same quality as its fresh counterparts. A CTAHR team also implemented an approach that integrates research and extension so that scientific questions originating through extension activities were addressed directly in laboratory studies.

### 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**

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	229	2500	50	50

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

**Patent Applications Submitted**

Year: 2018  
 Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2018	Extension	Research	Total
<b>Actual</b>	0	33	33

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number of workshops, field days and demonstrations

Year	Actual
2018	37

**Output #2**

**Output Measure**

- Presentations at national and international meetings.

Year	Actual
2018	12

**Output #3**

**Output Measure**

- Grant proposals submitted.

<b>Year</b>	<b>Actual</b>
2018	9

**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**

<b>Year</b>	<b>Actual</b>
2018	195

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

The consumer is genuinely concerned about the ability to obtain foods that will be safe to eat, without the fear of produce, meats, and edible agricultural products being contaminated with harmful biological organisms. The food producers, that is, the farmers, as well as food processors are concerned about the additional costs that they must bear in order to meet the FDA's Food Safety Modernization Act's requirements.

#### **What has been done**

A CTAHR food safety team has been established statewide and workshops have been on-going regarding on-farm and processing facility food safety information. These have been in conjunction with the Hawaii Departments of Agriculture and Health.

#### **Results**

Farmers and food processors are receiving training in food safety in order to be in compliance with USDA-FDA Food Safety Modernization Act regulations. This will help to ensure a safe food supply that is available to the public.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
607	Consumer Economics
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety
724	Healthy Lifestyle

903 Communication, Education, and Information Delivery

**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**

<b>Year</b>	<b>Actual</b>
2018	0

**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**

Farmers and food processors are receiving training in food safety in order to be in compliance with USDA-FDA Food Safety Modernization Act regulations. This will help to ensure a safe food supply that is available to the public.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
607	Consumer Economics
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety
724	Healthy Lifestyle
903	Communication, Education, and Information Delivery

## **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 often inconsistent and changes with this and other competing program needs.

## **V(I). Planned Program (Evaluation Studies)**

### **Evaluation Results**

N/A

### **Key Items of Evaluation**

N/A

## VI. National Outcomes and Indicators

### 1. NIFA Selected Outcomes and Indicators

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