University of Hawaii System Combined Research and Extension Plan of Work
2020-2024

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I. Plan 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 Family, the Center of Tropical and Subtropical Aquaculture, and the Western Insular Pacific Sun Grant Subcenter. CTAHR administration has undergone significant changes during the previous 5 years. The Dean (since September 2017) is Dr. Nicholas Comerford. The Associate Dean of Research, Dr. Walter Bowen, was newly hired in February of 2019. He came from the University of Florida where he had developed a well-funded international agricultural program for the Institute of Food and Agriculture Sciences. Kelvin Sewake continued improving the state-wide Extension program as the Interim Associate Dean of Cooperative Extension. For example, his work with the state legislature resulted in 10 new Extension positions added to CTAHR in 2019. Dr. Ania Wieczorek, Interim Associate Dean of Academic and Student Affairs, has been working to modernize the academic programs and improve the culture for CTAHR students. In 2020, CTAHR will be advertising to make permanent this Associate Dean position.

CTAHR is a highly diverse college with departments that have foci on natural resource management, management of tropical plants in and beyond agriculture, soil science, animal science, human nutrition and dietetics, molecular biology, bioengineering, plant pathology, entomology, family science, consumer science and fashion design. This is accomplished with current faculty that are spread across research, teaching and extension. Future programs will emphasize protected agriculture and high technology. Since Hawaii is the only tropical island state in the USA, and because it is the most remote population center on the planet, CTAHR faces unique climate and societal environments. CTAHR’s programs are therefore not only addressing national and international issues, but also focus on Hawaii’s unique natural resources, crops, invasive pest pressures, and development of youth, adults, family and communities.

Hawaii has virtually every recognized soil type. It has elevations over short distances that range from sea level to as much as 13,000 feet; and it has annual rainfall variation from less than ten to over 400 inches per annum. Ecosystems range from desert, to tropical rainforest, to snow covered mountains. Hawaii faces the unique environmental challenges unknown in other parts of the USA. Vog (volcanic fog) from an active volcano stresses agriculture, native forests and human communities alike. Periodic volcanic eruptions deposit ash. Lava can destroy native forests, human habitats and agricultural land and operations. For example, recent eruptions on the island of Hawaii in 2018 destroyed as much as 50% of the papaya industry and about 60% of the dendrobium orchid industry; while lava obliterated the CTAHR research station at Malama Ki.

Hawaii's Governor has proposed an ambitious goal of doubling local food production and Article XI of the Hawaii Constitution states that Hawaii shall ‘increase agricultural self-sufficiency”. This presents CTAHR with the challenge of assisting the state to meet this goal. Yet, Hawaii's challenges are many. It is unique in its social and cultural mix. While the native Hawaiian community has a focus and interest in small-scale family agriculture, first-generation immigrants are entering agricultural production with a wide range of crops, cultural practices and dietary preferences oriented toward commercialization. The costs of land, labor, and energy exceed those found in most other states. Agrochemicals and animal feed are mostly imported, and exporting products to distant markets reduces the farmers’ competitive ability. The high costs of energy, lack of skilled labor and reduced interest in farming are major challenges. The farm size is not always at the scale which determines economic viability. Hawaii has 7,328 farms, 66% of which are less than 10 acres in size. Another 23% are between 10-49 acres. Hawaii imports nearly 90% of its food.

Hawaii's agricultural sector includes specialty crops grown nowhere else in the USA, such as coffee, macadamia nuts, and cacao. Although livestock producers in Hawaii are making progress toward the goal of grass-finished healthy beef, the majority of calves are still shipped to mainland feedlots due to lack of economical local feed supplements. Lack of

slaughterhouses for livestock is another challenge for small livestock producers. 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 understand these challenges and engage in a broad spectrum of research and extension activities, including management of invasive species that constantly threaten the "gateway" state of Hawaii. The Governor's Hawai'i Interagency Biosecurity Plan for 2017-2027 addresses the problem comprehensively with actionable items for several state agencies, including CTAHR. With a new pest entering Hawaii every day, biosecurity research and extension are crucial. Currently, Rapid Ohia Death is devastating the native forest of the Big Island and has now been found on Kauai. The coffee berry borer, the two-line spittle bug, little fire ant, and a viral disease on ornamental ginger are a few additional examples of what the state is fighting. The use of technology in the form of genetically modified organisms and pesticides are not universally accepted as practices; and in some cases they are considered to be counter to native Hawaiian thinking. Other areas in which CTAHR continues to work, and needs to enhance its capability, is in improved cultivation and processing of specialty crops, agricultural advanced technology, 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, and human nutrition programs. CTAHR needs to address the lack of current technology used in Hawaiian agriculture and be at the forefront of new technology specific to the needs of the state.

CTAHR administration and faculty have worked during the previous five years within the framework provided by ten program areas that have been described in previous Annual Reports. Upon evaluation of the past 5 annual reports, these ten program areas have been redefined into five Critical Issues that are consistent with USDA-NIFA Areas of Emphasis. They are (1) Protect/Manage Natural Resources/Environment; (2) Diversified Tropical Crop Systems for Food/Energy; (3) Biosecurity of Agriculture/Natural Resources; (4) Youth/Family/Community Development and Health; and (5) Bioengineering for Agriculture/Natural Resources/Health.

2. FTE Estimates

Year	1862 Extension	1862 Research
2020	52.1	45.1
2021	62.0	44.0
2022	62.0	44.0
2023	62.0	44.0
2024	62.0	44.0

II. Merit / Peer Review Process

CTAHR uses the following process to review individual work plans for all capacity fund projects. The 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. Reviewers are asked to determine if the program or project: addresses the critical issues of strategic importance, including those identified by the stakeholders; utilizes multi-disciplinary approaches and provide evidence of integration of research and extension; addresses the needs of underserved populations of the State; describes the expected outcomes and impacts; and will likely result in improved effectiveness and/or efficiency. 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. If revisions are suggested, 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.

Research publications are submitted to refereed journals which then provide the scientific review and decide on merit for publication. Extension publications by the Cooperative Extension Service are written by the Extension personnel and turned into the CTAHR Office of Communication Services (OCS) where they are edited, returned the to the author for agreement, and then returned to OCS for publication.

Tenure and post-tenure reviews are accomplished via the University of Hawai'i process that has been defined by the contract between the State and the appropriate worker's union. This involves a departmental review by the Department Personnel Committee (DPC) and a vote for or against by individual DPC members. That review is provided by a written letter to the Dean. Accompanying that is a letter and recommendation from the Department Chair. The Dean reviews the materials and provides a letter of recommendation for or against the applicant. All material is provided to the University tenure and promotion review committee. Pre-tenure reviews occur in the second and fourth year from initial employment, with tenure review conducted in the fifth year. Post tenure reviews occur every 5 years.

III. Stakeholder Input

1. Actions to Seek

CTAHR seeks stakeholder input and participation in the following ways:

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 are not available for a particular local issue, stakeholders often call upon college administrators or the county administrators with their input and concerns.
The CTAHR Dean's Advisory Committee is used on a year-around basis to provide input concerning CTAHR's performance.
CTAHR is reviving a practice of the past which was an industry analysis. This analysis produced the industry priorities for research and extension. This informed and helped direct the college research and extension programs.
College administrators also consult often with officers and executive staff of relevant stakeholder associations, such as the Hawaii Farm Bureau Federation, and the Hawaii Farmers Union United. Active consultation is most prevalent during the time when the legislature is in session. The Dean confers with agency and industry representatives about common interests and seeks support for bills that affect the college.
The Dean of CTAHR has a monthly meeting with the Director of the Hawaii Department of Agriculture.
CTAHR's Dean and Associate Deans for Research and Extension have been a resource for information for different agriculture groups on related issues.

2. Methods to Identify

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, federal, and county 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.

3. Methods to Collect

CTAHR employs a variety of methods, including face to face discussions with industry representatives. Additional methods are specified below:

Participation in trade and community association meetings.

Participation on the State of Hawaii Board of Agriculture, State of Hawaii Department of Land and Natural Resources, 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; Department of Agriculture Advisory Board of Directors, 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, feedback and input from the Farm Bureau or Farmers Union United, other non-government organizations, 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 listserv groups of CTAHR and external individuals are also used. Information, questions, and other exchanges take place on a regular basis.
Stakeholder blogs have been found to also be a useful means of obtaining timely information on needs and opportunities.

4. How Considered
CTAHR uses this input in its program planning in the following manner:

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 the large number of upcoming retirements, past budget and staffing cuts, and some restrictions on hiring, stakeholder requests will be a challenge to meet. However, in the next several years, faculty retirement salary savings and a favorable state legislature to CTAHR, CTAHR is hiring in high priority positions. Priority positions are based on a 5-year hiring plan based on faculty and industry input.
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 about one pest per day with an average of 24 new insect introductions to the Islands each year. In addition, Hawaii is the first port of call for pests that may well move on to attack agriculture in the continental USA. Currently, 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 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. These concerns help guide program emphasis and hiring. For example, we are currently hiring an IPM faculty member and an Urban Pest faculty member.
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 $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. Based on the success of the former TSTAR program, CTAHR requests each year that our congressional delegation seek to resurrect this program.

IV. Critical Issues

1 Protect and Manage Natural Resources and the Environment

Description:
Hawai'i has unique, diverse, and fragile ecosystems. Therefore, research and extension efforts on effective and sustainable natural resource management continue to be a high priority for CTAHR. Active projects include 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, and water quality. To preserve, protect, and renew Hawai'i's natural resources, we have also developed programs to provide environmental education to the public with emphasis on schools, youth groups, land managers, tourists, local government, and private partners. We are also involved in international partnerships and collaborations on management of natural resources.

Term: Long

Science Emphasis Areas
Education and Multicultural Alliances
Environmental Systems

2 Diversified Tropical Agricultural Systems

Description:
Hawai'i imports 80% to 90% of its food. Hawai'i's Governor set a goal to double local food production. To that end, CTAHR conducts basic and applied research to increase production, efficiency, and profitability of diversified agricultural industries for food and energy, while also protecting the environment. Research and extension efforts include: breeding and crop improvement; variety selection for pest and disease resistance; identification and evaluation of new specialty crops; nutrient and water management; import replacement with locally grown produce; livestock production; protected agriculture, and aquaponics and hydroponics. Research efforts are helping growers reduce losses in ornamental and food production.

Term: Long

Science Emphasis Areas
Agroclimate Science
Bioeconomy, Bioenergy, and Bioproducts
Education and Multicultural Alliances
Environmental Systems
Sustainable Agricultural Production Systems

3 Biosecurity of Agriculture and Natural Resources

Description:
In Hawai'i, the introduction and establishment of invasive species represents a constant threat to agricultural production, farm profitability, and Hawai'i's surrounding natural and urban ecosystems. CTAHR conducts research and extension 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 are 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.

Term: Long

Science Emphasis Areas
Agroclimate Science
Environmental Systems
Food Safety

Human Nutrition
Sustainable Agricultural Production Systems

4 Youth/Family/Community Development and Health

Description:

The family has a profound influence on the health and well-being of its members, particularly its youth and elderly. CTAHR strengthens families by providing research and extension in family health, intergenerational programs, youth development, and parenting. Well-integrated research and extension initiatives have been developed to improve diet and nutrition in Hawai'i's multi-ethnic population addressing diabetes, obesity and weight management. CTAHR plays a key role in collecting, compiling, and reporting to legislators, government agencies and non-profit organizations on current social indicators for Hawai'ian families and communities. The 4-H Youth Leadership program focuses on healthy living, science, citizenship, volunteer development, marketing, and public relations.

Term: Long

Science Emphasis Areas

Education and Multicultural Alliances
Family & Consumer Sciences
Food Safety
Human Nutrition
Youth Development

5 Bioengineering for Agriculture/Natural Resources/Health

Description:

Molecular biology and bioengineering are critical areas for agriculture, natural resources, and human health to help CTAHR meet the challenges of climate change, energy generation, biosensing, microbiome evaluation/management, and human health. CTAHR approaches these issues via genomics/bioinformatics/proteomics, molecular biotechnology, plant/microbe interactions, waste management using bioconversion/bioenergy, development of biosensors, and the application of environmental biochemistry to ecosystem and human health. For example, current work is researching the role that enzymes extracted from agricultural plants can have on dementia and obesity. Other current approaches deal with the bioconversion of waste to energy and the development of nutraceuticals and pharmaceuticals from agricultural crops and endemic plants.

Term: Long

Science Emphasis Areas

Agroclimate Science
Bioeconomy, Bioenergy, and Bioproducts
Environmental Systems
Human Nutrition