2018 University of Guam Combined Research and Extension Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

Guam, an unincorporated Territory of the United States, is the largest of 16 islands in the Marianas in the Western Pacific. The estimated population of Guam in 2018 was 166,000. The most represented ethnic groups include Chamorros (37%), Filipinos (26%), Caucasian/Americans (7%), and Chuukese (7%). The University of Guam, an 1862 Land Grant institution includes the College of Natural and Applied Sciences (CNAS) which has three functions: research, extension, and teaching. The CNAS Dean serves as Director of the Agriculture Experiment Station and Director of Cooperative Extension & Outreach (CE&O).
The Western Pacific Tropical Research Center (WPTRC) was created in 2006 to conduct applied and basic research in agriculture, aquaculture), and natural resources. Research at WPTRC is aimed to 1) sustain, protect, and restore the natural environment, 2) stimulate economic development though sustainable use of resources, and 3) improve quality of life in the Western Pacific. Some noteworthy research to preserve Guam's unique environment includes the Guam Plant Extinction Prevention Program, forest health studies on biotic and abiotic threats to native and introduced tree species, the Guam Forest Inventory Analysis, and extensive work on "geo-health" to reduce chemical pollution, curtail sedimentation in coastal environments, conserve threatened taxa, and improve water quality by reducing application of synthetic fertilizers and disposal of animal waste. Research on socio-economic alternatives focuses on aquaculture, integrated small-scale farming systems involving simultaneous production of compost, fish, fruits, poultry, and vegetables; disease-free plant propagation, and widened availability of crop genetic resources. Projects emphasizing the enhancement of quality of life in the Western Pacific concentrate on human nutrition and child obesity, food safety and quality, and green roofs (i.e., vegetated surfaces on top of buildings).
In 2018, the eight full-time WPTRC research faculty co-authored 27 papers in peer-reviewed journals They also offered numerous presentations in national and international meetings, and advised nine graduate students.
University of Guam Cooperative Extension and Outreach (CE&O) mission is to deliver research-based, unbiased information to citizens to incorporate into their daily lives. In turn, CE&O is the conduit back to the university research base about needs and concerns of the citizens that should drive the research cavities of the faculty. CE&O delivers education programs, materials, and activities that enhance and improve the lives of children, youth, families, businesses, villages, production agriculture, government agencies, non-profit agencies, service groups, and other island partners. CE&O is administered in the College of Natural and Applied Sciences, but the mission of Extension is to partner with all entities in the university to service the outreach function and philosophy. Partnerships are essential to conducting research and delivery of extension education. In the areas of nutrition education, child and youth activity, invasive species control, and youth engagement, CE&O faculty and professionals lead the research and engagement activities for the university, island, region, and international efforts for Micronesia.
In 2018, CE&O faculty and professionals conducted workshops, learning events, and activities to engage citizens of Guam and the region to effectively engage people with the knowledge generated from research. In 2018, CE&O acquired a new associate dean for extension in the mid fiscal year. During the remainder of the year several changes have been established to ensure extension operations continue to evolve to meet the needs of citizens. A peer reviewed publications process has been established for extension materials (print, on-line, etc) to link to programming and national reporting systems. Publications are

branded with university guidelines, meet basic standards for grammar, reading level, format, and learner style, as well as content base.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	22.0	0.0	24.0	0.0
Actual	26.1	0.0	24.0	0.0

II. Merit Review Process

1. The Merit Review Process that was Employed for this year

- Internal University Panel
- External Non-University Panel
- Combined External and Internal University Panel

2. Brief Explanation

Cooperative Extension & Outreach (C-E&O) of the University of Guam, have established programming and outreach efforts based on needs assessments and information gathering processes over the last five years. Identifying needs is an on-gong process to truly stay abreast of needs of stakeholders and link to the research base. Faculty and extension professionals plan and design programs based on those needs. The focus of the programs for production agriculture focus on small area (micro-plot) production (backyard farming). Large commercial producers are few, but effective. The greatest need is for self-sufficiency and micro-supply. Invasive species control is identified as a major issue for the island for the region. Not only insect, but reptile, bird, virus, fungus, fish, and other species not native or controlled by this environment are a concern for the natural, economic, and social environments of the island. Youth investment is another major thrust defined by multiple sectors of the island and region. With the compact of free association that allows in-migration from neighboring islands, youth new to the island are a target audience for involvement in youth development options to reduce risks in other areas. Youth leadership skills, as well as workforce skills, are the focus for community, school, club, and other youth active learning groups.

Unlike the WPTRC, the amount of funds available for projects within C-E&O is relatively small. As with all research approaches encourage the acquisition of outside funding by all faculty members and professional staff. Both extension and research faculty submit an annual plan of work called Comprehensive Faculty Evaluation System (CFES), that covers a range of activities that are within the University of Guam faculty portfolio. Non-faculty employees paid by Smith-Lever funds, use the same standard form developed by C-E&O for faculty, but their loads are project based. Each faculty and professional member is given $2,000-$3,500/yr to support basic work activities within their CFES and that work plan is discussed, modified (as necessary), and approved by the Associate Director/Dean and the Director/Dean prior to the faculty receiving their funds.
A concerted effort has been exerted to capture, update, and publish previous materials in the extension system. Captured and updated research based materials are located on the college website: cnas-re.uog.edu. Additionally, scanning historical material to preserve and retain the immediate history of CE&O is a priority. Limited access has been dedicated to capturing material, media accounts, and related materials across time for use in the future. Guam and regional content that did not come from UOG resources but are relevant clients, has been placed at http://cnas-re.uog.edu/other-non-cnas-publications/.

two years, there will a migration of operating system and access to the main university site. There are dedicated individuals addressing issues of material integrity, access, and retention.
For WPTRC (AES), review of individual Plans of Work are conducted by WPTRC administrators (Director and Associate Director). New research proposals are submitted to WPTRC Associate Director who checks them for completeness and format. There are few faculty at the university with expertise to review research proposals. Therefore, a draft proposal that is ready for review may be submitted to external reviewers to assess significance, need, approach, new knowledge to be generated, potential for impact, and potential for success.
Research at WPTRC is aimed to 1) sustain, protect, and restore the natural environment, 2) stimulate economic development through sustainable use of resources, and 3) improve quality of life in the Western Pacific. Some noteworthy research to preserve Guam's unique environment includes the Guam Plant Extinction Prevention Program, forest health studies on biotic and abiotic threats to native and introduced tree species, the Guam Forest Inventory Analysis, and extensive work on "geo-health" to reduce chemical pollution, curtail sedimentation in coastal environments, conserve threatened taxa, and improve water quality by reducing the application of synthetic fertilizers and the proper disposal of animal waste.
Research on socio-economic alternative focuses on aquaculture, integrated small-scale farming systems involving simultaneous production of compost, fish, fruits, poultry, and vegetables; disease-free plant propagation, and widened availability of crop genetic resources. Projects emphasizing the enhancement of quality of life in the Western Pacific concentrate on human nutrition and child obesity, food safety and quality, and green roofs (i.e., vegetated surfaces on top of buildings).
CNAS researchers post progress and final reports annually using NIFA's RReport site. The Associate Director then reviews and submit the reports. Reports contain outputs and short, medium, and long term outcomes.

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
- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Survey of the general public
- Survey specifically with non-traditional groups

Brief explanation.

Both CE&O and WPTRC employed several stakeholder input methods including gathering input from local community groups, individual farmers, farmer's groups and other organizations, non-profit groups, businesses groups, service organizations, local agencies, federal partner agencies. In the relatively small area of Guam, personal interaction with stakeholders is very easy to do. Seeking information, concerns, and issues has been sought through formal meetings, as well as through informal and non-formal methods, such as social media and casual conversation.
Periodically, stakeholders (farmers, golf course superintendents, owners of nurseries, and others) are invited to meet with faculty and professionals to discuss concerns, options, and research opportunities. At the end of 2018, CE&O held the first annual report to stakeholders meeting, where all stakeholders, partners, potential collaborators, and decision-makers were invited to attend and

engage with Extension professionals about the impact of their programs on Guam citizens. In addition, a printed report of impacts was issued with the intent of being an annual report.

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.

There are approximately 250 Bona Fide farmers on Guam. Those involved in production agriculture range from large commercial operations to micro-plot farmers. The production agriculture population on Guam do not have organization commodity groups, but the option remains open. Their associations are rather loose and based on personal contacts. In addition, with a small population and close associations, contact with government agencies (local and federal) are fairly easy to utilize. Again, with a small population, media contacts are very easy to make and use as means to advertise as well as disseminate information. The website includes a feature where clients can sign up to receive news briefs. In 2018, a division of communications and marketing was established to use professional skills for visual, audio, print, and social media as teaching and information sharing tools.

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 with the general public (open meeting advertised to all)
- Survey of the general public
- Survey specifically with non-traditional groups
- Survey specifically with non-traditional individuals

Brief explanation.

Guam is a relatively small and close-knit community. Most UOG faculty work closely with stakeholders. These include community organizations, individual farmers, homeowners, school teachers, state legislature, and government agencies. Informal and formal input is provided to UOG on a regular basis during workshops, open houses, telephone calls, and letters. Several faculty members conducted research on stakeholders' farms. Some faculty and administrators were invited for informal or formal meetings, such as for example Guam Soil and Water Conservation District where UOG receives an input and feedback from stakeholder groups.

3. A statement of how the input will be considered

- To Identify Emerging Issues
- Redirect Extension Programs
- In the Staff Hiring Process
- To Set Priorities

Brief explanation.

Faculty maintain close contacts with local farmers, landscapers, aquaculture producers, and local environmentalists. Because of the breadth of experience on other islands in the region, UOG-CNAS scientists and extension agents are able to identify, characterize and provide a rational method of management for invasive species, new disease outbreaks and other concerns on Guam. After identifying the challenges, researchers apply for funding for more in depth investigations. We also address the needs of non-agricultural clients. There are a variety of needs for information and education for youth, families, and the elderly on Guam. Specific to production agriculture, some bottlenecks for producers are distribution and markets for products, barriers to markets, and business management.

Brief Explanation of what you learned from your Stakeholders

From the perspective of Cooperative Extension & Research, the need for science literacy and application to food security, environmental threats, and impacts to human populations is continuing to be part of the dialogue with agriculture producers, elected leaders, and consumers. Research-based information as a foundation of education and outreach is critical and needed for all programmatic efforts, but specifically for the Western Pacific in the areas of invasive species economic and environmental impact, food production, and water capture and use.

IV. Expenditure Summary

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

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	1129957	0	1361442	0
Actual Matching	767348	0	710213	0
Actual All Other	0	0	0	0
Total Actual Expended	1897305	0	2071655	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	546284	0	615667	0

V. Planned Program Table of Content

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

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
608	Community Resource Planning and Development	30%		0%	
704	Nutrition and Hunger in the Population	10%		0%	
801	Individual and Family Resource Management	10%		0%	
802	Human Development and Family Well-Being	10%		0%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	10%		0%	
805	Community Institutions, Health, and Social Services	30%		0%	
	Total	100%		0%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	4.0	0.0	0.0	0.0
Actual Paid	2.2	0.0	0.0	0.0
Actual Volunteer	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**
101850	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
68710	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The majority of community development activities is concentrated in providing content and process expertise based on the various collaboration with community and government organizations. These activities range from community development workshops, training, and program orientation. A large part of the program effort involved assisting various planning groups address their strategic reporting requirements and conducting outreach. Project partners continue to value and rely on the use of community asset and strategy maps, assistance in conducting needs assessments, policy developments and operating procedures for various programs. Activities for this program include:

1. Conducting community development workshops and training that foster more inclusive decision-making process and action (to teach policy leaders to interpret and apply economic data to local development decisions)
2. Conducting community asset mapping
3. Providing provide technical assistance in strategic planning, conducting needs assessments, survey design to help people understand the economic impact of policy changes, and implementation capabilities
4. Accessing, interpreting and applying objective data and conduct assessments (survey design and field data collection)
5. Establish and maintain collaborations with local and federal government
6. Establish partnership and/or collaborative MOAs and MOUs
7. Establish coalitions for placed based economic development (community-based entreprenuership)
8. Conduct focus groups sessions and provide training on how to conduct community needs assessments

2. Brief description of the target audience

The target audiences in the program include: local government, numerous commissions and boards; non-governmental organizations, and youth ages 14-17. Other target audiences are also economic development professionals, small businesses and industries, community groups and the general public, regional collaborators. Community development audiences are distributed across both governmental and nongovernmental organizations and their stakeholders. The target audiences in the program include: local government agencies involved in comprehensive planning and statistical/survey work. Other key cooperators include the various local and regional boards and commissions overseeing a range of programs. Although the majority of the audiences are Guam based government and non-government groups, a growing number of audiences come from the regional areas (through various projects and program affiliations with Guam projects/programs).

3. How was eXtension used?

As a member in the various Communities of Practice (CoPs), member networks and project discussions have been utilized to develop and deliver programs. eXtension continues to be an important source for accessing leading edge program innovations and practices. The eXtension platform provides a wealth of opportunities to access professional networks. Webinars continue to be a valuable tool to participate and learn about the latest research and program interest areas.

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	125	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	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- number of extension articles

Year	Actual
2018	1

Output #2

Output Measure

- number of workshops

Not reporting on this Output for this Annual Report

Output #3

Output Measure

- number of brochures

Not reporting on this Output for this Annual Report

Output #4

Output Measure

- number of disseminated research results, new technology and information

Year	Actual
2018	14

Output #5

Output Measure

- number of surveys

Not reporting on this Output for this Annual Report

Output #6

Output Measure

- number of focus groups conducted

Not reporting on this Output for this Annual Report

Output #7

Output Measure

- number of popular articles in newsletters, magazines and newspapers

Not reporting on this Output for this Annual Report

Output #8

Output Measure

- number of one to one assistance

Year	Actual
2018	80

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of organizations individuals increasing leadership skills.
2	Number of individuals and organizations increasing knowledge of program development skills.
3	Number of individuals and organizations increasing knowledge of effective strategies for public decision making
4	Number of individuals and organizations crafting, evaluating, and implementing alternative solutions to address public issues
5	Number of individuals and organizations building skills and identifying opportunities to enhance effective participation in public decision making processes

Outcome #1

1. Outcome Measures

Number of organizations individuals increasing leadership skills.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
For the most part, government boards and commissions and councils continue to struggle with strategic planning and plan updates. This issue is seen in the need for addressing data, needs assessments and policy and operating procedures guidelines. Strengthening the planning capacity of these boards, commissions and council can alleviate programming challenges and funding issues for the various programs under their oversight.

What has been done
Through both Extension's content and process expertise, planning assistance and evaluation of programs have been extended to these organizations.This includes assisting planning processes with facilitated dialogue and action plan development.

Results
Strategic planning and action plans completed, as well as increased dialogue between agencies.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services

Outcome #2

1. Outcome Measures

Number of individuals and organizations increasing knowledge of program development skills.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	20

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Strengthening of planning capacity continues to be a high interest area. The Government of Guam continues to fall short in addressing its broad planning roles and responsibilities because of limitations in addressing and managing their collective social program delivery priorities.

What has been done
Extension continues to participate in the assembly of planners forum sponsored by the GovGuam. This forum provides an opportunity to gain insights and sharing and expanding program development knowledge and skill building.

Results
Extension continues to provide content and process expertise support through the various cooperator work groups. This includes participating in various ad-hoc program development teams to address various technical program and project/proposal development.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services

Outcome #3

1. Outcome Measures

Number of individuals and organizations increasing knowledge of effective strategies for public decision making

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	25

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Knowledge management continues to be a recurring issue among government and community organizations dealing with various public issues. Addressing public issues requires a knowledge platform to share and link data to policy for informed decision-making and program development. Stakeholder input and community engagement is important in public policy work.

What has been done
During this reporting period, the University of Guam established a Regional Center for Public Policy to carry the broader engagement interest of the University of Guam as a land grant institution and helping communities address their knowledge needs through public issues research advocated through the UOG-RCPP. This center is located in the School of Business and Public Administration and is resourced as needed by Extension & Outreach.

Results
The UOG RCPP was approved by the University President establishing a formal public policy research program for public decision making.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services

Outcome #4

1. Outcome Measures

Number of individuals and organizations crafting, evaluating, and implementing alternative solutions to address public issues

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	20

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The Knowledge@Guam Initiative (K@GI) builds upon Extension's community development issues education work. Issues identification continues to be a planning challenge for planning agencies and community organizations struggling with limited resources and expertise.

What has been done
The K@GI continues to serve as the initiative to align the various public issues through the use of the community capitals framework (CCF). The CCF continues to guide the issues conversation through the use of various planning tools such as asset maps, strategy maps.

Results
K@GI continues to Extension's community development branding for managing and sponsoring conversations around public issues education. This effort is a long term project with specific outcomes in the area of intangibles: trust, dialogue, and planning for long term projects.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services

Outcome #5

1. Outcome Measures

Number of individuals and organizations building skills and identifying opportunities to enhance effective participation in public decision making processes

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	10

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The lack of reliable data and information around key public issues continues to be a challenge for community government planners. This is evident in the village arena where a total of 19 village mayors continue to struggle with their version of village-based issues and engaging their stakeholders to participate in planned community growth. Harnessing big data for use at the village level is daunting for all elected leaders, yet needed for long term impact.

What has been done
The K@GI provides the platform for the development of an ongoing series of village monographs. illage monographs align with the CCF approach to frame the various community assets, data and issues. Specific program son how to use data and reducing barriers to data are continually implemented.

Results
The CCF and K@GI continues to be the main approach for community planning discussions and engaging various stakeholders in the planning processes. In the next three years. Extension programming will focus on reducing barriers to data access, use, and implications for planning.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, 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
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Linking key data and information to public issues and policy continues to be a challenge by all organizations. Leadership of government, private, and business organizations acknowledge the need for planning and actions related to use of data, but don't know where to start. Extension education programs have focused and continue to evolve programmatic efforts to assist the use of data and information for use by all citizens of Guam and the region. All the efforts to provide education about use of data will have long term positive impact on collaborations and cooperative programming among public and private entities.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Cooperative Extension & Outreach is becoming the resource for survey operationalization and interpretation. Multiple MOUs are being explored for FY 19 and FY 20 to gather economic, social, and infrastructure data for federal and territorial entities.

Key Items of Evaluation

CE&O is the key source of data interpretation for federal partners (USDA NASS, Department of Commerce, Census). In addition, CE&O is the prime contractor to gather survey data.

V(A). Planned Program (Summary)

Program # 2

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
501	New and Improved Food Processing Technologies	10%		15%	
502	New and Improved Food Products	40%		45%	
503	Quality Maintenance in Storing and Marketing Food Products	10%		0%	
604	Marketing and Distribution Practices	5%		0%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	30%		40%	
806	Youth Development	5%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	1.5	0.0	0.5	0.0
Actual Paid	4.5	0.0	1.1	0.0
Actual Volunteer	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**
193019	0	40902	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
130214	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The input activities are to: (1) investigate factors affecting foodborne illness and food quality in food processing and preparation; (2) provide workshops and training in food safety and food processing in the community; (3) provide consultant services about food safety and food technology in community; (4) determine beneficial and adverse effects of natural chemicals and tropical and subtropical plants, fruits, and vegetables on human health and food safety; (5) develop tropical value-added food products; and (6) disseminate scientific-based information and technologies related to food safety, food processing, and marketing safe and wholesome food products in the community.

2. Brief description of the target audience

The target audiences include entrepreneurs, food manufacturers, food workers, and food-safety educators, farmers, general consumers, college students, youth, and school children.

3. How was eXtension used?

Continually, eXtension is reviewed for program applications and ideas.

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	2326	480	75	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	2	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- # of peer reviewed publications

Year	Actual
2018	2

Output #2

Output Measure

- # of non-peer reviewed publications

Not reporting on this Output for this Annual Report

Output #3

Output Measure

- # of workshops

Year	Actual
2018	7

Output #4

Output Measure

- # of dissemination of science-based information

Year	Actual
2018	7

Output #5

Output Measure

- # of work with media

Year	Actual
2018	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Changes of participants (or residents) in gaining knowledge of principles and practices in food safety and food processing
2	Changes of participants (or residents) in improving practices and applying principles in food safety and food processing
3	Changes in magnitude of foodbonre illness and marketing safe and wholesome value-added food products in the community
4	xx

Outcome #1

1. Outcome Measures

Changes of participants (or residents) in gaining knowledge of principles and practices in food safety and food processing

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	2316

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The frequency of foodborne illness on Guam is greater than that in the U.S. states. Each year about one of four residents experiences foodborne illness because of poor knowledge and practice in controlling temperatures in storage and cooking as well as avoiding unsafe food sources. In addition, ninety percent of foods are imported on Guam and value-added food products are lacking on the island.

What has been done
Workshops of food safety and home food processing using local produce were provided to the residents in the community of Guam. One-to-one assistance in food safety and food processing were also provided to meet the specific needs of individuals. In addition, the FSMA FSPCA Food Safety Course "Preventive Controls for Human Food" were provided to the regional entrepreneurs.

Results
Through the educational activities, the target audiences improved their knowledge in food safety and food processing. With food entrepeneurs, increased inquiries about food processing and stabilization are reported in CE&O.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
503	Quality Maintenance in Storing and Marketing Food Products
604	Marketing and Distribution Practices

712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #2

1. Outcome Measures

Changes of participants (or residents) in improving practices and applying principles in food safety and food processing

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	2326

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
With estimation, each year about one of four residents experiences foodborne illness because of poor knowledge and practice in controlling temperatures in storage and cooking as well as avoiding unsafe food sources. In addition, ninety percent of foods are imported on Guam and value-added food products are lacking on the island.

What has been done
Workshops of food safety and home food processing using local produces were provided to the residents in the community of Guam. One-to-one assistance in food safety and food processing were also provided to meet the specific needs of individuals. In addition, the FSMA FSPCA Food Safety Course "Preventive Controls for Human Food" were provided to producers as well as applicable information to consumer for self use.

Results
Through the educational activities to targeted audiences, participants learned to make food safety plan, to conduct preventive controls for processing foods; to make coconut kefir, and other products using local coconuts.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
502	New and Improved Food Products

503	Quality Maintenance in Storing and Marketing Food Products
604	Marketing and Distribution Practices
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #3

1. **Outcome Measures**

Changes in magnitude of foodbonre illness and marketing safe and wholesome value-added food products in the community

Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

xx

Not Reporting on this Outcome Measure

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

Storm incidents impact workshop delivery. Storm recovery becomes the priority and immediate consumer needs are the focus for food safety. Other government agencies continually seek to overstep their mission to cover this area, without research based information, nor credentials of training in FSMA.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Pre- and post-tests, workshop evaluation, and direct observation in practicing learned skills were used to evaluate the results of educational activities in food safety and food processing. The evaluation results showed that target audiences learned the new knowledge and skills in food safety and home food processing. The target audiences were very satisfied with the workshops and other activities provided in the community.

Key Items of Evaluation

Targeted audiences improved knowledge and behaviors in food safety. Targeted audiences used food processing skills to make value-added food products using local fresh fruits and vegetables. There has been an increase in the number of food entrepreneurs who utilize the food label analysis before sending their product to market. Increasing production capacity to positively impact food security are the next steps for CE&O.

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

4-H and Youth 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
806	Youth Development	100%		0%	
	Total	100%		0%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	2.0	0.0	0.0	0.0
Actual Paid	3.1	0.0	0.0	0.0
Actual Volunteer	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**
94702	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
63887	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

To achieve the 4-H program goals the following activities was conducted based on research proven curriculum adopted Experiential Learning Model promoting life skills.

4 new 4-H Community Cubs were charted while supporting our 5 established ones annually

12 4-H school enrichment programs was established and later 1 was chartered as 4-H Clubs

10 special interest/short-term programs/Day Camps was conducted

06 technology related workshops was conducted and

03 planned workshops for 4-H individual study/mentoring/family learning activities was implemented.

2. Brief description of the target audience

Primary target audience includes: children, youth, and families in the community, and schools including military establishments and their families including teachers, educators, and organizations that may request our services in a collaborative manner. Efforts will be made to reach targeted population who are underserved.

3. How was eXtension used?

eXtension was used to generate ideas and evaluation options for programming.

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	363	436	9603	11524

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	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- (1) # of club members

Year	Actual
2018	466

Output #2

Output Measure

- (2) # of volunteer leaders

Year	Actual
2018	54

Output #3

Output Measure

- (3) # of workshops

Year	Actual
2018	355

Output #4

Output Measure

- (4) # of brochures

Year	Actual
2018	4

Output #5

Output Measure

- (5) # of surveys

Year	Actual
2018	3

Output #6

Output Measure

- (6) # of media articles and promotions

Year	Actual
2018	40

Output #7

Output Measure

- (7) # of focus group

Year	Actual
2018	11

Output #8

Output Measure

- (8) # of volunteers trained

Year	Actual
2018	21

Output #9

Output Measure

- (9) # of extension staff trained

Year	Actual
2018	3

Output #10

Output Measure

- (10)# of collaboration established

Year	Actual
2018	57

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	(1) Number of youth through communication and expressive arts programming demonstrate increased self efficacy in public speaking, presentations, visual arts and performing arts
2	(2) Number of youth participants in 4H natural resouces and environmental education programs demonstrate environmentally responsible behavior
3	(3) Number of youth participants who study plant, soil and entomology learn the interconnectedness of organisms and their environment
4	(4) Number of youth reporting positive attitude change and/or aspirations about learning and careers in a 4-H project area
5	(5) Number of youth increasing participation in science and technology educational programming/clubs
6	(6) Number of volunteers completing a training program and successfully leading a program, activity, event or club
7	(7) Number of youth indicating increased knowledge/skills related to economic education and/or entrepreneurship
8	(8) Number of youth indicating knowledge and/or skills related to leadership
9	(9) Number of youth reporting positive attitude change and/or aspiration related to volunteering and community service

Outcome #1

1. Outcome Measures

(1) Number of youth through communication and expressive arts programming demonstrate increased self efficacy in public speaking, presentations, visual arts and performing arts

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	1278

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
To help build confidence and self-esteem within youth attendants, Guam 4-H provides culturally appropriate workshops that allow youth to have skills to address, cope and progress daily. Participants continue to build and gain faith and self-reliance in one's self. Specifically, for youth who are new to the island especially from the outer islands of Micronesia. Participation in 4-H creates an environment of inclusion and belonging where they are less likely to be "at-risk". Weaving of Micronesia, a newly implemented program is designed to unify our island youth by bridging the gap of misconception, misunderstanding and conflict through various workshops and activities centered around the different island culture of Micronesia.

What has been done
Through summer and weekend programming, students participate in numerous activities ranging from cultural driven topics, conservation of Guam's natural resources and environment, STEM to college and career path readiness.These lessons promote and help build their creativity, innovation, self-responsibility, self-esteem and self-confidence.

Results
Evaluation showed students had a 72% growth of knowledge by the end of the workshop but most impressive was the display of work done by the students. High school and middle school students had to create a mini presentation on what was the most import thing they learned and accomplished throughout the summer or during the weekend workshops. Workshops are designed to encourage students to participate as much as possible while developing relationship with their fellow student.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #2

1. Outcome Measures

(2) Number of youth participants in 4H natural resouces and environmental education programs demonstrate environmentally responsible behavior

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	5125

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
As a tiny island in the vast Pacific with minimal land mass, Guam's environment and natural resources plays a vital role in the survival of its people. By instilling values and responsibility through education, youth gain better understanding of conservation and preservation practices needed to protect their environment and natural resources.

What has been done
During this reporting time frame, 312 workshops were conducted to include themes such as STEM, Horticulture, Youth Fisheries and the Flora and Fauna of Guam. Lessons were taught with an underlining theme of preserving and conserving our natural resources and environmental responsibility.

Results
Over 60% of all participants showed an increase of knowledge and understanding based on a pre and post evaluation test giving during the workshop. Students gained a better awareness of the impact they make on their environment and the important role they play in protecting it.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #3

1. Outcome Measures

(3) Number of youth participants who study plant, soil and entomology learn the interconnectedness of organisms and their environment

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	4894

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
To cultivate youth understanding in how to interconnect and interrelate their environment to people are and to foster a great interest in STEM.

What has been done
Through STEM, Horticulture, Marine Science, Entomology and our Youth Fisheries Workshops, students not only gain a better comprehension on how the environment and all organisms, ourselves included are interconnected and how they have the power to affect change. Hundred percent of all participants walk away with a better understanding of the positive and negative impacts they make when it comes to our environment and natural resources most especially in the Pacific region.

Results
Based on our pre and post evaluation data from our STEM, Horticulture, Marine Science, Fisheries and Entomology Workshops, participants showed a 40% increase in their comprehension level from when they first started the program. Students were able to connect the relationship between them and the environment and how interconnected and mutually interdependent they are with each other.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #4

1. Outcome Measures

(4) Number of youth reporting positive attitude change and/or aspirations about learning and careers in a 4-H project area

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	4583

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
With a competitive market and a limited job pool, island youth must be prepared with appropriate skills that allow them to complete in a tight market. "In demand" qualities also provide opportunity to think outside the box of what is available in the traditional job market.

What has been done
Guam 4-H provides opportunities for workshop participants to meet a diverse group of employers, explore various fields in job market, interact with numerous community partners and tradesman passionate about their work. Participants were able to gain firsthand job experience from some of our collaborators while participating in the workshop. 4-H also exposes young participants to volunteerism and giving back to their community through service learning.

Results
Based on pre and post evaluation, more than 60% of all youth participants gained a better understanding of the skills needed in job market. Also, emphasized is the importance of volunteering in their community and how that simple act helps to further develop not only their skills but how the interact and relate with others.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #5

1. Outcome Measures

(5) Number of youth increasing participation in science and technology educational programming/clubs

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	4335

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Although Guam's youth have demonstrated improvement over several years in their district wide assessment scores in math and science, they still fall below national average according to Guam Department of Education. To help address this issue, Guam 4-H offers various STEM workshops throughout the school year, weekends and during the summer.

What has been done
Participants engaged in various STEM workshops through the 4-H program, a schools curriculum, club activity or community sponsored events. All 4-H sponsored workshops and activities center on our island and the surrounding Pacific region. Students focused on situations that affected them socially, culturally and economically. Students apply theories and principals of STEM that addressed issues such as global warning, raising sea water, bio-security, invasive plants and animals, and national and food security.

Results
All workshop conducted contained a STEM component whether it was a art, health, fisheries or cooking. During this reporting period, 70% of all participants showed an increase of knowledge in both the subject matter and targeted life skill based on their post evaluation test after participating in various workshops offered throughout the year.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #6

1. Outcome Measures

(6) Number of volunteers completing a training program and successfully leading a program, activity, event or club

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	7

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
To continue to develop our youth volunteers abilities, confidence and mindset while up holding 4-H's essential Element of Generosity. Also, to extend our volunteer pool and assist Guam's youth to meet their service hour requirements.

What has been done
Beside our Introduction to Volunteering, Code of Conduct, Stages and Ages, and Volunteer Expectation, all youth volunteers gain hands-on training by shadowing adult mentors to develop their skills, self-confidence and their self-assurance when interacting with participants.

Results
By the end of the training and shadowing adult mentors, seven youth mentors were able to lead and present in various workshops. Youth mentors conducted either the life skill portion or a segment of the main curriculum with a 100% mastery and confidence in their ability.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #7

1. Outcome Measures

(7) Number of youth indicating increased knowledge/skills related to economic education and/or entrepreneurship

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	3909

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
On an island where a person's livelihood depends on goods being imported, finding alternative solutions for long-term sustainability, protection of natural resources and economic growth resonate in the minds of everyone. One way to help our island youth face these challenges is to provide them with the tools they need to prepare themselves, as work force and as entrepreneurs. Instilling life skills, discovery of interest, guidance and mentorship will guide life-long learning and application of skills.

What has been done
As part of college and career readiness path, youth finance and entrepreneurship lessons are incorporated into the workshop to give participants a broader understanding of economics, an alternative to the traditional path of school and work and help them to become self-sufficient.

Results
Eighty-three percent of all participation in our College and Career Path Readiness Workshop are able to illustrate their comprehension of the subject matter and make sound judgement in formulating a plan to benefit their future.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #8

1. Outcome Measures

(8) Number of youth indicating knowledge and/or skills related to leadership

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	4583

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
On an island were respect and humbleness govern one's behavior based on cultural practices, youth find it difficult to assume a leadership role in fear of disrespecting or belief that those in social position automatic fill those positions and it's not necessary to assert oneself.

What has been done
Workshop activities were organized in a way to foster more team building, culture awareness, leadership, public speaking and college and career path readiness. The workshop included Cultural Exchange Day, Citizenship, College and Career Path, Youth Finance, STEM and Fisheries.

Results
Students participating in our summer and weekend workshops showed a growth of 30% in their leadership related skills between the time they started the program and the end of the workshop cycle. Students had to engaged in various activities that fostered their leadership skills, allowed them to work together, solve issues pertinent to their generation, find solutions to problems affecting the Pacific region and showcase what they have learned during the workshop presenting as a team.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #9

1. Outcome Measures

(9) Number of youth reporting positive attitude change and/or aspiration related to volunteering and community service

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	7

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
As a foundation for good citizenship, volunteering and community service help shape our youth to be positive and proactive members in society. "Giving back" or "paying forward" (philanthropic use of time and talent) help youth volunteers comprehend they must take an active role in their community to interconnected as human beings, make our world a better place and to help look beyond our island.

What has been done
Volunteers are given the opportunity to mentor at-risk youth throughout the island through various workshops and events whether a 4-H sponsored program or a community event with our partners and collaborates. Volunteers are given the opportunity to share their experiences and take the lead in mentoring at-risk youth.

Results
Hundred percent of our youth volunteers show a positive change in their mindset regarding volunteering. Their performance exceeded our expectation by them going beyond the program to volunteer within their school and their community on a regular base.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Competing Programmatic Challenges

Brief Explanation

Several external factors affecting the program outcomes consist of extreme weather, disabled vehicles, delay in MOU agreement,s and last-minute schedule change because of unforeseen circumstance. Although these factors caused postponement and setbacks, schedule adjustment and a back-up plan helped to alleviate the impact.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Based on pre and post evaluation data, youth participants showed an increase in knowledge and understanding by 74% after completing the workshop lessons. A 30% growth in their comprehension level from the time they started the program to it's completion. Overall 70% of students stated they could demonstrate their grasp of the subject matter by applying it to their daily lives. Curriculum ranged from STEM, Fisheries, Horticulture, Art, Entomology, Citizenship, Health and College and Career Path Readiness were the focus of the lessons during this reporting period. Hundred percent of preteens surveyed during the summer stated they were willing to become future volunteers if given the opportunity while all young adults who volunteered during this time frame had prior experience as a volunteer and service learning.

Key Items of Evaluation

Of the 9,603 youth participants, 230 of them are newly established community or club member; 210 were summer campers with several of them coming from parts of Asia to specifically attend our summer workshops; more than 5, 000 took part in community sponsored events celebrating their achievement in school or promoting health and wellness, and 28 were youth dependents from 3 of the military installations located on Guam. In addition, 3,867 at-risk students from the Guam Department of Education school system had the opportunity to participate in several 4-H workshop focusing on improving student's competence in STEM. Also, during this time frame, Guam 4-H has received an influx of request centered on culture, environment sustainability, food security and climate change.

V(A). Planned Program (Summary)

Program # 4

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
134	Outdoor Recreation	10%		10%	
701	Nutrient Composition of Food	15%		0%	
702	Requirements and Function of Nutrients and Other Food Components	10%		0%	
703	Nutrition Education and Behavior	10%		30%	
704	Nutrition and Hunger in the Population	10%		0%	
724	Healthy Lifestyle	20%		30%	
802	Human Development and Family Well-Being	10%		20%	
805	Community Institutions, Health, and Social Services	15%		10%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	4.0	0.0	0.5	0.0
Actual Paid	2.9	0.0	0.9	0.0
Actual Volunteer	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**
174183	0	91225	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
117507	0	37591	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

(1) Provide basic nutrition education classes on topics that relate to nutrition and food which include: 'MyPlate'; Food Safety (Kitchen & Safe Food Handling); Importance of Exercise; Fruits & Vegetables (Vitamins); Shopping Tips; Budgeting; meal Planning; Reading Food labels; promoting use of herbs and spices to help reduce the intake of salts, fats and sugars; and chronic disease prevention, (2) Conduct nutrition workshops to target population, (3) Develop culturally relevant curriculum for promoting physical activity; education to prevent obesity; localized general nutrition education materials (brochures/pamphlets) and also develop a curriculum on food portion control and over-eating, (4) Develop recipe books that feature favorite local recipes with healthful modifications, (5) Conduct food demonstrations on local dishes that incorporate healthful modifications, (6) Develop booklet and/or calendar that identifies locally grown fruits and vegetables with high nutritive value and suggest ways to healthful ways to prepare the local produce, (7) Conduct workshops promoting locally grown fruits and vegetables with healthful recipes for both farmers and experienced cooks (marketing healthful recipes with locally grown produce), (8) Maintain partnership with local food sources businesses to promote a greater variety of healthful foods and education awareness within food source facilities, (9) Develop and disseminate fact sheets on foods/beverages and of common causes of preventable chronic diseases that are prevalent on Guam and show how related to poor lifestyle choices, (10) Develop and disseminate health and nutrition education curriculum for chronic disease prevention along with educational materials.

2. Brief description of the target audience

The target audiences of the program include: (1) school-aged children (elementary through high school level); (2) families in public assistance programs; (3) families with young children; (4) general consumers; (5) military families; (6) health educators; (7) school teachers; (8) local farmers; (9) working professionals; and (10) other groups requesting services.

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
Actual	2896	4795	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	2	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- # of workshops

Year	Actual
2018	226

Output #2

Output Measure

- # of brochures

Not reporting on this Output for this Annual Report

Output #3

Output Measure

- # of dissemination of research results and new technology and information

Year	Actual
2018	12

Output #4

Output Measure

- # of one to one intervention
  Not reporting on this Output for this Annual Report

Output #5

Output Measure

- # of focus group
  Not reporting on this Output for this Annual Report

Output #6

Output Measure

- # of work with media

Year	Actual
2018	2

Output #7

Output Measure

- # of articles in newsletter, magazines, and newspapers
  Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	# of participants exposed to nutrition, exercise, and obesity prevention information
2	# of participants gaining an increase in physical activity knowledge and skills, especially as it pertains to maintaining mental and physical well-being, prevention of chronic disease, and improving overall health
3	# of participants who have been exposed to health and nutrition education for chronic disease prevention

Outcome #1

1. Outcome Measures

of participants exposed to nutrition, exercise, and obesity prevention information

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	2788

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The most recent data on Guam report a high prevalence of overweight and obesity among adults and youth. The BRFSS and YRBS both report that adults and youth alike are not meeting the recommended fruit and vegetable servings and physical activity minutes. An increase in knowledge and skills of a healthy lifestyle promotes the willingness to adopt healthy behaviors.

What has been done
Developmentally appropriate and evidence-based curricula have been delivered to the target audience. Additionally, community-based programs have been implemented with extension and stakeholder collaboration to promote physical activity, healthy food choices, and meal planning. Media outlets and social marketing campaign have been used to support and enforce messages in the communities where the target audience frequent. Curricula is consistently evaluated for application to need.

Results
Pre-/post-test, evaluations, and/or alternative assessments were administered to measure improvements in physical activity. The community-based program has provided a model for sustainable community-owned programs to be launched. Community relationships have been strengthened and more partners have been added to programs to support policy and sustainable programs. Another measure of impact is the 4,795 indirect/non-formal/self-directed learners contacted/communicated with these program efforts. Specific to direct contacts, 10,077 contact hours were logged.

4. Associated Knowledge Areas

KA Code	Knowledge Area
134	Outdoor Recreation
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle
802	Human Development and Family Well-Being
805	Community Institutions, Health, and Social Services

Outcome #2

1. Outcome Measures

# of participants gaining an increase in physical activity knowledge and skills, especially as it pertains to maintaining mental and physical well-being, prevention of chronic disease, and improving overall health

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	87

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The high prevalence of chronic disease in Guam implies inadequate healthy behaviors. Health and nutrition education is a tool or vehicle for adopting healthy attitudes and behaviors and, in turn, reduce risk for chronic disease.

What has been done
In addition to the implementation of evidenced-based curricula, outreach events at health fairs, family engagement events, and worksite wellness activities have underscored exposure of health and physical activity education. Online outlets and extension products published and disseminated have reinforced health and physical activity education making information more accessible to target audience. Physical activity education is a high priority section for healthy behavior programs.

Results
Extension products, like 5-2-1-Almost None and Food Friends and Mighty Moves newsletters, webpage content posted on websites (e.g. Walk-A-Mile Maps), and local publications, have been developed to ensure exposure to health and nutrition information and education is far-reaching and sustained. Partnerships with community stakeholders and extension programs have been maintained. Contact hours measured 1,044 in this program area.

4. Associated Knowledge Areas

KA Code	Knowledge Area
134	Outdoor Recreation
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle
802	Human Development and Family Well-Being
805	Community Institutions, Health, and Social Services

Outcome #3

1. Outcome Measures

# of participants who have been exposed to health and nutrition education for chronic disease prevention

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	21

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Childhood overweight and obesity is prevalent on Guam and the Pacific abroad related to children not meeting fruit and vegetable recommendations and/or exceeding energy and/or sugar recommendations. Healthy eating patterns implies a variety of healthy foods consumed routinely with little to no added sugars and saturated fat. A healthy eating pattern is possible with locally

sourced Pacific foods.

What has been done
Extension programs have worked in collaboration to deliver evidence-based curricula involving nutrition and garden concepts to connect nutrition and health to the source of food and environment. Cooking demonstrations of healthy traditional recipes including local produce have been conducted. Programs have maintained partnerships with institutions to improve policy to support healthy choices and substitutes

Results
Coupling childhood obesity prevention education with older adult healthy living has provided learner perspectives that can be shared between programs. Older adults reported their physical activity minutes and had their weight taken every class time. Cooking demonstrations were well-received throughout the year. Contact hours logged was 546 for Extension education.

4. Associated Knowledge Areas

KA Code	Knowledge Area
134	Outdoor Recreation
703	Nutrition Education and Behavior
724	Healthy Lifestyle
802	Human Development and Family Well-Being
805	Community Institutions, Health, and Social Services

V(H). Planned Program (External Factors)

External factors which affected outcomes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Changes in policy direction have sometimes threatened withdraw of matching funding, but those tend to be delays rather than ending of programs.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

From pre-/post-assessments completed from direct nutrition and behavior education, results indicated that approximately half of all participants had improved, at least, one behavior/knowledge in healthy food/diet, food safety, food resource management, physical activity, and/or chronic disease prevention. Evaluations of the program reveal a desire for more integration of cultural traditions, foods/recipes, and language;as well as, internet-accessible products, like a Pacific e-cookbook. Community members shared the interest in web-based video tutorials or "how-to's" and/or an "app" for researching nutrient value of recipe using, or growing local produce. Community-based program evaluations revealed

more community programs ingrained in the villages are welcomed as to support physical and social environments to promote physical activity and access to healthy foods. However, multi-lesson workshops or programs are challenging due to lack of transportation and competing family/work obligations underscoring cultural and economic challenges. The CHL Program Baseline Prevalence Results and Community Reports are the most recent data available on Guam to demonstrate that children do not meet the recommended fruit and vegetable servings and physical activity minutes; in addition to having a frequent consumption of sugar-sweetened beverages. As a result of the social marketing campaign of 5-2-1-Almost None, six elementary schools have adopted the campaign with regularly scheduled "Fit Days," where all children participate in physical activity, and administrators/teachers have adopted "healthy meetings"; ten food stores have modified the food environment to identify school-approved Smart Snacks; and three mayor's office that has supported 5-2-1-Almost None activities.

Key Items of Evaluation

For all programs, culturally appropriate food, nutrition, healthy behavior, physical activity, and healthy aging curricula must be adapted for the specific islands of the Western Pacific. For Guam, the in-migrant populations are the target audience, yet not all materials resonate with these populations. Translating documents as well as adapting teaching environments is essential to making an impact with these ever-increasing populations.

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Plant Health and Pest 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
102	Soil, Plant, Water, Nutrient Relationships	5%		0%	
205	Plant Management Systems	10%		25%	
211	Insects, Mites, and Other Arthropods Affecting Plants	5%		0%	
212	Pathogens and Nematodes Affecting Plants	20%		0%	
213	Weeds Affecting Plants	5%		0%	
214	Vertebrates, Mollusks, and Other Pests Affecting Plants	5%		0%	
215	Biological Control of Pests Affecting Plants	10%		50%	
216	Integrated Pest Management Systems	40%		25%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	2.0	0.0	0.5	0.0
Actual Paid	2.5	0.0	3.4	0.0
Actual Volunteer	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**
143768	0	156474	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
96988	0	59168	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The University of Guam Cooperative Extension Service's Plant Health and Pest Management group performed educational outreach to the public sector, private sector, and government agencies. Subject areas covered included pesticide application, Integrated Pest Management (IPM) strategies, plant propagation, insect identification, weed identification, plant disease identification, soil nutrition and fertilizers, invasive species, and grafting. The group also provided plant disease diagnostics and insect identification for the island through the Cooperative Extension Service's Plant Health Clinic.
To improve the flow of information regarding Guam's plant diseases among the scientific IPM communities and extension practitioners, an update of the Index of Plant Diseases in Guam was produced that was originally funded by a WSARE Professional Development Program grant EW-14-006 in 2014. With current CPPM/EIP funding this publication was updated through new reports and a new literature search and published in June 2018. The index can be found here:
http://cnas-re.uog.edu/wp-content/uploads/2018/07/Submitted_Index-of-Plant-Diseases-in-Guam-Version-2-07142018.pdf
The Guam Plant Health and Pest Management group was able to assist extension, research and University of Guam instructional program in plant diagnostic related activities. A total of 863 plant disease inquiries were made of the Center (579 were handed informally and another 284 were logged and handed formally). Clients included students, farmers, gardeners, landscapers, Guam Plant Quarantine, and researchers.
The Guam Plant Health and Pest Management group provided quick simplified answers on production and IPM issues for beginning farmers and gardeners. Three full page newspaper articles were published in a local newspaper to provide the basic information necessary to deal with Guam's most common disease. These articles concentrated on the disease anthracnose. The three articles vegetable emphasis was cucumber, papaya, and hot pepper, respectively. The IPM emphasis area was PAMS approach to IPM: Prevention, Avoidance, Monitoring, and Suppression. The three articles were placed in the printed version of the Guam Pacific Daily News. One of the articles was also placed in the online version and can be found here: https://www.guampdn.com/story/life/2018/08/21/home-garden-tips-combating-anthracnose-cucumber/1039854002/
An IPM workshop was performed for science students at a local high school. Students were taught the basics of gardening/farming and IPM practices to identify and manage pests and diseases. Pre and post-tests were given to the students to assess their knowledge gained. The average gain in knowledge was 33%. A six question evaluation questionnaire indicated the 90% "strongly agreed" that the workshop was worthwhile and successful.
In order bring greater awareness of Phellinus noxius brown root rot disease to the community of Guam and the region, a newspaper article was submitted Guam Pacific Daily News. The article was published online and can be found here: (http://www.guampdn.com/story/life/2017/10/17/tree-killer-fungus-

guam/7670030Tomato crops in Guam were surveyed to determine the presence or not of Ralstonia solanacearum (RS) and Tuta absoluta (tomato leaf miner). Surveys indicated that all fields were negative for Tuta absoluta and RS although RS was present in eggplant and pepper. Giant Cavendish bananas that are semi-resistant to Fusarium wilt were propagated at the WPTRC-Guam Department of Agriculture tissue culture facility and around 1000 plants were distributed to farmers.

2. Brief description of the target audience

The target audience for this program includes extension personnel, researchers, local farmers, homeowners, nurseries, landscapers and golf course superintendents and their crews, teachers, University of Guam students, school children, and government agencies.

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
Actual	2758	51150	505	2900

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	2	3	5

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- # of research papers

Year	Actual
2018	5

Output #2

Output Measure

- # of research citations

Year	Actual
2018	150

Output #3

Output Measure

- # of extension fact sheets or articles

Year	Actual
2018	11

Output #4

Output Measure

- # of workshops/trainings/classes

Year	Actual
2018	13

Output #5

Output Measure

- # of brochures

Year	Actual
2018	2

Output #6

Output Measure

- # of research or new technology reports

Year	Actual
2018	2

Output #7

Output Measure

- # of one-on-one interventions

Year	Actual
2018	535

Output #8

Output Measure

- # of surveys

Year	Actual
2018	56

Output #9

Output Measure

- # of focus groups

Year	Actual
2018	1

Output #10

Output Measure

- # of news media activities (TV and radio)

Year	Actual
2018	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	% of participants gaining skills in identification of insects and related pests
2	% of participants gaining skills in identification of plant diseases
3	% of participants gaining skills in identification of weeds
4	% of participants gaining knowledge about pesticides and their application
5	% of participants reducing indiscriminate use of chemical pesticides
6	% of participants adopting some established IPM practices

Outcome #1

1. Outcome Measures

% of participants gaining skills in identification of insects and related pests

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Local farmers, homeowners, nurseries, landscapers and golf course superintendents and their crews, students, teachers, government agencies and the general public. Identification is essential in determining the difference between beneficial insects and pests, and to insure that proper management practices for IPM and pesticide application are employed. These practices lead to improved plant health and crop yield, and reduce negative impacts on human and wildlife health and the environment.

What has been done
A National Plant Diagnostic First Detector training was held which included insect identification.

Results
One hundred percent of the trainees passed the First Detector training and received certificates.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
216	Integrated Pest Management Systems

Outcome #2

1. Outcome Measures

% of participants gaining skills in identification of plant diseases

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Local farmers, homeowners, nurseries, landscapers and golf course superintendents and their crews, teachers, students, government agencies and the general public. Plant disease identification of biotic and abiotic caused diseases is essential to insure that proper management practices for IPM and pesticide application are employed. These practices lead to improved plant health and crop yield, and reduce negative impacts on human and wildlife health and the environment.

What has been done
A National Plant Diagnostic First Detector training was held which included identification of plant diseases.

Results
One hundred percent of the trainees passed the First Detector training and received certificates.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems

Outcome #3

1. Outcome Measures

% of participants gaining skills in identification of weeds

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Local farmers, homeowners, nurseries, landscapers and golf course superintendents and their crews, teachers, students, government agencies and the general public. Identification of specific weeds is essential to insure that proper management practices for IPM and pesticide application are employed. These practices lead to improved plant health and crop yield, and reduce negative impacts on human and wildlife health and the environment.

What has been done
A National Plant Diagnostic First Detector training was held which included identification of Weeds.

Results
One hundred percent of the trainees passed the First Detector training and received certificates.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
205	Plant Management Systems
213	Weeds Affecting Plants
216	Integrated Pest Management Systems

Outcome #4

1. Outcome Measures

% of participants gaining knowledge about pesticides and their application

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	90

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Local farmers, homeowners, nurseries, landscapers and golf course superintendents and their crews, teachers, students, government agencies and the general public. Knowledge of pesticides and their application is crucial for the health and safety of the applicator, consumers of produce, the health of humans and wildlife, and the environment.

What has been done
Farmers and home gardeners were given instruction on pesticide application over the course of the year.

Results
Ninety percent of participants showed a gain in knowledge.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
214	Vertebrates, Mollusks, and Other Pests Affecting Plants
216	Integrated Pest Management Systems

Outcome #5

1. Outcome Measures

% of participants reducing indiscriminate use of chemical pesticides

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	95

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Local farmers, homeowners, nurseries, landscapers and golf course superintendents and their crews, teachers, students, government agencies and the general public. Correct application in this area leads to improved plant health and crop yield, savings on pesticide purchases, and reduces negative impacts on human and wildlife health and the environment.

What has been done
Farmers were given instruction and monitored for reducing pesticide application during farm visits by Extension personnel.

Results
Ninety-five percent of participants showed a change in action.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
214	Vertebrates, Mollusks, and Other Pests Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems

Outcome #6

1. Outcome Measures

% of participants adopting some established IPM practices

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	95

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Local farmers, homeowners, nurseries, landscapers and golf course superintendents and their crews, teachers, students, government agencies and the general public. Correct application of IPM practices leads to improved plant health and crop yield, and reduces negative impacts on human and wildlife health and the environment.

What has been done
Farmers were given instruction and monitored for establishing IPM practices during farm visits by Extension personnel.

Results
Ninety-five percent of participants showed a change in condition.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
214	Vertebrates, Mollusks, and Other Pests Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Other (None)

Brief Explanation

No external factors affected outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Evaluation is based on internal review of the Plant Health and Pest Management group, stakeholder input, and pre/post testing.

Key Items of Evaluation

Invasive species and disease are a continued and ever-present threat to food and and environment systems. Plant health and diagnosis are increasingly important to production and containment.

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

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	10%		10%	
104	Protect Soil from Harmful Effects of Natural Elements	10%		10%	
125	Agroforestry	10%		5%	
205	Plant Management Systems	15%		35%	
302	Nutrient Utilization in Animals	10%		5%	
307	Animal Management Systems	10%		5%	
403	Waste Disposal, Recycling, and Reuse	10%		10%	
601	Economics of Agricultural Production and Farm Management	10%		10%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	0%		10%	
806	Youth Development	15%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	3.3	0.0	3.0	0.0
Actual Paid	3.4	0.0	5.8	0.0
Actual Volunteer	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**
150413	0	269476	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
101471	0	143854	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

This program will address such areas such as:

1. Each year hold planning meetings between the cooperating agencies to identify priorities for grant funding to address these priorities. Funded grants and collaborative projects are a planned output of this POW, demonstrating capacity building through training, collaborative planning and presentation of needs.

2. Conduct applied research and field experiments at program demonstration sites, at both institutional and private (farmer) sites. Best management conservation and sustainable agricultural practices will be demonstrated on multi-agency, university research stations, and farmer demonstration areas. New enterprises, varieties and production methods will also be demonstrated. Variety trials and potential new production enterprise identification are an ongoing effort.

3. Conduct workshops, trainings, field tours, conferences and other educational activities to local and regional producers, students, teachers and youth groups on program topics.

4. Identify producers on island and reach out on educational programs, also target farmers with agricultural land leases who are not utilizing the land for agricultural or under utilizing the land, for recruitment into the education and demonstration activities and survey them on barriers to their agriculture implementation.

5. Target home gardeners and community groups starting school and community gardens for recruitment into these programs and programs on promoting edible landscapes.

6. Increase the skills of island agricultural and food professionals by holding train the trainer workshops on program curriculum prior to holding workshops for the general public.

7. Improve watershed management and use of Vetiver and other plant based contour technologies for trapping sediment to control soil erosion on slopping lands and to slow storm water flow and trap sediment and nutrients for improving water quality downstream.

8. Promote waste management, mulching and composting as an alternative to land filling of solid organic waste and use of compost for soil quality enhancement as an alternative to synthetic fertilizers for crop production and for environmental integrity of natural resources. We will study the use of composted organic waste to increase organic matter content for improving soil physical properties in order to reduce soil erosion.

9. At least one workshop each year will be held on government (USDA) support and incentive programs and funding opportunities for farmers.

10. For the subsistence/home/community garden portions of this program will identify gardners/small farmers and their information needs on small (1/4 acre to 1 acre) production systems and develop outreach efforts to address these educational needs through workshops and extension publications, in order to increase the substitution of local production for the current imported produce and home grown produce for purchased produce.

11. This plan of work will develop home and community produced food as alternatives to store bought food through farm, home, community gardening, and animal production programs, thus increasing local food diversity and self reliance.

2. Brief description of the target audience

Primary local clients will include former, existing and potential new plant and animal producers including home, small-scale and subsistence level garden/micro farm plots. Over the past decade, the Chamorro Land Trust Commission signed 1,000+ new agriculture land leases and the DoAg idenified 300+ existing full and part time commercial and subsistence agricultural producers. Many producers possess limited resources and desperately need education and technical support programs. Additionally, new village based needs assessments indicate that there are hundreds if not thousands of local homeowners and community groups that want training in sustainable food production practices so this effort is being adapted to include them. Also identified is a strong desire among many of our communities to start community gardens so this will be a new target group.

The secondary target audience is the agricultural professional (both plant and animal) community on Guam. This program is a collaborative effort to build capacity and enhance performance of Guam's Cooperative Extension Ag professionals and partner agencies so they can better identify issues and mobilize resources to provide broader technical assistance. Many non agricultural professionals are now promoting gardening and food production these professionals need agricultural training and materials to utilized in their outreach efforts. The Micronesian Chefs Association and Guam Community College Culinary program faculty have also become strong supporters of this program's efforts. Ag professionals with partner land grant programs throughout the American Affiliated Pacific have requested assistance. Regional workshops will address these requests.

The tertiary target group is island youth. The youth target population includes students, youth interested in entrepreneurial agricultural activities, and clients of mayors' offices interested in small scale and community agricultural activities.

A fourth audience is the University of Guam agricultural student cohort. The demonstration farm will be utilized as laboratory classroom for students enrolled in agriculture courses (Introduction to Agriculture and Introduction to Animal Science).

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
Actual	2439	12089	1524	75

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	1	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- # of workshops or conferences

Year	Actual
2018	43

Output #2

Output Measure

- # of best management practice demonstrations conducted on private or institutional sites

Year	Actual
2018	7

Output #3

Output Measure

- # of popular articles in newsletters, magazines and newspapers, or TV and Radio presentations.

Year	Actual

2018	6

Output #4

Output Measure

- # of extension publications (fact sheets, white papers, web-based learning modules, etc.)

Year	Actual
2018	15

Output #5

Output Measure

- # of research and extension advisory councils and boards consulted in program planning and implementation.

Year	Actual
2018	10

Output #6

Output Measure

- # of new educational/workshop curriculum developed and/or piloted with program partners

Year	Actual
2018	11

Output #7

Output Measure

- # of either: Memorandums of Understanding, cooperative agreements, partnerships, or shared demonstrations initiated or continued

Year	Actual
2018	6

Output #8

Output Measure

- Number of Poster presentations.

Year	Actual
2018	5

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	# of program participants indicating intent to adopt recommended program practices, activities, and technology
2	# of producers indicating decreased imported ag production inputs
3	# of program participants indicating improved knowledge and skills of recommended practices
4	# of community strategic plans and policies implemented as a result of this program
5	# of cooperating agency and organization personnel adopting and utilizing curriculum materials developed under this POW (both Guam and Distance Education)
6	# of producers indicating intent to utilize recommended new varieties/species in production.

Outcome #1

1. Outcome Measures

# of program participants indicating intent to adopt recommended program practices, activities, and technology

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	114

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Food production in Guam is challenged by the high cost of imported inputs, limited availability of good lands, high wages, and other factors. People interested in revamping agriculture and aquaculture often lacks the experience and expertise needed for farming. CNAS extension and research work is vital to test crop varieties and integrated farming systems and educate the public in the importance of fresh produce and proper nutrition. Soil conservation is also key to reduce negative effects on lands and coastal environments.

What has been done
Extensive field tests on farmer fields and CNAS research stations of varieties of Chinese kale, bell pepper, lettuce, hot pepper, winged bean, bok choy, zucchini, and edamame provided new knowledge on yield and quality of relevant crops. Results of these and other trials have been disseminated in workshops and technical publications. A study of promising lettuce varieties for Guam was portraited at the NIFA web site. More than 1500 school children visited the CNAS station in Yigo.

Results
Outputs from intensive research on this programmatic area have been shared by extension personnel to farmers, farm-to-table initiatives, food sector, and other stakeholders. The Triton Farm, a subunit of one of the CNAS experimental station in Northern Guam produces eggs, calamansi, ti leaves, and aquaponics vegetables which are available to the public, and demonstrate pesticide-free, integrated farming practices. Two new varieties of papaya with resistance to main diseases in Guam have been selected and are going through the certification

process.

4. Associated Knowledge Areas

KA Code	Knowledge Area
104	Protect Soil from Harmful Effects of Natural Elements
125	Agroforestry
205	Plant Management Systems
302	Nutrient Utilization in Animals
307	Animal Management Systems
403	Waste Disposal, Recycling, and Reuse
601	Economics of Agricultural Production and Farm Management
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
806	Youth Development

Outcome #2

1. Outcome Measures

# of producers indicating decreased imported ag production inputs

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

# of program participants indicating improved knowledge and skills of recommended practices

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	67

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Food production in Guam is limited because of technical, economic, and environmental reasons. Knowledge of best farming practices and crop varieties is still limited, and pest pressures are very high.

What has been done
CNAS has promoted an integrated approach to address the different aspects of food security and hunger in Guam and Micronesia; e.g., community development, agricultural and aquaculture systems, human nutrition, youth development, and environmental conservation. Most research and extension initiatives follow this multi-wedge perspective.

Results
Farmers have been adopting soil conservation strategies such as use of compost and recycled paper researched and promoted by CNAS, and widening their portfolio of crop species and varieties including hybrid and natural-pollinated plants.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
125	Agroforestry
205	Plant Management Systems
302	Nutrient Utilization in Animals
307	Animal Management Systems
403	Waste Disposal, Recycling, and Reuse
601	Economics of Agricultural Production and Farm Management
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
806	Youth Development

Outcome #4

1. Outcome Measures

# of community strategic plans and policies implemented as a result of this program

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Most food consumed in Guam in imported. Food prices are very high and variety and accessibility are limited. Several initiatives like the Farm-to-Table program has been initiated to remediate these challenges.

What has been done
There has been an active participation of CNAS researchers, extension specialists, and administrators in local and regional commissions, councils, and advisory boards to provide scientific oversight and logistic support, as well as increase community participation in policies and strategic plans.

Results
As one of the most noteworthy developments related to CNAS work has been the launching of a Task Force on Aquaculture by Guam Government to revamp aquaculture in Guam and collaborate with other areas in Micronesia. This initiative is informed by CNAS long-standing work on aquaculture in the Fadian Hatchery.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
125	Agroforestry
205	Plant Management Systems
307	Animal Management Systems
403	Waste Disposal, Recycling, and Reuse
601	Economics of Agricultural Production and Farm Management
806	Youth Development

Outcome #5

1. Outcome Measures

of cooperating agency and organization personnel adopting and utilizing curriculum materials developed under this POW (both Guam and Distance Education)

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	34

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Knowledge of economically feasible, sustainable food production in Guam is limited and some food production facilities (like a hydroponic vegetable producer) has gone out of business.

What has been done
CNAS extension and researcher personnel interact with personnel of the Department of Agriculture, the Northern and Southern Soil and Water Conservation consortiums, APHIS, and farmer cooperatives to share effectively new practices, and improved varieties.

Results
Several research studies and demonstrations are conducted in fields belonging to long-standing and new farmers. Increased crop yields and improved soil conditions have been achieved by using compost and other materials for soil amelioration. Findings from these studies have been incorporated to distance education programs at UOG.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
125	Agroforestry
205	Plant Management Systems
302	Nutrient Utilization in Animals
307	Animal Management Systems
403	Waste Disposal, Recycling, and Reuse
601	Economics of Agricultural Production and Farm Management
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
806	Youth Development

Outcome #6

1. Outcome Measures

# of producers indicating intent to utilize recommended new varieties/species in production.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	17

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There are still substantial knowledge gaps on appropriate crop species and varieties appropriated to the tropical weather and varied soil conditions present in Guam. These crops and varieties should also fit the value chains present in Guam in terms of storage, trade, and consumer preferences.

What has been done
Multi-year (2016-2018) trials in CNAS experimental stations and farmer fields widely increased the knowledge base on crops species and varieties with high yield, heat tolerance, and disease resistance,

Results
In addition to studies done on hybrids, research included heirloom plants with desired market traits, Despite having sometimes low yields they are better adapted to the native environment, are easy to establish and require low maintenance. They are open-pollinated and produce seeds that are true to their parent identity and generate plants that maintain their characteristics in the next generations.

4. Associated Knowledge Areas

KA Code	Knowledge Area
125	Agroforestry
205	Plant Management Systems
307	Animal 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
- Other (Change in government leaders)

Brief Explanation

No external factors affected outcomes

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Evaluations of workshops, focus group, and presentations to government agencies, conservation districts, and farmers cooperatives have been consistently positive. Some activities included pre-post comparison of participants knowledge and attitudes. Assessments from funding organizations indicated overall satisfaction on CNAS research and extension work and emphasize the college's leading role in Micronesa,

Key Items of Evaluation

Knowledge generated by research studies was effectively transferred to targeted audiences, and increased interest in producing local fruits and vegetables. Guam government agencies have been receptive to CNAS research and extension outputs and launched initiatives to improve food availability, quality and access.

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Sustain, Protect, and Manage the Environment and Natural Resources of Guam and Micronesia.

☑ 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	10%		10%	
136	Conservation of Biological Diversity	15%		15%	
202	Plant Genetic Resources	10%		20%	
205	Plant Management Systems	15%		10%	
211	Insects, Mites, and Other Arthropods Affecting Plants	20%		20%	
215	Biological Control of Pests Affecting Plants	15%		15%	
216	Integrated Pest Management Systems	10%		10%	
723	Hazards to Human Health and Safety	5%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	2.0	0.0	12.0	0.0
Actual Paid	7.3	0.0	12.7	0.0
Actual Volunteer	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**
272022	0	803365	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
188571	0	469600	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Little fire ant (LFA) was detected on Guam in 2011 and continues to spread in Guam. A delimiting survey was completed in a GovGuam Conservation Forest that includes planted acacia trees interspersed with shrubs and bushes. The areas was treated with Tango, a pesticide that contains the insect growth regulator s-methoprene, and Siesta, a granular formulation of a chitinase inhibitor, metaflumizone. Following the application of the pesticides, the worker ants ingest a sublethal dose of the active ingredient of either pesticide, feed it to the queen upon returning to the main colony. Once the queen dies, the workers and ultimately the entire colony gradually dies out. Initial results indicated that LFA's numbers decreased by about 60%.
Work on coconut rhinoceros beetle has focused in detecting biological control organisms than can be effective in Guam. Whereas control with virus imported from New Zeland failed, two viruses recently brought from Papua New Guinea have been deemed promising for bio control.
CNAS faculty provide service and training on species invasive identification, serve in the Invasive Species Council and other committees, and participate in the National Plant Diagnostic Network.
Plant inventories of urban landscapes have continued. Data are entered into the Plan-it Geo Treeplotter database. Propagated and out-planted Guam rare plant species are establish in protected sites. Plants are monitored and maintained using adaptive management until they are established. Monitoring included documenting pest problems.
Agriculture and forest lands are affected by climate change, but also contribute to it through greenhouse gas emissions. Soil organic C, in turn, could be increased by feedback loops caused by climate change. Results from studies consisting in applications of biochar and compost in limestone soils in Northern Guam suggested positive effects on corn yields and trends to lower CO_2 emissions.
Here is an outline of the major research thrusts over the next 5 years.
- implementation of biological control to mitigate damage from invasive species
-improvement of integrated pest management of agricultural and natural resource systems
- monitoring of invasive pests and their impact on insular environment
- conduct urban forest inventory on Guam
- characterization of genetics of threatened and endangered plants on Guam and the region
- investigate how to enhance carbon content of Guam soils
-maintenance and improvement of biological collections and biodiversity information systems

2. Brief description of the target audience

Our target audience is the general public, farmers, landscapers, the research community at large, and federal, territorial, and regional government agencies and NGO's. In addition, certain issues such as invasive species have moved CNAS to be a regional, national, and international partner.

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
Actual	1325	55871	1208	2893

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	16	16

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- # of workshops

Year	Actual
2018	27

Output #2

Output Measure

- # of one-to-one contacts

Year	Actual

2018	737

Output #3

Output Measure

- # of popular articles in newsletters, magazines and newspapers

Year	Actual
2018	31

Output #4

Output Measure

- # of Extension publications (fact sheets, white papers, web-based learning modules, etc)

Year	Actual
2018	21

Output #5

Output Measure

- # of research or extension advisory boards and councils

Year	Actual
2018	0

Output #6

Output Measure

- # of peer-reviewed research publications

Year	Actual
2018	21

Output #7

Output Measure

- # of presentations at professional international, national, or regional conference

Year	Actual
2018	19

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	# participants indicating improved knowledge and skills or recommended practices
2	# of strategic plans and policies implemented as a result of this program
3	# of cooperative agreements/partnerships initiated or continued as a result of this program

Outcome #1

1. Outcome Measures

participants indicating improved knowledge and skills or recommended practices

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	83

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Invasive species have large detrimental effects on Guam's environment and people. These species continue to arrive to Guam because of increasing commercial, military and public activities. The cycad scale, the coconut rhinocero beetle and the little fire ant are the most common invasive species but other species are detected periodically by our extension and research personnel.

What has been done
Numerous workshops and meetings have been conducted to increase awareness of the invasive species problem and explain strategies to reduce their spread and impact. Extension and research faculty participate in the Guam Invasive Species Council and collaborate with APHIS to identify new insects and pathogens and assess the chances of invasion. They also work regionally to prevent invasions in Micronesia, Polynesia and the Western United States.

Results
Approaches to conduct surveillance of the coconut rhinocero beetle and the little fir ant have been delivered throughout Micronesia. Information and assistance have also been provided for monitoring and rapid responses to invasions.

4. Associated Knowledge Areas

KA Code	Knowledge Area
136	Conservation of Biological Diversity
202	Plant Genetic Resources
205	Plant Management Systems

211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
723	Hazards to Human Health and Safety

Outcome #2

1. Outcome Measures

# of strategic plans and policies implemented as a result of this program

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Strategic plans and policies about invasive species, environmental degradation, and ecological restoration need to be develop further in Guam through the collaborative effort of federal agencies, Guam government, University of Guam, and local communities.

Results
Guam Invasive Species Master Plan and CNMI Invasive Species Master Plan both completed, published, and submitted to the respective legislatures in 2017.

In addition, there is continued growing awareness on the part of policy makers and general public.

Many plans have been developed by local and federal government agencies, but implementation remains problematic due to funding limitations and lack of professional capacity.

What has been done

In regard to invasive species, CNAS research and extension personnel have continued working on different initiatives to reduce their the impact, improve detection and preventing them for infecting other islands. The Guam Invasive Species Master Plan will be revised to incorporate more actionable items.

Results
Guam Invasive Species Master Plan and CNMI Invasive Species Master Plan both completed, published, and submitted to the respective legislatures in 2017.

In addition, there is continued growing awareness on the part of policy makers and general public.

Many plans have been developed by local and federal government agencies, but implementation remains problematic due to funding limitations and lack of professional capacity.

What has been done

In regard to invasive species, CNAS research and extension personnel have continued working on different initiatives to reduce their the impact, improve detection and preventing them for infecting other islands. The Guam Invasive Species Master Plan will be revised to incorporate more actionable items.

What has been done
The Guam Invasive Species Master Plan is being revised with the participation of CNAS extension and research personnel to include actionable items. Viruses that may control the coconut rhinoceros beetle are being tested in CNAS laboratories.

Results
Awareness of invasive species has increased in Guam and is now a main focus of government and community initiatives in the territory. Research by CNAS scientists have led to successful translocation of three endangered orchid species threatened by land use changes. Strategic plans for ecological management of military lands have been refined.

4. Associated Knowledge Areas

KA Code	Knowledge Area
136	Conservation of Biological Diversity
202	Plant Genetic Resources
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
723	Hazards to Human Health and Safety

Outcome #3

1. Outcome Measures

# of cooperative agreements/partnerships initiated or continued as a result of this program

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	9

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Protecting island resources from invasive species has been considered one of the top five concerns in Guam.

What has been done
The Forest Inventory Analysis (FIA) cooperative agreement will continue until 2021. Technicians were sent to Alaska to be trained in FIA measurement practices and they are now conducting field work in Guam and other islands.

-CNAS research and extension personnel participates in the Cooperative Agriculture Pest Survey (CAPS) program aimed to conducting national and state surveys targeted to plant pests, diseases, and weeds identified as threats to agriculture and the environment.

-The Arborist Certification program for Guam is run at CNAS.

-Endangered native orchids were re-established at the Anderson Air Force base with 87% success rate in partnerships with the U.S. Department of Defense

Results

-Relocation and protection of endangered native snail species in Guam has been successful through collaborative efforts involving efforts by CNAS and several agencies.

-Partnerships with the U.S. Military has led to relocation of endangered native orchid species caused by land use changes and to the establishment of seedlings of a native trees species with only one remaining adult individual left.

- Advise was provided to federal agencies on issues regarding federally listed plant species. APHIS has acknowledged the relevant role of CNAS in generating knowledge and spreading information about invasive species.

4. Associated Knowledge Areas

KA Code	Knowledge Area
136	Conservation of Biological Diversity
202	Plant Genetic Resources
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
723	Hazards to Human Health and Safety

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Appropriations changes
- Government Regulations

Brief Explanation

Two severe storms required to follow contingency plans and caused delays in projects.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Federal agencies periodically conduct evaluation of extension and research projects and positive reviews have been received. Feedback from stakeholders is requested following workshops, focus groups and other activities.
The M.S. program in Sustainable Agriculture, Food and Natural Resources created in 2017 at the College of Natural and Applied Sciences have progressed through the teaching

efforts of extension and research faculty, and has increased enrollment with students scheduled to graduate in 2019. Initial evaluations from the UOG Graduate Council have been positive. Research faculty are evaluated yearly by the WPTRC director to allocate HATCH funds based on a standard matrix to assess research productivity and impact.

Key Items of Evaluation

Overall satisfaction with content and delivery of workshops, focus groups, and other activities was high (> 85% positive responses), Participants expressed strong interest in participating in conservation initiatives.

VI. National Outcomes and Indicators

1. NIFA Selected Outcomes and Indicators

Childhood Obesity (Outcome 1, Indicator 1.c)	
0	Number of children and youth who reported eating more of healthy foods.
Climate Change (Outcome 1, Indicator 4)	
0	Number of new crop varieties, animal breeds, and genotypes whit climate adaptive traits.
Global Food Security and Hunger (Outcome 1, Indicator 4.a)	
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.
Global Food Security and Hunger (Outcome 2, Indicator 1)	
0	Number of new or improved innovations developed for food enterprises.
Food Safety (Outcome 1, Indicator 1)	
0	Number of viable technologies developed or modified for the detection and
Sustainable Energy (Outcome 3, Indicator 2)	
0	Number of farmers who adopted a dedicated bioenergy crop
Sustainable Energy (Outcome 3, Indicator 4)	
0	Tons of feedstocks delivered.