

Commonwealth of The Northern Mariana Islands (Northern Marianas College)

Plan of Work for 2023-2027

Status: Final (Approved 9/26/2022)

Executive Summary Overview

Due to the current economic downturn and the subsequent challenges due to two destructive supertyphoons in 2015, October 2018 and the COVID19 pandemic, there is increased urgency to provide innovative programs and services that prevent and mitigate problems that have or can result from climate change, food and biosecurity security issues, labor shortages, workforce development, and health issues. This plan describes the critical issues that Northern Marianas College (NMC) Cooperative Research, Extension, and Education Services (CREES) must be positioned to respond to in order to ensure the regeneration of the CNMI's agriculture, aquaculture, human capital, health, and economy. Faculty and staff from CREES' five program areas, Agriculture Production, Aquaculture and Natural Resources (A&NR), Family, Community, and Youth Development (FCYD), Nutrition and Health, and the recently added Food Sceince program, have formulated the critical issues effecting our community based on the community needs assessment, lessons learned from the COVID19 pandemic, stakeholder engagement, key informant interviews, and locally and regionally conducted research.

Although our department has experienced major setbacks in the last several years, including reduced research and extension personnel, unanticipated leadership changes, the complete destruction of our main campus department building on Saipan in 2015 and 2018, and experiment station damage on Saipan, Tinian, and Rota, we remain inspired by the resiliency of our community and committed to positively impacting agriculture, community development, aquaculture, food science, and nutrition & health for the people of the Northern Mariana Islands.

Merit and Scientific Peer Review Processes

The merit review processes take place for the plan of work development and for scientific and extension proposals. Proposals are subject to a rigorous, internal (CREES program leaders) and external (research scientist from other institutions of higher learning and/or recognized experts) peer review process prior to submission to funding agencies. The process ensures that the proposal has a sound and established scientific basis, that the proposed project adheres and is consistent with the community needs assessment, critical issues in the Institutional Profile or identified by one or more of the local advisory councils, and/or makes a compelling case for addressing an emerging issue. A draft of the proposal to be reviewed is e-mailed to all department faculty for suggestions and comments based on established timelines prior to the face-to-face or virtual review meeting. All available professional research and extension faculty participate in the review. Staff are also welcome to attend. During the review, the following are assessed: 1) the priority of importance of the proposed project based on community need and/or critical issues; 2) the relevance of the proposals; 3) the quality and scientific value of the proposed research or extension activities and 4) the opportunities for cooperation with others, and 5)

available resources (a proposed budget must be included). The proposals are then revised to incorporate the suggestions given during the face-to-face/virtual merit review and then finally reviewed by the dean prior to submission.

Stakeholder input: Action Taken to Seek Stakeholder Input

Stakeholder engagement is a critical component of the development and improvement of programs. As such, the following actions are taken to engage stakeholders and to encourage their participation in the formulation and improvement of programs, projects, and services:

Use of print and social 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

Targeted invitation to selected individuals from general public

Survey of traditional stakeholder groups

Survey of the general public

Survey of selected individuals from the general public

Stakeholder input: Methods to Identify Individuals and Groups

CREES has five programmatic areas: Agriculture, Aquaculture & Natural Resources, Family, Community, and Youth Development, Food Science, and Nutrition & Health. Each programmatic area has a local advisory council with a diverse group of members from the islands of Saipan, Tinian, and Rota. Local advisory council group members are selected through a key informant interview process. Key informants recommend individuals from their respective communities, including industry, to advise on current and emerging community needs. Potential advisory council group members are then asked by research and extension personnel if they would be willing to be a member and provide input in group and individual settings. Extension and research personnel also use their knowledge and experience of local industry, farmers, health personnel, and those who actively participate in CREES program areas to recommend individuals for local advisory group membership. A Food Science advisory council will be established in Fall 2022 as this is a new program. Additionally, research and extension faculty, who represent CREES on various councils, committees, and groups, solicit input from stakeholders during each respective group's meetings. Focus groups have also been used to identify issues and concerns as well as potential ways to address issues to meet local needs. Program leaders regularly collect input from stakeholders and recipients of program services.

Stakeholder input: Methods for Collecting Stakeholder Input

Stakeholder input is collected through established frameworks at the department level and through the four programmatic areas through:

Meeting with traditional Stakeholder individuals

Survey of traditional Stakeholder individuals

Meeting with the general public (open meeting advertised to all)

Meeting specifically with non-traditional groups

Survey specifically with non-traditional groups

Meeting specifically with non-traditional individuals

Survey specifically with non-traditional individuals

Meeting with invited selected individuals from the general public

Survey of selected individuals from the general public

Schools Parents Teachers and Students (PTSA) meetings

Local advisory groups are convened periodically. Department personnel are present at meetings to listen to concerns and recommendations from stakeholders. Minutes of meetings are recorded and summarized for review by department personnel. Online survey results are also used to gauge the community readiness of identified village communities to participate in research and extension programming.

Stakeholder input: A Statement of How the Input Will Be Considered

The input provided by stakeholders from community meetings, focus groups, advisory group meetings, and survey results is considered when planning programs and assessing progress in meeting program objectives and addressing community needs. In some cases, program personnel present program and project formulation plans to advisory groups for their input. The minutes or notes garnered from the aforementioned data collection methods are centralized online for all department personnel to access. Stakeholder input (clientele, government) is used to create yearly plans of work for each of the five program areas: Family, Community, and Youth Development, Nutrition and Health, Aquaculture and Natural Resources, Food Science, and Agriculture. The yearly plans of work are used as part of the process by department administration to determine prioritization of funds.

Critical Issues

Biosecurity and Invasive Species

Initiated on: Nov 26, 2019

State: Commonwealth Of The Northern Mariana Islands

Term Length: Long-term (>5 years)

The CNMI is highly vulnerable to the impacts of invasive species due to its limited land mass and unique flora, fauna, and native species. The islands' biodiversity is being altered or lost because of invasive and threatful species. Improving our Biosecurity and Invasive species management programs will mitigate the threat and allow for thriving ecosystems. Currently, the NMI does not have an integrated plan to

address prevention and mitigation of these threats, which are pervasive across the U.S.-affiliated Pacific Islands.

Designing, developing, and implementing biosecurity programs will help maintain the CNMI's strategic advantage as a pathogen free location for aquaculture production. Continued collaboration and partnerships with like agencies and organizations as well as research and public education are crucial in preventing further introduction and suppression of invasive species that are a threat to resource depleted CNMI.

Science Emphasis Area

Education and Multicultural Alliances, Environmental Systems, Food Safety, Sustainable Agricultural Production Systems

Climate Change Effects & Mitigation

Initiated on: Nov 26, 2019

State: Commonwealth Of The Northern Mariana Islands

Term Length: Long-term (>5 years)

The CNMI is experiencing the effects of climate change such as rising temperatures, stronger typhoons with increased frequency, rising sea levels, and more severe drought and heat waves. Local food production is being impacted by these changes, with limited insurance options for producers. Human health and development is also effected as a result of the trauma and stress that is experienced prior to, during, and after natural disasters. Schools and colleges are shutdown for prolonged periods of time following severe typhoons, which interferes with educational attainment and learning.

As islands with limited land mass for land based aquaculture, the push to conduct more fish farming in the ocean (mariculture) around the CNMI is becoming an attractive proposition. Climate Change's effect in the ocean, however, due to rising temperatures, ocean acidification, lower oxygen levels, and its effect on the ocean's productivity and food web will make mariculture more challenging in the future. Mitigative practices such as Integrated Multi-trophic Aquaculture or IMTA is an example of an area where CREES can conduct research and share knowledge on a production system that addresses both climate change mitigation, macroalgae production, while allowing concurrent mariculture production.

Improving the research, extension, and education programs is important to mitigate the effects of climate change in the local economy, local food production, and human health.

Science Emphasis Area

Agroclimate Science, Bioeconomy, Bioenergy, and Bioproducts, Education and Multicultural Alliances, Environmental Systems, Food Safety, Human Nutrition, Sustainable Agricultural Production Systems, Youth Development

Food Safety, Food Quality, & Assurance

Initiated on: Oct 01, 2022

State: Commonwealth Of The Northern Mariana Islands

Term Length: Long-term (>5 years)

The Northern Mariana Islands (NMI) imports a high majority of food from overseas. The NMI has the potential to increase food processing, food safety, food quality and value-added food production. Currently, there are many locally produced carbohydrate such as sweet potato, potato, taro, cassava, yam and breadfruit that have yet to maximize their value-added and food processing potentials.

Breadfruit, sweet potato, taro, cassava, and yam are the major carbohydrate sources and easily available. According to the census of agriculture of Northern Mariana Islands (2018) Commonwealth and Island Data, Volume 1, Part 56, AC-17-A-56), breadfruit, sweet potato, taro, cassava, and yam are harvested in 43 farms (35 acres), 40 farms (20 acres), 32 farms (21 acres) and 18 farms (4 acres), respectively. Despite the little amount, the harvested crops are exported directly due to the lack of processing knowledge and its application in the CNMI. The possibility of using breadfruit, sweet potato, taro, cassava and yam flour of CNMI in bakery products, noodles and other wheat-based foods has not been investigated to date.

Various types of crops are locally grown in the Northern Mariana Islands and are only available in the harvesting seasons throughout the year. Therefore, it is very important to find an alternative way to preserve these types of food crops to fulfill the demand of the NMCI people. The quality of the crop's ingredients depends on different factors such as environment, soil, nature of the plant, gender, plant grown areas etc. Thus the main objective of this study is to characterize and analyze the ingredients, and optimizes the blending ratios of the CNMI products of breadfruit, sweet potato, taro, cassava and yam flours and starches to replace wheat flour diversifying their uses as value-added food products.

A new diversified value-added food will be introduced to permit manufacturing and nutraceuticals raw materials that contain no lethal solvents and that do not cause contamination in the surrounding local environment, which is essential for both food and general wellbeing as well as increasing local economic activity in the CNMI. They will be able to preserve this value-added food for a long time as an alternative source of wheat and carbohydrate while increasing local food security and decreasing the reliance on imported food stuff. CNMI people will also get the enriched nutritional value because this diversified food will be prepared by a combination of different crops.

Mixtures of breadfruit, sweet potato, taro, cassava, and yam flour from locally grown crops in CNMI could be replaced with wheat flour to diversify the uses of the local products to produce the value-added bakery and other food products.

Science Emphasis Area

Food Safety, Human Nutrition, Sustainable Agricultural Production Systems

Food Security

Initiated on: Nov 26, 2019

State: Commonwealth Of The Northern Mariana Islands

Term Length: Long-term (>5 years)

The Northern Mariana Islands imports approximately 95% of food consumed in the islands. Most of the food is brought in by ship and fresh produce by air from the U.S. and Asian countries. The dependency on ocean and air carriers to bring in food not only has made food expensive in the NMI and unavailable when ships cannot unload cargo due to inclement weather or infrastructure damage due to

natural disasters. Port lock outs due to labor and other issues has also affected the CNMI's food supply system in the past. The number of farmers has decreased in the last 10 years due to many factors: urban development, high inputs costs, fluctuating economy, environmental challenges, and an aging farmer population. The aforementioned factors have led to declines in fresh local produce, meats, and starch/root crop production. In the last 4 years, the islands have experienced two super-typhoons which destroyed much of the islands including farms. This resulted in limited produce availability, and in some cases, the closure of commercial farms. The CNMI can work to reduce its dependency on imported foods, the need to transport food, and be food secure by addressing constraints to agricultural production through research, extension, and education in areas such as labor through mechanization, sustainable agriculture methods (no-till farming), reduce input cost through supply cooperatives and sustainable practices, and crop varieties suitability and marketability.

Food security affects the islands not just from a commercial standpoint, but also on the household level. Studies have found that approximately half of households report running out of food. Food cost is high. A study conducted in 2015 found that a family of 4 on Rota living on NMI median household income, would have to spend approximately 70% of income in order to be able to afford the USDA Thrifty Meal Plan.

Science Emphasis Area

Agroclimate Science, Bioeconomy, Bioenergy, and Bioproducts, Education and Multicultural Alliances, Environmental Systems, Family & Consumer Sciences, Food Safety, Human Nutrition, Sustainable Agricultural Production Systems, Youth Development

High Cost of Production

Initiated on: Nov 26, 2019

State: Commonwealth Of The Northern Mariana Islands

Term Length: Intermediate (1-5 years)

Cost of production, specifically, energy cost continues to be a critical issue for aquaculture producers in the CNMI. As a United States territory, the CNMI is required to conform to waste water discharge regulations covered by the Environmental Protection Agency's Concentrated Aquatic Animal Production guidelines that prohibit release of effluent from fish farms. As a result, most aquaculture farms operate using Recirculating Aquaculture Systems which is energy intensive due to the need to operate mechanical and biological filtrations 24-hours a day, 7 days a week. As a result of intermittent power outages, aquaculture producers must also have back-up power generators (which run on gasoline or diesel) available, which further increases the cost of production. The CNMI has one of the highest energy cost per kilowatt-hour in the nation at \$0.33/kW, and as a result, energy represents 30% of the cost of production for aquaculture farms operating in the CNMI.

Science Emphasis Area

Agroclimate Science, Education and Multicultural Alliances, Environmental Systems, Human Nutrition, Sustainable Agricultural Production Systems

Mental Health

Initiated on: Oct 01, 2022

State: Commonwealth Of The Northern Mariana Islands

Term Length: Long-term (>5 years)

A significant percentage of CNMI youth are experiencing depressed mood and suicidal behaviors as reported in the 2017 CNMI Youth Risk Behavior Survey (YRBS). Approximately, 1943 adolescents participated in the YRBS of which 40% (n=786) reported that they were in a depressed mood every day for two or more weeks in a row. Suicidal thoughts were reported by 25% (n=498) of respondents, 22% (n=444) reported formulating a suicide plan, while 13% (n=241) attempted suicide in the 12 months prior to participating in the YRBS survey. As this survey was conducted prior to Super Typhoon Yutu and the COVID19 pandemic, further research is needed to determine if these events have compounded the already troubling mental health issues being experienced by CNMI youth and their families. Feedback from youth leaders and community partners suggests that adverse mental health issues have increased as a result of Super Typhoon Yutu and the pandemic.

Sakamoto, J. L., Shibamura, A., & Jimba, M. (2020). Depressed mood, suicidal behaviors, and health risk behaviors among youths in the Commonwealth of the Northern Mariana Islands: the 2017 CNMI Youth Risk Behavior Survey. *BMC Public Health*, 20(1). <https://doi.org/10.1186/s12889-020-08663-z>

Science Emphasis Area

Youth Development

Overweight and Obesity

Initiated on: Nov 26, 2019

State: Commonwealth Of The Northern Mariana Islands

Term Length: Long-term (>5 years)

A study of child overweight and obesity (OWOB) prevalence on children ages 2-8 residing in the Northern Mariana Islands found that 16.7% of children were obese with 9% showing some degree of acanthosis nigricans (AN). Children who develop AN are at higher risk for developing type 2 diabetes. A study which looked at the predicted prevalence of children ages 2-8 residing in the Northern Mariana Islands based on publically available child growth assessment data concluded that at age 2, 25% of NMI children are overweight or obese. By age 8, 47% of NMI children are predicted to be overweight or obese. Children who are overweight or obese are more likely to stay obese into adulthood and to develop noncommunicable diseases such as diabetes and cardiovascular earlier in life. They are also more likely to be bullied and marginalized.

Among adults, 64% are overweight or obese (30% obese). Adults ages 25 to 34 have the highest prevalence of overweight and obesity (73%) among all adult age group categories. Among ethnic groups, Chamorro and Carolinian having the highest rates of overweight and obesity (82.5%, 86.4%). Overweight and obese adults are at increased risk of developing high cholesterol, high blood sugar, and heart disease.

Yet, despite these harrowing statistics, the NMI is not included in national health surveys (such as NHANES). The local data infrastructure is limited and needs further development in order to establish trends and to understand the extent and causes of the overweight and obesity issues across the lifespan. Data infrastructure enables individuals and programs to understand the extent of the problem, establish trends, and to formulate programs and interventions that address overweight and obesity, the resulting health consequences of OWOB, and improve health outcomes.

Science Emphasis Area

Education and Multicultural Alliances, Environmental Systems, Family & Consumer Sciences, Human Nutrition, Sustainable Agricultural Production Systems, Youth Development

PSEs Built & Food Environments

Initiated on: Nov 26, 2019

State: Commonwealth Of The Northern Mariana Islands

Term Length: Long-term (>5 years)

The environment affects emotional, social, and intellectual well-being. Physical, chemical, and biological features of the environment and low social cohesion in lower-income neighborhoods have been found to contribute to poorer health outcomes. Research demonstrates that built and food environments influence food intake and physical activity. The design of the environments that people live, work, and play is therefore important. Communities that are not well designed may have higher rates of undesirable health, economic, and well-being outcomes. It is essential that communities have policies that govern community design to ensure that communities/villages are purposefully designed to encourage social cohesion, sustainable economic opportunities, and environments that make it easy to access healthy food choices and opportunities for physical activity.

Science Emphasis Area

Agroclimate Science, Education and Multicultural Alliances, Environmental Systems, Family & Consumer Sciences, Human Nutrition, Sustainable Agricultural Production Systems, Youth Development

Workforce Development & Human Capital

Initiated on: Nov 26, 2019

State: Commonwealth Of The Northern Mariana Islands

Term Length: Long-term (>5 years)

The 2010 Census revealed 82.4% of the CNMI adult population are high school graduates, while 20.4% have a baccalaureate degree. Businesses report that it is challenging to find competent and creative workers that are necessary to compete in the global economy. A well-trained workforce is necessary for a healthy economy, productive citizens, and strong families. Due to the rapid growth of the NMI economy in the last several decades and the limited pool of skilled workers, the NMI is dependent on foreign labor. The CW-1 permit program, which allows for the employment of non-U.S. citizens in the NMI, will end in 2029, which will significantly impact our economy due to the lack of labor available in the NMI. The exact extent of the digital divide in the CNMI in quantitative terms is currently unknown. However, a survey conducted by the Public School System in March 2020, found that a significant percent of students do not have adequate digital access at home (including but not limited to access to internet and/or devices to access the internet) to attend school through online platforms. The anticipated increase in the use of digital platforms for work, education, and socialization, expedites the need to increase digital skills among residents. Human capital is a key ingredient in a thriving economy, therefore, it is imperative that we focus our efforts on workforce development, youth professional and workforce preparation, soft skills development, community capacity building and civic engagement through volunteerism.

Science Emphasis Area

Education and Multicultural Alliances, Family & Consumer Sciences, Sustainable Agricultural Production Systems, Youth Development

Youth Development & Advancement

Initiated on: Nov 26, 2019

State: Commonwealth Of The Northern Mariana Islands

Term Length: Intermediate (1-5 years)

According to the 2017 CNMI Youth Risk Behavior Surveillance Report, 24.8% of middle school aged students have used marijuana, 44.3% of high school aged students have used marijuana and 3.4% have used methamphetamines. Additionally, 44.5% of middle school aged students had suicidal thoughts while 25% of high school aged students had suicidal thoughts. Among middle and high school aged students, rates for thoughts of suicide, there were 21.4% and 13.4% attempts respectively; of the 13.4% attempts among high schoolers, 4.3% resulted in injury.

We aim to decrease the numbers of students at risk and increase resiliency by providing opportunities for volunteerism, personal and professional capacity building, and leadership development. Through our efforts, we are empowering students and young adults to promote acceptance, camaraderie and self-esteem in order to actively seek positive engagement that directly apply their skills to suitable positions upon entering the labor workforce.

Science Emphasis Area

Education and Multicultural Alliances, Environmental Systems, Family & Consumer Sciences, Youth Development