

2008 University of Guam Research Annual Report of Accomplishments and Results

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2008 University of Guam Research Annual Report of Accomplishments and Results

I. Report Overview

1. Executive Summary

Guam, an unincorporated Territory of the United States, is located in the Western Pacific at 13 degrees north latitude and 144.4 degrees east longitude. It is the largest of 16 islands in the Marianas. It is approximately 3,600 miles west-southwest of the Hawaiian Islands and about 1,500 miles due east of Manila, Philippines. Guam's population is approximately 180,000. About forty percent of the population is under 20 years old. The ethnic background of the island includes: Chamorro (native islanders), Filipinos, Caucasians (including members of the U.S. Armed Forces and their dependents), other islanders (Micronesians and Palauans) and Asians (Koreans, Japanese and Chinese).

On June 22, 1972, the U.S. Congress passed Public Law 92-318, which designated the University of Guam as a member of the 1862 Land Grant institutions. In March 1974, the University of Guam Board of Regents created the College of Agriculture and Life Sciences (CALS) to facilitate the tripartite functions of the college: research, extension and teaching. On August 1, 2003, the University executed a major reorganization, which included consolidating five colleges into three major colleges. CALS was merged with mathematics and science disciplines from the former College of Arts and Sciences to form the College of Natural and Applied Sciences (CNAS). The Dean of CNAS retained the Directorship of the Agriculture Experiment Station, while the Vice President of University and Community Engagement reassumed his appointment as Director of Cooperative Extension Service.

In December 2007, as a result of another reorganization tripartite functions of the college was restored with the dean being simultaneously a director of Cooperative Extension Service as well as a director of Agriculture Experiment Station. In 2006 AES was renamed to Western Pacific Tropical Research Center. This new name more accurately reflects the division's broad mission and research priorities. The primary mission of WPTRC is to conduct applied and basic research in agriculture and to protect the natural environment. The Hatch funds and their respective Government of Guam matching funds are used to maintain operations of the Western Pacific Tropical Research Center. These funds principally support the salaries of permanent personnel of WPTRC.

The Western Pacific Tropical Research Center conducts research for the development of the island's agriculture, for the protection of natural environment as well as in related fields. The University of Guam Cooperative Extension Service translates and delivers technical information and conducts informal education programs for farmers, homemakers, families, youth and the community.

Continuing financial hardships facing University of Guam cause the biggest challenges for WPTRC . However, research productivity over last several years continuously increase and 2008 was no exception. Very significant growth in refereed journal publications as well as substantial increase in successful grant proposals in 2008 was evident. One new position in WPTRC was created and aquaculture program develops fast. Announced increase in military presence on Guam had positive impact on the island's economy and local businesses predict less severe impact of recession on Guam than US average. Overall, 2008 was a successful year for WPTRC.

Total Actual Amount of professional FTEs/SYs for this State

Year:2008	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	9.0	0.0
Actual	0.0	0.0	9.0	0.0

II. Merit Review Process

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

- Combined External and Internal University Panel
- Expert Peer Review

2. Brief Explanation

Because of the small size of WPTRC, review of individual projects was conducted by WPTRC administrators (Director and Associate Director). Planned programs and activities addressed the critical issues of strategic importance, including those identified by the stakeholders during the development of 2006-2011 Strategic Plans. All new research proposals were submitted to WPTRC Associate Director who checked proposals for completeness and format. Afterwards proposal were sent for review to external ad hoc peer reviewers. Based on the review, that includes assessment of (1) significance, (2) need, (3) approach, (4) new knowledge to be generated, (5) potential for impact, and (6) potential for success, WPTRC administrators are submitting proposals to CRIS and make decisions regarding allocation of resources.

III. Stakeholder Input

1. Actions taken to seek stakeholder input that encouraged their participation

- Targeted invitation to traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to selected individuals from general public

Brief Explanation

The crucial issues addressed by WPTRC planned programs fall within the strategic goals of WPTRC adopted by the faculty during Strategic Planning Retreat. It was agreed that all programs must address issues that are relevant to the needs of the region, serve interest of scientific community and are linked to the needs of our stakeholders.

The college still is in the process of establishing an advisory board/council as a mechanism to receive stakeholder input on the college's programs. Some of the college's programs have advisory bodies, and that stakeholder input is sought and received on an informal basis, however the college would benefit from a more formal and systematic process to receive stakeholder input. Since stakeholder input is an important mandate for receipt of federal formula funds we plan to complete this process in 2009.

In 2008, numerous research projects were driven by stakeholders demand and addressed environmental issues, integrated plant protection, biocontrol as well as served ethnic needs of local population. Relatively large portion of research aimed to develop control mechanisms for eradication/ suppression of non-indigenous/invasive species, to improve and implement effective early detection and prevention strategies, and to develop Integrated Pest Management strategies for major exotic insect plant pests and diseases. Another important research project attempted to define the genetic structure of the Cycads populations among the island habitats of Guam, Rota, Yap, Palau, and the Philippines. We also continued to focus on issues that insure the understanding, protection, and sustained management of precious natural resources waste management, water quality and other natural resources vital for people of Guam.

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

- Open Listening Sessions
- Other (Guams stakeholders are well identified)

Brief Explanation

WPTRC researchers employed several input methods to solicit input from individual farmers, farmers groups, representatives of the industry and representatives from federal and local agencies. Because of relatively small number of faculty and stakeholders on Guam, it has been a long-lasting practice to invite stakeholders for various functions in the college and give them frequent opportunities to express their needs in informal settings such as personal contact with faculty members. In 2008 stakeholders (farmers, golf course superintendents, managers from nurseries etc.) were invited to the college numerous times to express their needs and concerns. Of particular importance was creation of good understanding and stakeholders' support on issues related to the natural environment.

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
- Meeting with traditional Stakeholder individuals
- Meeting with invited selected individuals from the general public

Brief Explanation

Guam's stakeholders are well identified. About fifty farmers who supplement their income with some sort of agricultural production ranged in their activities from substantial (full time farmers) to hardly significant. Their associations are rather loose and based on personal contacts, friendships, etc. Their research requests are consequently not strong however researchers are required to listen and then to address their concerns. Many researchers modified their research programs to improve a service to stakeholders and provided additional opportunities for continued feedback. Research Information were disseminated to communities through newsletters, local newspaper coverage, radio and sometimes television programs. Administrators used stakeholders input to prioritize resource allocations. Recommendations from various groups of stakeholders were used in developing research programs that reach the island community.

3. A statement of how the input was considered

- To Identify Emerging Issues
- Redirect Research Programs
- In the Action Plans

Brief Explanation

We feel our informal and formal contact system with stakeholders works quite well. Perhaps one of the best examples of how stakeholder input is translated into action by CNAS is the rapid manner in which UOG was able to react to the sudden appearance of certain invasive species, especially rhino beetle on Guam. Due to the close contact extension and research scientists maintain with local growers, and because of the breadth of experience on other islands in the region, UOG-CNAS entomologists and extension agents were able to identify, characterize and provide a rational method of management for these species. Scientists were then able to apply for funding for more in depth research on the nature and optimal management technique to contain these species.

Brief Explanation of what you learned from your Stakeholders

For the most part, our professionals know the primary stakeholders in their particular disciplines, and interact with them regularly in the course of their normal university duties. Input from these interactions allows the faculty to tailor their programs to the unique needs of Guam's diverse community. Because Guam is a small island where most business is transacted in an informal setting, we felt it necessary during 2008 to introduce a more structured and easily evaluated format for obtaining community input into faculty endeavors.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	890166	0

2. Totaled Actual dollars from Planned Programs Inputs				
Extension			Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	0	0	890166	0
Actual Matching	0	0	575000	0
Actual All Other	0	0	0	0
Total Actual Expended	0	0	1465166	0

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

V. Planned Program Table of Content

S. NO.	PROGRAM NAME
1	Sustain, Protect, and Manage Guam's Natural Environment and Resources.
2	Development and Protection of Guam's Diversified Tropical Plant Systems, and Aquaculture.

Program #1

V(A). Planned Program (Summary)

1. Name of the Planned Program

Sustain, Protect, and Manage Guam's Natural Environment and Resources.

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			100%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2008	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	2.0	0.0
Actual	0.0	0.0	1.0	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
0	0	100000	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	75000	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

Two years ago, when preparing Plan of Work for 2008 I have made a mistake and included all anticipated research projects in WPTRC regardless of the funding source. Consequently I have included too many research activities not related to Hatch, Multistate Hatch, McIntire-Stennis, etc. I have revised our list and only relevant activities have been addressed below. In 2008 Agriculture Engineer left WPTRC. One soils scientist addressed issues related to soil management practices conducting hatch and multistate projects.

An integrated approach was designed to evaluate the effect of conservation tillage, rotation with leguminous crops as well as green manure for organic matter build up. The residue management for soil conservation was evaluated for re-habilitation and restoration and for enhancement and maintenance of soil productivity and quality. As part of in-field experiment and in order to evaluate the re-generating of soil surface that is degraded by erosion the following regimes are being practiced: a) No-tillage, b) Reduced tillage c) Conventional Tillage d) Conventional Tillage with Rotation to leguminous Sunnhemp It was found that carbon content of the soil was higher in the no-till than any other treatments. On the reduced till plots the percent carbon content also remained high next to the no-till plots mainly due to the reduced disturbances as compared to conventional tillage practices. Conventional tilled plots are the lowest for all sampling events while the conventional tilled with sunnhemp rotation had higher carbon mainly due to the green manure effect that added organic matter as well as carbon to soil as the result of sunnhemp biomass production and incorporation between the main crops as rotating crop.

In another project two types of animal manures used at both sites were based on local availability. Experiments in Guam included un-composted poultry (chicken), and hog (swine) manures applied at four rates (0, 200, 300, and 400 kg/ha total N) with three replications. An additional treatment utilizing a synthetic source of N applied at optimum rates was included for comparative purposes. The results of these experiments were reported earlier indicating that the soils did not respond well to the lower application rates regardless of animal manure types. Hence, it was decided that the highest rate of animal manure evaluation (400 kg/ha total N) could provide more conclusive results with regard to the kind of animal manure and as related to the soil type. For the second phase of the experiment, the two types of animal manures used (chicken and swine) at both sites were based on local availability. The results showed that the soils under study were not responsive to low rates (200, and 300lb/a) of manure. The results from the second phase of the experiment however showed that 400lb/acre applied was sufficient enough to produce acceptable amount of biomass considering the setback that were experienced during this investigation. Also, it was determined that residual effects of the nitrogen source material applied were at minimum six month after the initial application. This is due to high rate of nitrogen loss due to high rain fall rate which is characteristics to the local climate of Guam and the other island of Mariana's. Furthermore it appears that among the animal manures used as source of nitrogen, the chicken manure is more efficient and provides more nitrogen to the soils for plant uptake than the hog manure. Hog manure nitrogen use efficiency is shown to be low probably due to volatilization of nitrogen in the form of ammonia.

2. Brief description of the target audience

The immediate impact as a knowledge provided to the farmers and ranchers is that, the chicken manure seems to be a better source of N for both soils studied in this experiment. The educational impact of this project has already proven to be of a great value to the farmers, ranchers, as well as other members of the communities of the pacific islanders whom are concerned about the use of animal manure application as soil amendment for soil physical property improvement and fertility enhancement for the soils under agricultural production in Guam and the other islands of the western Pacific. Some of the results of this project were presented in a workshop and a descriptive article of the results is being drafted for submission.

The results of these experiment will also contribute to the overall scientific efforts in understanding the role of agriculture in sequestration of carbon in soils, and the ways in which this may reduce atmospheric carbon dioxide.

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	0	0	0	0
2008	10	500	0	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year	Target
Plan:	0
2008 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	0	0	
2008	0	2	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Conference Presentations

Year	Target	Actual
2008	4	3

Output #2

Output Measure

- Journal Publications

Year	Target	Actual
2008	4	3

Output #3

Output Measure

- Newspaper, magazine and other non peer reviewed publications.

Year	Target	Actual
2008	4	4

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O No.	OUTCOME NAME
1	

Outcome #1

1. Outcome Measures

Not reporting on this Outcome for this Annual Report

2. Associated Institution Types

3a. Outcome Type:

3b. Quantitative Outcome

Year	Quantitative Target	Actual
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3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
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V(H). Planned Program (External Factors)

External factors which affected outcomes

- Other (no factors)

Brief Explanation

none

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Before-After (before and after program)
- During (during program)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

Program #2

V(A). Planned Program (Summary)

1. Name of the Planned Program

Development and Protection of Guam's Diversified Tropical Plant Systems, and Aquaculture.

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
202	Plant Genetic Resources			20%	
211	Insects, Mites, and Other Arthropods Affecting Plants			15%	
212	Pathogens and Nematodes Affecting Plants			15%	
215	Biological Control of Pests Affecting Plants			30%	
216	Integrated Pest Management Systems			10%	
307	Animal Management Systems			5%	
601	Economics of Agricultural Production and Farm Management			5%	
Total				100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2008	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	6.0	0.0
Actual	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
0	0	790166	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	500000	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

Two years ago, when preparing Plan of Work for 2008 I have made a mistake and included all anticipated research projects in WPTRC regardless of the funding source. Consequently I have included too many research activities not related to Hatch, Multistate Hatch, McIntire-Stennis, etc. I have revised our list and only relevant activities have been addressed below.

Continue the research on biological control of the Cycad Aulacaspis scale. The Asian cycad scale is now distributed throughout much of the cycad growing area of Guam. Approximately 1000 photographs of the cliff line perimeter of northern Guam were taken. Healthy and unhealthy cycads were identified and counted.

Assess the biodiversity, biology and ecology of ants in Micronesia. Surveys of invasive ants on the islands of Guam, Saipan, Tinian, and Rota in the Mariana Islands continued during 2008. The majority of plant species showed high site specificity while ant species were more widely dispersed across the two habitats.

Monitor the spread of invasive insects to the various islands of Micronesia. We continued to study the spread of invasive insects in Micronesia. We have been documenting population survivorship using a demographic approach.

Develop environmental safe control methods for the invasive species by integration of semiochemicals and biocontrol agents. We optimized several important factors that affect pheromone-based catches, such as trap type, trap dimensions, and color and position of the traps. Ground traps were found to be superior to ramp and pitfall traps, and larger traps were more efficient than smaller ones.

Research biological control of banana borer and sugarcane weevil. The banana root borer *Cosmopolites sordidus* chemical control is both undesirable and expensive. Biological control methods were used across Guam and differences among sites were highly significant.

Evaluate banana cultivars against panama wilt and banana bunchy top diseases. We have finished evaluating cultivars for resistance to Panama wilt. We have concluded that most are not resistant to local strain.

Identify causal agent of bud rot and its control methods. The flare-up of bud rot has been inactive for some time. We are evaluating different varieties for resistance to *Phytophthora palmivora*, the causal agent of bud rot. We are still maintaining seedlings of studied varieties.

Survey fungal, bacterial and viral diseases on orchids. A survey of orchid viruses was completed. Cymbidium Mosaic and Odontoglossum Ringspot were detected in Dendrobium, Vanda, Phalaenopsis, Cattleya, Cymbidium and Oncidium.

Evaluate local and transgenic cultivars for papaya ring spot virus resistance. We have advanced another generation in the crosses of papaya cultivars to the F4 generation. Last year we also crossed cultivar Red Dagua with Yellow Dagua, using each one as female and as pollen donor, respectively. These plants are being evaluated for their reaction to PRV and are being self-pollinated.

Introduce specific pathogen free shrimp production and development of an export market. We successfully obtained six distinct populations of specific pathogen free *Penaeus vannamei* stocks to University of Guam. To maintain genetic diversity in the successive generation, multiple populations were produced by family based breeding. The produced families are planned to submit for genetic and nutritional interaction study and performance tests in order for the family selection.

Research ways to implement Aquaculture Development Plan for Guam.

Rapid growth of global aquaculture industry faces great challenges towards long-term and sustainable development. One of these challenges is to find cost-effective alternative protein source to replace fish meal in aquaculture feed. A study was conducted to investigate if selective breeding toward different traits has altered *P. vannamei* nutritional requirement. The results was obtained and analyzed, and used as a starting point for more nutrition and genetic studies.

2. Brief description of the target audience

On Guam target audience include farmers, commercial nurseries, vegetable growers, landscapers, homeowners, teachers, extension educators, and policy makers.

Farmers, Nursery managers, commercial growers, landscapers and homeowners are excited to use biological and others environmental friendly methods to control pests. Researchers have followed up with the stakeholders on the effectiveness and impact of this control method on Guam.

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	0	0	0	0
2008	20	50	20	20

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year	Target
Plan:	0
2008 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	0	0	
2008	4	23	27

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Journal publications

Year	Target	Actual
2008	12	23

Output #2

Output Measure

- Newspaper, magazine, and other non peer reviewed publications.

Year	Target	Actual
2008	15	22

Output #3

Output Measure

- Abstracts and conference presentations.

Year	Target	Actual
2008	12	28

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O No.	OUTCOME NAME
1	

Outcome #1

1. Outcome Measures

Not reporting on this Outcome for this Annual Report

2. Associated Institution Types

3a. Outcome Type:

3b. Quantitative Outcome

Year	Quantitative Target	Actual
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3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
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V(H). Planned Program (External Factors)

External factors which affected outcomes

- Other (no factors)

Brief Explanation

none

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- During (during program)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}