2019 Annual Report of Accomplishments and Results

HAWAII
College of Tropical Agriculture and Human Resources (CTAHR), University of Hawaii at Manoa

I. Report Overview

The NIFA reviewer will refer to the executive summary submitted in your Plan of Work. Use this space to provide updates to your state or institutions as needed.

1. Executive Summary (Optional)

An updated Executive Summary is available in the 2021 Plan of Work. CTAHR administration and faculty have worked for several years within the framework provided by 10 Planned Program areas, which are listed below. With the development of the 2020 Plan of Work, CTAHR adopted a new framework whereby state-defined Critical Issues have replaced Planned Programs to comply with AREERA legislation. Since all FY2019 activities continued to be carried out under the framework of the 10 Planned Program areas, this report will focus on outcomes and impacts obtained within these Planned Programs. Subsequent annual reports are expected to focus on outcomes and impacts using the Critical Issues framework.

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

II. Merit and Scientific Peer Review Processes

The NIFA reviewer will refer to your Plan of Work. Use this space to provide updates as needed or activities that you would like to bring to NIFA's attention.

Process	Updates
1. The Merit Review Process	Please refer to 2021 Plan of Work.
2. The Scientific Peer Review Process	Please refer to 2021 Plan of Work.

III. Stakeholder Input

The NIFA reviewer will refer to your Plan of Work. Use this space to provide updates as needed or activities that you would like to bring to NIFA's attention.

Stakeholder Input Aspects	Updates
1. Actions taken to seek stakeholder input that encouraged their participation with a brief explanation	Please refer to 2021 Plan of Work.
2. Methods to identify individuals and groups and brief explanation.	Please refer to 2021 Plan of Work.
3. Methods for collecting stakeholder input and brief explanation.	Please refer to 2021 Plan of Work.
4. A Statement of how the input will be considered and brief explanation of what you learned from your stakeholders.	Please refer to 2021 Plan of Work.

IV. Planned Program Table of Contents

V. Planned Program Activities and Accomplishments

Please provide information for activities that represent the best work of your institution(s). See Section V of the Guidance for information on what to include in the qualitative outcomes or impact statements. Add additional rows to convey additional accomplishments. You may expand each row as needed.

No.	Title or Activity Description	Outcome/Impact Statement	Planned Program Name/No.
1.	**Sustainable resource management, improving ecosystem health, and increasing economic prosperity**	Protecting Hawai'i's natural resources preserves the islands unique environments and native species, enhances the well-being of Hawai'i residents, and promotes sustainable economic growth. Research and extension efforts are focusing on an array of issues that include forest conservation and restoration, control of invasive species, range management, wildfire risk assessment and mitigation, nutrient management, agricultural chemical use, soil erosion, soil health, water quality, bioremediation, biological diversity, rehabilitation of degraded and idle lands, and handling of hazardous materials. The results of these efforts are contributing significantly to sustainable resource management, improving ecosystem health, and increasing 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 for sustainable and resilient production. Additionally, research at different scales, from the field plot to the watershed level, is improving 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.	1. Sustain, protect, and manage Hawaii's natural resources and environment
2.	**Opportunities for diversifying tropical agriculture in Hawaii**	CTAHR has a long history of working to diversify the state's agriculture economy based on the unique advantages of a tropical environment. Research and extension activities across the state are helping growers diversify and take advantage of commercial opportunities for alternative	2. Hawaii's diversified tropical crop systems for sustainability and competitiveness

		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. And integrated research and extension programs offer science-based information and best management practices to current farmers while also providing training opportunities specifically for new farmers.	
3.	**Scientific understanding and participatory methods for monitoring and controlling invasive species**	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 threat is so severe that it has prompted the creation of a Hawaii Interagency Biosecurity Plan for the state, in which CTAHR plays a significant scientific and extension education role. In coordination with partner agencies, community groups, and other interested stakeholders, CTAHR conducts research and extension activities that have resulted in the development, testing, and implementation of comprehensive approaches to the control of invasive species through 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 residual environmental impact. Additionally, research into allelopathic compounds (root phytochemicals) of locally available plant species and agricultural byproducts hopes to provide specific weed-killing compounds that are more environmentally friendly. Integrated research and extension efforts have also provided a framework for controlling Coffee Berry Borer, which is based on prevention (education), detection (early warning), delimitation (SWAT team approach) and	3. Invasive species education and management

		response (pruning, sanitation, insecticides). Furthermore, CTAHR's Extension has developed a hot shot team approach designed to quickly respond by sending specialists to new problem areas to provide farmer education on pest biology, management, and control strategies. In addition to leadership on confronting invasive species, CTAHR coordinates an annual state conference on invasive species.	
4.	**Providing families with the knowledge to make educated decisions on how to improve quality of life**	Family culture 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 efforts focus on families and community well-being, with results feeding into 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. For example, locally grown crops that are underutilized are being evaluated for their nutritional value, which is often better than more conventional commodities. These initiatives are providing families and individuals with the knowledge to make educated decisions on how to improve and maintain their health, wellness, and overall quality of life. CTAHR faculty also play 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. Such information is used to disseminate data and indicator briefs to raise public awareness on the conditions and challenges of children and families in Hawaii, and to advocate for beneficial policies.	4. Youth, family, and community development
5.	**Improving food choice in Hawaii for better health**	Factors that affect health and wellness among the general population in Hawaii include economic constraints, an aging population, and food choice. Unfortunately, these factors often combine to produce greater rates of obesity and diabetes among Native Hawaiians and Pacific Islanders. In a study from the Centers for Disease Control and Prevention, nearly 40% of Native Hawaiians were found to be obese. While conducting research on the impact of local diets on Hawaiian populations, CTAHR	5. Health and wellness of Hawaii's families and communities

		researchers have been utilizing both 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 they 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. Extension activities 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. A "Got Nutrients" website with "Daily Tips" has provided information on nutrition, exercise, and health-related topics to over 2,000 subscribers, including health professionals, extension personnel, dietitians, physicians, and individuals from many walks of life. Subscribers come from over 60 universities in the U.S. and around the world.	
6.	**Increasing food security**	CTAHR strongly supports this national priority; it is our program area with the largest number of projects. Integrated research and extension efforts continued to focus on providing critical scientific knowledge and technologies needed to sustainably produce and improve food products. 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	6. Global food security and hunger

		also helping to develop virus detection assays for the identification of newly emerging viruses. And 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.	
7.	**Climate change impacts on carbon sinks and sources**	Research and extension efforts focus on quantifying changes in carbon storage, carbon cycling, and carbon flux in Hawaiian terrestrial systems as a result of land use dynamics, 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.	7. Climate change
8.	**Renewable energy potential of locally grown feedstocks**	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.	8. Sustainable energy
9.	**Making healthy living a priority for children**	The rate of obesity in children ages 6 to 11 in Hawaii is twice the national average, with recent research showing that 35% of eight-year old children are obese. CTAHR faculty participate in regional and national efforts to identify the factors contributing to weight gain in young children, particularly in low-income households in order to develop obesity prevention programs. Research has looked at food waste by early adolescents to understand the barriers, motivators and perspectives on how to reduce food waste, while also seeking to identify best practices	9. Childhood obesity

		that parents have used to promote positive eating behaviors. In an expanded effort including but also going beyond Hawaii, the Children's Healthy Living Program for Remote Underserved Minority Populations of the Pacific (CHL) continued to integrate research on diet and obesity factors in native Pacific populations with culturally-appropriate community-scale interventions in Hawaii, American Samoa, Northern Marianas, Guam, Palau, Micronesia and Alaska. A Pacific Food Guide website developed previously was maintained and continued to provide information on healthy foods available in the Pacific Region. CHL continued with the CHL Summer Institute program in 2019, which integrates Extension and Instructional programs by transforming specialized curriculum in child obesity prevention, health and measurement. Delivered through the UH Outreach College, it allows students as well as health professionals from Hawaii and the Pacific to obtain specialized training for either credit or non-credit online. This institute has gained in popularity and has experienced continued growth, with much of the material also offered at present through five online courses.	
10.	**Ensuring a safe food supply**	Successful implementation of the Food Safety Modernization Act (FSMA) is a primary focus of this important program. 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. Research under this program has 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 has shown that supercooling technologies can be used to avoid microbial contamination in beef steaks while maintaining the same quality as its fresh counterparts. A CTAHR team also implemented a novel approach that integrates research and extension in such a way that scientific questions originating through extension activities can be addressed directly in research laboratory studies conducted by trainees.	10. Food safety