

Report Status: Approved as of 07/08/2022

Contributing Organizations

University of Guam

Executive Summary

Overview

The University of Guam (UOG) is the only four-year public institution of higher education in Guam and became a U.S. land grant university in 1972. The university serves Guam and the Western Pacific region which comprised 2.2 million square miles and island nations that are under the protection of the United States. The College of Natural and Applied Sciences (CNAS) includes three agriculture experiment stations and the Guam Aquaculture Development and Training Center which have significantly impacted research on agriculture and related topics. The Western Pacific Tropical Research Center (WPTRC) is the research arm of CNAS and carries the research mission of UOG as a land-grant university. WPTRC faculty and administrator work on the mission: "Excellence in research in support of the land grant mission of discovery, learning, and engagement." Research is conducted on aquaculture, tropical agriculture, natural resource management, food science, nutrition, economics, integrated pest management, and other areas.

The University of Guam Extension & Outreach (UOG CE&O), also at CNAS engages the university community and the public through a multidisciplinary approach to address Guam's social, environmental, and economic complex issues. UOG CE&O collaborates with government agencies, private entities, businesses, non-profit agencies, and non-governmental organizations. This approach has proven to be one of the strengths in ensuring effective non-formal education programs are delivered on time. These partnerships have helped extend research-based information using several strategies to engage individuals, families, youth, and communities.

UOG Extension and research work together to benefit communities through various engagement processes, gathering perspectives of needs, concerns, issues, and emerging trends. This approach entails applying research-based, unbiased information for daily application in the use and protection of natural resources in urban and rural environments, developing food security strategies at different levels, youth and family leadership, and economic sector enhancement. Given Guam's geographic position, social, economic, environmental, and policy research and outreach have positive effects at the local, regional, national, and international levels.

Critical Issue: Community Development

Access to quality data and addressing and managing their uses are critical issues for Extension's Community Development work and investments in collaboration with various Guam organizations and community cooperators addressing a variety of official measures of local issues. The importance of Big Data continues to be a recurring challenge for Guam organizations dealing with capacity building and managing important data and reports. Treating data as a public good represents the government interest domain and captures the importance of knowledge management and the ideas behind public issues education. The burden of dealing with Micronesian migration inflows to Guam remains a GovGuam concern as the Micronesian regional governments deal with a sunseting U.S. compact treaty to these jurisdictions. The onset of the Guam military build-up accelerated growth contributes to the increasing demand for skilled workers and the need to evaluate the changing population patterns of growth and decline. The data initiative focuses on the importance of big data analytics for managing a variety of datasets generated throughout the various critical issues and collaborator /cooperator engagement. Highlights of projects include:

- Development of benefit-cost methodology and analyzing compact impact of migrants into Guam
- Connecting island communities through cultural economics
- Western Regional Agricultural Stress Assistance Program

Critical Issue: Family and Consumer Science

The role of Guam's CE&O Family and Consumer Sciences (FCS) program focuses on addressing the unmet needs of families, and critical consumer issues, including the intersection of health and agriculture domains. The FCS programs continue to address family and consumer decision-making regarding nutrition, health literacy, wellness, and improving access to community resources. Ongoing challenges related to health disparities include Guam's morbidity high ranking for diabetes and obesity. Extending the impact of nutrition education and outcomes to the breadth of consumer factors that influence health and wellness decision-making relies on research-based work and outreach extension education to support the overall portfolio family resource management and communication amongst family members. Highlights of projects include:

- Work on the extension project "Family and Personal Finance."
- Publications- Publication 1_ Chen, K. J., Barber, L. R., Sayama, K. C., and Bassett, J. K. (2021) "Financial Strategies: Monthly Budget" University of Guam Extension Publication FS 3-21; Chen, K. J., Barber, L. R., Sayama, K. C., and Bassett, J. K. (2021) Financial Strategies: "Net Worth Statement", University of Guam Extension Publication FS 2-21.
- FCS Keys to Embracing Aging (KEA) program. Elements of this program include a "Senior-to-Senior program in support of homedelivered lunch programs in partnership with the GovGuam Department of Public Health. Activities include distribution program and project recruitment flyers (1,540 project flyers).

Critical Issue: Food Safety and Security

Addressing food security opportunities for residents includes increasing the purchasing power of households and aligning food purchasing program strategies. Evidence-based food products research contributes toward identifying viable and sustainable local valueadded food products to ensure that all individuals and families have access to safe and nutritious food sources.

Highlights of projects include:

- Agricultural technology for viable small production storage
- Community-based food events collaboration. Ongoing collaboration with local government agencies, local mayoral councils, and non-government organizations supports various community-based food events and allows to deliver science-based information to stakeholders.
- "Customized Food Safety Education Strategy for hard-to-reach audiences in the Western Pacific Islands
- Integrated projects supporting the Beginning Farmer and Rancher Development project. Prepared value-added flour from breadfruit and green banana commodities through sponsored food processing workshops, as part of the planned food processing workshop series, four virtual workshops aligned with UOG-wide Charter Day virtual activities.
- Developed Extension home food processing and preparation video
- Improving the Development of Food Safety Plans through the Advanced Preventative Controls School Initiative
- Extension technical bulletins, Coconut yogurt at home and making bread fruit flour
- Consumer Preference for Genetically Modified (GMO) Food Products in Guam. Manuscripts: "An Analysis of Multiple Treatment Interventions on Recidivism" and "Associations between the Biomaterials and Agricultural Commodities."

Critical Issue: Human Nutrition and Childhood obesity

Nutrition and childhood obesity are key components of CNAS research and extension efforts. The Pacific Island's Cohort for Cardiometabolic Health (PICCAH) study during 2017–2020 evaluated the associations of parent and child risk factors and identified prevalent modifiable risk factors in children. Early childhood interventions can promote long-term healthy eating and physical activity habits to prevent obesity. A study with indigenous children examined the effectiveness of the Food Friends®: Fun with New Foods™ and Get Movin' with Mighty Moves™ (FFMM) curricula on willingness to try fruits and vegetables (FV) and gross motor (GM) skills. A pre-post community-based study included preschoolers from Head Start (HS), gifted and talented education (Pre-GATE), and Pre-Kindergarten programs. In 2017–2018, the intervention group had a significant increase in imported FV compared with the other three groups. No significant differences between groups were found on different FV scales. Regarding gross motor skills, no significant differences between groups were found. In SY2018–2019, the intervention group had a significant increase in all FV scales except imported FV when compared with the enhanced intervention group. No significant differences were found between groups on its progress with gross motor skills.

Critical Issue: Sustainable Agricultural Production Systems - Global Food Security

At CNAS, research and extension personnel work to expand food supply and quality for people in Guam and Micronesia. There is a renewed interest in developing fish and shrimp farming in Guam. The Guam Aquaculture Development and Training Center (GADTC) at the Fadian Hatchery has been working on expanding and diversifying aquaculture in Guam. Researchers

have introduced high-quality clean-seed shrimp stocks, Tilapia, and freshwater prawns and determined feeding regimes that best support larval development and survivability. GADTC is a certified bio-secured facility keeping stocks under strict health surveillance to remain pathogen-free.

Breakthrough research on genetic regulation of sex change in shrimp has been published in peer-review journals. Novel research includes coculturing of two crustacean species: *Macrobrachium rosenbergii* and *Penaeus vannamei* (white shrimp). A study using microsatellite DNA marker techniques showed that 36 families of *P. vannamei* had high genetic variation but this did not differ between two consecutive generations. The Fadian Hatchery entered into a private-public partnership in 2018 that led to substantial infrastructure improvements including laboratories, dormitories and other facilities.

Field research has been carried on selecting varieties of eggplant, sweet potato, and other crops. Research results were integrated into technical reports and shared with the local communities. Application of 90-tons per acre of composted organic waste increased maize yields and soil organic carbon compared with applications of inorganic fertilizer. Four type of locally-sourced compost were used to grow leafy lettuce varieties in pots. Growing media affected fresh and dry shoots and roots, shoot and root length, and the number of leaves.

CNAS researchers participate in Multi-state Hatch projects on the effect of natural chemicals on human health and food safety. A study has shown that people in Guam are willing to pay up to 7% more for local produce. The potential value of a citrus tree, calamansi (*Citrus microcarpa*) to provide human health benefits is being studied.

Critical Issue: Sustainable Agricultural Production Systems - Protect Resources of Guam

Non-native plants, insects, and diseases threaten Guam's natural resources, agriculture, biological populations, and humans. The rate and intensity of invasions in Guam is one of the greatest in the world. Other causes of environmental degradation include soil erosion, unchecked urban development, and wild fires. Soil management studies have proven the beneficial effects of compost and biochar application on soil health and crop yields. In a study with compost application to limestone soils, plots receiving compost had higher soil organic carbon and lower C/N than plots receiving fertilizer. Nitrate levels in pore water were generally higher on compost plots during the early stages of corn but were higher on fertilizer plots during active leaf, tasseling, and maturity stages.

A relevant aspect of natural areas conservation and restoration is to generate knowledge on plant phenology, reproduction/propagation, and field outplanting practices. A study on the genetic structure of the endangered species *Serianthes nelsonii* in Guam and Rota using a genome-wide multiplexed inter-simple sequence repeat (ISSR) genotyping by sequencing (MIG-seq) analysis or single-nucleotide polymorphisms (SNPs) detection, showed a clear genetic differentiation between plants from the two islands, between Rota wild trees and Rota out-planted tree populations, and among individuals from Rota out-planted trees. Lower genetic diversity in the Guam seedlings population was observed, likely caused by the selfing of the Guam mother tree.

Critical Issue: Sustained Agricultural Production Systems - Plant/Pest Efforts

Insects and diseases negatively affect crops and natural areas on Guam. Some of the more relevant are little fire ant, Cycas scale, coconut rhinoceros beetle, greater banded hornet, Varroa mites, *Ralstonia* bacteria, and *Phellinus* fungus. *Ralstonia* bacteria is one of the causal agents of ironwood decline. It has been present in Guam and recently detected in the island of Saipan by WPTRC researchers. Surveying of tree species for the root rot fungus *Phellinus noxius* in partnership with the US Forest Service, Rocky Mountain Research Station Moscow Forestry Sciences Laboratory, and the University of Hawaii was included in RREA stewardship plans for Guam's agroforestry and limestone forest landowners. Students, teachers and other members of the public visited interactive displays and received information on ironwood tree decline and tree health. Landowners and managers were trained on stewardship plans.

WPTRC houses the only USDA Biocontrol Quarantine laboratory in Guam. Farmers, government personnel, students, and other stakeholders were trained on identification and control strategies. Environmental friendly pesticides such as Tango and Siesta were found highly effective in controlling little fire ants in central Guam.

Critical Issue: Youth Development - 4-H Youth Development

The University of Guam's 4-H Youth Development adopted a community action framework to support positive youth development programming in several areas, such as community responsibility, youth leadership development, mentorship, and acknowledgment in STEM and arts. The framework approach provides the structure for delivering the essential elements for

promoting positive youth development through inclusive programs, safe learning environments, self-confidence, and self-esteem, literacy, communication, problem-solving, volunteerism and community service, interaction and relationships with adults and peer groups, engagement in civic engagement, and working with different community organizations. Highlights of successful projects that cut across these critical issues include:

- Micronesian Mythology Storytelling Initiative. The CE&O 4-H Mythology project focuses on helping youth and families increase their collective knowledge in belonging and sense of safety, self-confidence and self-esteem, literacy, communication, and problemsolving. The Micronesian mythology cultural education material is supplemental for 4-H and cooperator workshops and educational programming. The project builds on established relationships with adults and peer groups, leadership development and opportunities, youth initiatives in non-formal science, engineering, technology, and civic engagement.
- 4-H Youth and Military Youth, Families, and Organizations- Youth Camps. Addressing military families and youth needs includes ongoing collaboration with the military and UOG-CE&O 4-H to align research-based programs and resources for military-connected youth and families.
- 4-H Youth Fisheries Program-Sustaining Ocean Resources Community-based Approach. The summer youth 4-H fisheries program is the longest-running 4-H youth development program and integrates the 4-H STEM work plan to provide localized STEM programming in agriculture and fisheries. Programming efforts continue to strengthen the capacity of educational cooperators to collaborate and implement STEM curricula and teaching programs in the appropriate localized STEM and food and agricultural sciences disciplines.

Merit and Scientific Peer Review Processes

Updates

None

Stakeholder Input

Actions to seek stakeholder input that encouraged their participation with a brief explanation

Extension programs continue to conduct project and program surveys to seek input from stakeholders

Methods to identify individuals and groups and brief explanation

None

Methods for collecting stakeholder input and brief explanation

None

A statement of how the input will be considered and brief explanation of what you learned from your stakeholders

CE&O and WPTRC faculty and professionals are involved in various stakeholder groups as resource experts, board members, advisory members, and other roles. Identifying issues and partnerships is a daily activity. Through formal and different organizational roles, strategic, multidisciplinary teams composed of CNAS faculty, extension professionals, program and project staff, and other cooperators and collaborators were asked to provide input and information about needs. Feedback from traditional stakeholders, non-traditional groups, university partnerships, project teams, ongoing interagency collaborations, and planned university engagement initiatives represent continuous dialogue with stakeholders to understand their needs and explore new strategies. During the 2021 reporting period,

UOG Cooperative Extension & Outreach continued to build on the four strategic initiatives to address stakeholders' needs.

- Ensure Food Security
- Our Youth, Our Future
- Reinforce Family Resiliency
- Harness Big Data

Highlighted Results by Project or Program

Type

Projects / Programs

**Projects / Programs without a Critical Issue
Not Provided**

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