2009 University of Guam Research Plan of Work

Status: Accepted
Date Accepted: 06/02/08

I. Plan Overview

1. Brief Summary about Plan Of Work

2009 University of Guam Research Plan of Work
Brief Summary

The University of Guam (UOG) is the only 4 year public institution of higher education on Guam. Agriculture Experiment Station being a part of UOG since 1975 has had major impact on the agriculture research on Guam as well as many islands in the American Western Pacific. The new name Western Pacific Tropical Research Center associated with for the research division in the Land Grant collage was widely accepted because it accurately reflects our mission and research priorities. Western Pacific Tropical Research Center faculty and administrators recently held a strategic planning retreat. At that time we formulated clear and attainable goals and adopted the following mission: "Excellence in research in support of the land grant mission of discovery, learning and engagement. We excel in the areas of tropical agriculture, environmental and life sciences." We feel that our mission is well aligned with University of Guam mission of responsiveness to the specific needs of Guam and other Western Pacific island communities, thereby, contributing to their economic growth and stability.

The relatively small but very diverse group of WPTRC researchers also has considerable local and regional knowledge and experience. Our expertise, experience and specialized knowledge give us a competitive edge in securing funding from USDA and other federal and private sources. Due to the uniqueness of the communities we serve, we frequently qualify for additional grants available to institutions serving minority populations. We undertake steps to increase the range of potential funding sources, both within and outside of the field of agriculture. Issues such as environmental protection, invasive species control and detection, genomic research, bio-fuel, bio-control measures, extinction of native species and habitat loss are within our field of expertise.

WPTRC researchers collaborate with scientists around the world working with esteemed institutions (New York Botanical Gardens, European and Mediterranean Plant Protection Organization (EPPO), Florida Department of Agriculture and Consumer Services, Montgomery Botanical Center, National Geographic Society, Department of Biological Organic Chemistry in Barcelona, Spain) as well as with respected national and international universities.

WPTRC researchers collaborate with local authorities (Customs and Quarantine, Department of Agriculture, EPA, Guam Visitors Bureau, Guam Airport Authority) as well as with other UOG units and centers including WERI, Marine Lab, Cooperative Extension Service and local farmers, golf courses and individuals in the community.

Guam’s economy is driven by tourism therefore the natural beauty and fragile environment of the island is the major concern for the island's future prosperity. The military is Guam’s second largest industry in terms of value. An agriculture even relatively small, has a significant importance. In the recent years the majority of our activities revolved around preserving natural environment, protecting natural tropical forests, as well as landscapes around businesses and various residential areas. Military build-up that will result in moving over 20,000 military personnel and their dependents to Guam will require an increase in environmental research, waste management research, improvements in landscape management around newly build residential areas and increases in ornamental horticulture research in general. Besides environmental and ornamental research, there has been a strong demand for research allowing production of fresh vegetables and local fruits. With the projected increase in Guam’s population this demand is also going to increase. Unfortunately current Guam’s market prices are still not competitive with imported food. WPTRC researchers continuously look for ways to increase added value of existing products and/or increase consumer demand for new products.

The scope of work conducted by WPTRC scientists is quite broad and researchers are regarded as experts in the fields of plant and animal sciences, bio-technology, food and nutrition, aquaculture, soils science, tropical agro-ecology, technical networking, and agricultural economics. Overall, there are nine faculty members in WPTRC actively involved in research and each of them covers one major area of agriculture related to their field.

WPTRC scientists are perceived by the community as experienced in training Guam’s work force in the field of natural and applied sciences, education and extension. WPTRC continues to focus on issues addressing better understanding of the natural environment, protection and sustained management of natural resources, maintaining species diversity, management and prevention of invasive species, development of aquaculture, better waste management practices, improvements in water quality, enhancement and protection of forest resources, safety and improvement of food products, and growth of local markets,

especially fruits and produce. Our objective is to further increase collaborative research across the region and around the globe.

Our facilities include spacious buildings, three field stations, an aquaculture hatchery, sufficient lab space, and good internet connections. The field stations in operation cover all of the major soil types on Guam and offer university researchers places to conduct field experiments. The stations not only provide facilities and support for research activities, but also provide support and facilities for teaching university classes and extension and outreach programs.

We have a considerable amount of specialized equipment set up to conduct entomology, plant pathology, chemical ecology, soil science, horticulture, pomology and food science research. The Plant and Soil Testing Laboratory has been offering analytical services to the Guam community and the Micronesian region for approximately 20 years. Clients of this laboratory include farmers, home gardeners, golf courses, contractors, federal and local government agencies, schools, researchers, and landscapers.

Estimated Number of Professional FTEs/SYs total in the State.

Year	Extension		Research	
	1862	1890	1862	1890
2009	0.0	0.0	9.0	0.0
2010	0.0	0.0	9.0	0.0
2011	0.0	0.0	9.0	0.0
2012	0.0	0.0	9.0	0.0
2013	0.0	0.0	9.0	0.0

II. Merit Review Process

1. The Merit Review Process that will be Employed during the 5-Year POW Cycle

- External University Panel
- Expert Peer Review

2. Brief Explanation

Because of the small size of WPTRC, review of individual Plans of Work and projects has been conducted mostly by WPTRC administrators (Director and Associate Director). They usually utilize external reviewers as well as their knowledge and experiences to ensure that the planned programs and activities address the critical issues of strategic importance, including those identified by the stakeholders during the development of 2006-2011 Strategic Plans. All new research proposals (such as Hatch, McIntire Stennis, Regional Research etc.) are being submitted to WPTRC Associate Director who checks the proposal for completeness and format. There are very few peers at the university with expertise to review research proposals in agriculture fields. Therefore a draft proposal that is ready for review is being submitted to external ad hoc Peer Review Committee. Committee is comprised of three faculty members from other universities who are familiar with the issues addressed by the project. 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 making decisions regarding allocation of resources.

III. Evaluation of Multis & Joint Activities

1. How will the planned programs address the critical issues of strategic importance, including those identified by the stakeholders?

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 and relevant to the needs of the region, serve interest of scientific community and are linked to the needs of our stakeholders. Indeed, numerous new research projects address environmental issues, integrated plant protection, biocontrol as well as serve ethnic needs of local

population. Giving some examples of many projects that will be conducted by WPTRC researchers in the near future, two of them will investigate spread of the gallfly from the release site, asses its effect on plant growth, and the interaction between pest and parasite. One will study the biology of the gall-fly and evaluate their efficacy in the laboratory and field. One aims 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 plant and animal pests and diseases. Another important research project will attempt to define the genetic structure of the Cycads populations among the island habitats of Guam, Rota, Yap, Palau, and the Philippines, and then apply this knowledge to define critical conservation efforts on Guam. In addition AES is active in developing and providing knowledge and technologies to generate and improve food products, and processes for existing and new markets for local producers. AES has been and will continue to focus on issues that insure the understanding, protection, and sustained management of precious natural resources. Research activities will target waste management, water quality, invasive species, enhancing and protecting forest resources, species diversity, and many others issues. WPTRC faculty are also actively involved in multistate research such as Animal manure and waste utilization, Regulation of photosynthetic processes, Biological control in pest management systems, Carbon sequestration and distribution in soils of eroded landscapes and several others. They participate in yearly meeting, exchange information and coordinate their multistate activities.

2. How will the planned programs address the needs of under-served and under-represented populations of the State(s)?

The vast majority of Guam's inhabitants belong to the ethnic groups and cultures that often are not sufficiently served by federal programs. WPTRC (AES) administrators encourage new programs that address specific needs of under-served populations on Guam.

3. How will the planned programs describe the expected outcomes and impacts?

WPTRC (AES) administrators require annual reports to be submitted for all projects. Reports must contain sections called outputs and outcomes. Reported outcomes are categorized as short, medium and long term. Overall, AES projects produce valuable outcomes and impacts for our stakeholders and represent sound investments of our federal funding. WPTRC (AES) scientists have been able to obtain additional, significant funding from non-federal sources to support some of our programs. These types of funding indicate that conducted research is appreciated and considered to be trustworthy.

4. How will the planned programs result in improved program effectiveness and/or efficiency?

University of Guam used to have organizational structure that integrated agricultural research, and agricultural extension. After the split of AES and CES within UOG, agricultural programs became less effective.WPTRC (AES) hopes that extension faculty will return under the college umbrella and our faculty will again establish integrated projects that incorporate extension and education activities with our research efforts.

IV. Stakeholder Input

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

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

Brief explanation.

WPTRC will employ several of stakeholder input methods including soliciting input from individual farmers, farmers groups and organizations, 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. Periodically, stakeholders (farmers, golf course superintendents, owners of nurseries etc.) are invited to the college to make presentations and express their needs and concerns in more formalized manner. Both methods seem to work well and WPTRC administrators plan to continue with this way of providing stakeholders' input.

Of particular importance is to generate good understanding (between stakeholders and AES) why issues related to the natural environment receive so much of attention and need stakeholders' support. We plan that our future stakeholders will include producers, consumers, decision-makers, students, alumni, and members of the business community.

2(A). A brief statement of the process that will be 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 (Guam's stakeholders are well identified)

Brief explanation.

Guam's stakeholders are well identified. There are not more than 50 farmers and not more than 200 individuals who supplement their income with some sort of agricultural production. Their participation and input to define agriculture research ranges from substantial (full time farmers) to insignificant. Farmers do not form strong and focused commodity groups. Their associations are rather loose and based on personal contacts, friendships, etc.

2(B). A brief statement of the process that will be 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 individuals
- Meeting with traditional Stakeholder groups
- Meeting with invited selected individuals from the general public

Brief explanation

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

3. A statement of how the input will be considered

- In the Action Plans
- In the Budget Process
- To Identify Emerging Issues
- Redirect Research Programs
- To Set Priorities

Brief explanation.

Stakeholder input has been used extensively in developing the current AES Strategic Plan. As a result of the received input, AES faculty modify their research plans to improve service and to provide specific opportunities for continued feedback. Information will be disseminated to communities through newsletters, local newspaper coverage, radio and sometimes television programs. Administrators use stakeholders input to prioritize resource allocations. Recommendations from various groups of stakeholders are useful in developing research programs that reach the island community.

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.

V(A). Planned Program (Summary)

Program #1

1. Name of the Planned Program

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

2. Brief summary about Planned Program

With less than 1% of arable land on Guam and just a handful of truly commercial farms, WPTRC research efforts concentrate on the protection of natural environment. Major areas addressed by research include: agricultural waste management, forest resource management, nutrient management, soil erosion, soil quality, biological diversity, rehabilitation of degraded soils, and water use efficiency. Research efforts into preserving, protecting, and renewing Guam's natural resources continue to be an area of focus. This planned program will strengthen our capabilities in management of agricultural and natural resources, and to manage the impacts of human activities in ecosystems and mitigate environment and waste management problems.

3. Program existence : Mature (More then five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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			40%	
111	Conservation and Efficient Use of Water			10%	
403	Waste Disposal, Recycling, and Reuse			50%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Guam is a home for 170,000 inhabitants as well as tourist destination, mostly from Asia. The sustainability of natural resources, its use and management is vital for maintaining prosperity of the island. Water erosion is the most severe form of soil degradation on Guam. Eroded sediment carries away valuable soil nutrients and poses a serious threat to humans, resources, and environments downstream. The badlands of southern Guam are a prime example. Transport of sediment out of a badland basin and into a new sedimentary system promotes a spectrum of environmental and ecological changes ranging from wetlands formation and river turbidity to coastal modification and habitat destruction. The natural areas affected are integral parts of both the quality of life for residents and the viability of the tourism industry. Both are severely altered by unchecked badlands formation. WPTRC soil scientist is developing an integrated approach to control the accelerated soil erosion and restoration of the land resources in southern Guam. In his research, he and his colleagues evaluated a variety of options, including the effects of Vetiver Systems on the watershed areas for controlling the sedimentation and preventing water pollution downstream, hence protecting the coral reefs.

Increased tourism as well as systematic increase of consumption on the island resulted in some harm to the environment as well as increased production of waste. For example, parts of coral reef around Guam are severely damaged and existing

landfill is overloaded. A new landfill construction is on the way regardless of strong opposition from nearby residents. Effective management of the environment and natural resources must balance competing interests. Developing and applying sound management strategies, combined with thorough understanding of complex interdependences of natural systems, can yield sustainable benefits from land resources and urban development.WPTRCwill focus on development of knowledge base that achieves maximum benefits from natural resources. Through advances in scientific knowledge and effective application of that knowledge WPTRC can help in achieving harmony between economic growth and preservation of Guam's precious natural resources.

2. Scope of the Program

- In-State Research

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

At least one qualified researcher and supporting staff is available.

Additional external funds and other resources are available.

Partnerships with other agencies such as NRCS and other universities will continue, will coordinate efforts and share resources.

Basic Information on best management practices exists for the management of natural resources.

Government and other stakeholders are willing to implement best management practices.

2. Ultimate goal(s) of this Program

To achieve the balance between urban development and sustainability of natural resources.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2009	0.0	0.0	2.0	0.0
2010	0.0	0.0	2.0	0.0
2011	0.0	0.0	2.0	0.0
2012	0.0	0.0	2.0	0.0
2013	0.0	0.0	2.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

to develop various techniques and methodology to characterize the hydraulic properties of the soil affected by different farming practices.

to study the effects of surface crop residues and subsurface macroporosity on water infiltration into the soil profile.Effect of crop residue on soil quality improvement for agricultural sustainability.

to improve watershed management and use of Vetiver Technology 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.

to study the dynamic relationship between soil and water and chemical transport within the soil matrix.

to designe and conduct various experimentations by employing innovative techniques

such as cat-scan tommography and dyes and tracers to measure the parameters of solute transport and chemical movement throughout the soil profile.
to develop management techniques to slow and/or retard preferential macropore flow as

a preventive technique for reducing the risk of groundwater contamination under no-tillage production system.
to develop techniques to evaluate the effects of nutrient distribution under conservation management practices as an alternative to a sustainable production system.
to develop techniques to evaluate the effects of no-till management and inter cropping on chemical, physical and biological properties of the soil.
to study the effect of composted organic wastes on soil quality, crop production and agricultural sustainability.

to promote waste management 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.

to study bio-remediation of contaminated soils by using organic material for the enhancement of biological activities in the contaminated soils.

to investigate the use of Vetiver System (VS) for the bio-remediation of sewage water and drainage from storm water for water quality improvement and the restoration of water reservoirs and marine environments near the seashores.

to study the use of composted organic waste to increase organic matter content for improving soil physical properties in order to reduce soil erosion.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension	
Direct Methods	**Indirect Methods**
• Demonstrations • One-on-One Intervention • Workshop	• Web sites • TV Media Programs

3. Description of targeted audience

Extension joined research in October 2007. Extension component in this program's will be develooped soon.

V(G). Planned Program (Outputs)

1. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0
2013	0	0	0	0

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

Expected Patent Applications

2009 :0 **2010 :**0 **2011 :** 0 **2012 :**0 **2013 :**0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2009	0	0	0
2010	0	0	0
2011	0	0	0
2012	0	0	0
2013	0	0	0

V(H). State Defined Outputs

1. Output Target

- Conference Presentations

2009 :4 **2010 :4** **2011 :4** **2012 :4** **2013 :4**

- Journal Publications

2009 :4 **2010 :4** **2011 :4** **2012 :4** **2013 :4**

- Newspaper, magazine and other non peer reviewed publications.

2009 :4 **2010 :4** **2011 :4** **2012 :4** **2013 :4**

V(I). State Defined Outcome

O. No	Outcome Name
1	

Outcome #1

1. Outcome Target

{NO DATA ENTERED}

2. Outcome Type :

: {NO DATA ENTERED} : {NO DATA ENTERED} : {NO DATA ENTERED} : {NO DATA ENTERED} : {NO DATA ENTERED}

3. Associated Institute Type(s)

4. Associated Knowledge Area(s)

- {NO DATA ENTERED}

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

Natural disasters such as typhoons do occur on Guam frequently. Damage to research plots, and equipment can be very extensive. When the economy is poor, funding decreases. Small institution as WPTRC (AES) feels impact of financial difficulties very suddenly.

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

1. Evaluation Studies Planned

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

Description

Program is long term. Journal and other types of publications measure its success.

2. Data Collection Methods

- Journals
- Sampling
- Observation

Description

Typical for basic and applied research.

V(A). Planned Program (Summary)

Program #2

1. Name of the Planned Program

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

2. Brief summary about Planned Program

Guam's commercial agriculture is small and almost all food is imported. This is not likely to change and only small quantities of high value specialty crops for certain niche markets will be produced by Guam's farmers.

Guam relies heavily on its environment to provide excellent living conditions for the residents as well as major attractant for the visitor industry. Diversity and health of plants plays an essential role by providing tropical character to hotels, shops and residential areas. In addition the golf industry attracts many visitors who come to Guam specifically to play golf. The planned research program will address development of specialty crops produced on Guam, ornamental plants in our landscapes, as well as protect a diversified flora in natural environments.

Pests threaten agricultural products as well as natural and urban ecosystems. Through basic and applied research, host-pathogen interactions can be identified; control measures can be developed and researched. An important component of ecosystems management is mitigation of alien invasive species. Invasive species threaten Guam's native plants and damage economically important ornamental species.

The invasion of new pests and pathogens, including insects, and disease causing organisms, can devastate the expensive niche crops that Guam's farmers produce thereby destroying their limited economic opportunities. Plant pathologist and entomologist identify new pests that continually invade our island and destroy our high value crops and landscapes. New technologies are being developed at WPTRC to control insects by biocontrol methods. Plant pathologist is investigating resistance and control methods of numerous plants such as papayas, bananas, and taro. Horticulturists will evaluate genotypes of hot peppers (Capsicum spp.) for adaptability to tropical agro-climate in order to increase field production of the superior fruit-bearing lines. They will determine field performance of Capsicum genotypes for their adaptability to Guam's agro-environment, characterize physical and chemical properties, and conduct a consumer preference tests on hot pepper. They will also study taxonomy and ecophysiology of native plant species, as well as toxicology and pollination biology of cycads. In recent months, everyone on Guam is concerned about the invasion of the coconut rhinoceros beetle (CRB), Oryctes rhinocero discovered in mid September 2007. The infestation of CRB was identified by WPTRC entomologist, who then organized a delimiting survey to ascertain the extent of the infestation. This survey indicates that the infestation is limited to Tumon Bay an area of approximately 1,000 acres. CRB is a very real threat to Guam's economy and ecology. Without immediate action to suppress and contain the infestation, massive mortality of cultivated and wild palms is expected.

Recently, the University of Guam WPTRC intiated new research to support aquaculture development in Guam and the region. In February 2007, WPTRC hired the first aquaculture research faculty with the background in aquaculture nutrition, molecular biology and health management. New aquaculturist long-range plans include conducting applied research in aquaculture species, initially focusing on health management, and nutrition and genetics studies in shrimp. In addition a careful assessment has been conducted for revitalizing Guam Aquaculture Development and Traning Center for the production, maintenance, and distribution of specific pathogen free (SPF) shrimp stocks worldwide and for sustaining a viable regional shrimp aquaculture industry.

3. Program existence : Mature (More then five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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 and Biodiversity			15%	
205	Plant Management Systems			10%	
211	Insects, Mites, and Other Arthropods Affecting Plants			15%	
212	Pathogens and Nematodes Affecting Plants			10%	
215	Biological Control of Pests Affecting Plants			20%	
216	Integrated Pest Management Systems			10%	
307	Animal Production Management Systems			15%	
601	Economics of Agricultural Production and Farm Management			5%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Physical isolation of the island and its year round favorable growing conditions created unique ecosystems, extremely susceptible to invasion by undesirable plants, insects, microbes, and other invasive species.Invasive species, especially insects are considered the greatest threat to Guam's economy and natural environment. Invasive species cause great losses, sometimes the extinction of native species, and in general significant destruction of native forests. Sometime pests such as brown tree snake, change natural environment and quality of life forever. Despite federal and state quarantine regulations, many species become imported mostly with shipped products. Some are harmless but some cause a significant impact on Guam's economy. Research will be aimed at eradication of invasive species in localized outbreaks. In areas where eradication may not be immediately possible, control measures will be researched to minimize its spread and reducing the population.

2. Scope of the Program

- In-State Research

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Other agencies will cooperate.
External funds and resources will be available.
Several faculty will actively work and collaborate on IPM projects.
At least two faculties will devote their research efforts to address issues related to increased production of cash crops.
Aquaculture will be supported by local government

2. Ultimate goal(s) of this Program

Eradicate specific invasive species or at least improve management of targeted invasive species.

Reduce introductions of invasive species to Guam.

Quickly detect new introductions and eradicate them as soon as possible.
Increase collaboration with USDA National Resource Conservation Service and other territorial and federal agencies.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2009	0.0	0.0	6.0	0.0
2010	0.0	0.0	6.0	0.0
2011	0.0	0.0	6.0	0.0
2012	0.0	0.0	6.0	0.0
2013	0.0	0.0	6.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Here is an outline of the major research thrusts of the next 5 years.

Continue to develop biorational pest management strategies.
Assess the biodiversity and genetic structure of homopteran populations.
Assess the genetic structure of aphidiid parasitoid populations.
Assess the biodiversity, biology and ecology of ants in Micronesia.
Examine crops for host resistance to insect pests.
Monitor the spread of invasive insects to the various islands of Micronesia.
Participate in developing economic models for assessing the impact of insect, disease and vertebrate pests on Guam and Micronesia.
Evaluate of plant material for use in Guam's landscapes.
Study the environmental factors affecting the establishment of native trees and shrubs

Conduct a survey of Guam for current weeds and monitor the spread of newly introduced invasive plant species in Guam.
Conduct a survey of medicinal plants used historically in Guam.

Determine how Guam’s cycad population relates to populations in the Mariana and West Caroline Islands.
Study responses of native plants of Guam to various edaphic and climate factors Study management practices for precocity and early yields.
Study cycad pollination biology, cycad toxicology and biochemistry.
Develop environmental safe control methods for the invasive species by integration of semiochemicals and biocontrol agents.
Research biological control of banana borer and sugarcane weevil.

Evaluate banana cultivars against panama wilt and banana bunchy top diseases
Identify causal agent of bud rot and its control methods.
Survey fungal, bacterial and viral diseases on orchids.
Evaluate local and transgenic cultivars for papaya ring spot virus resistance.
Continue the research on biological control of the Cycad Aulacaspis Scale,
Chromolaena odorata, Coccinia grandis, Mimosa diplotricha, andpink hibiscus mealy bug.
Investigate morphological, genetic and ecological variation in Aphis gossypii and Pentalonia nigronervosa worldwide, with emphasis in Micronesia (joint project with Washington State University and Agiculture-Agri-Food Canada)

Characterize biodiversity of aphids in Micronesia and Hawaii

Examine the effects of indigenous and exotic ant species on forest biodiversity and agricultural production on Micronesian Islands

Develop classical biological control for aphids and other Hemiptera on islands of the Western Pacific; includes natural enemy surveys, systematics studies, prerelease testing, post-release follow-up studies, farmer education on biorational pest management strategies

Establish baseline levels of insecticide resistance for pests in Marianas Islands

Screen pesticides for control of psylla on tropical hardwood seedlings
Introduce specific pathogen free shrimp production and development of an export market
Investigate the integration of hard coral production for the aquarium fish trade and develop an exportable product.
Investigate the local production of rabbit fish to help diversify the local industry.
Implement Aquaculture Development Plan for Guam and hire one more faculty.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension	
Direct Methods	**Indirect Methods**
• Workshop • Demonstrations • One-on-One Intervention	• TV Media Programs • Web sites

3. Description of targeted audience

No extension, this is research Plan of Work only.

V(G). Planned Program (Outputs)

1. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0
2013	0	0	0	0

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

Expected Patent Applications

2009 :0 **2010 :**0 **2011 :** 0 **2012 :** 0 **2013 :** 0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2009	0	0	0
2010	0	0	0
2011	0	0	0
2012	0	0	0
2013	0	0	0

V(H). State Defined Outputs

1. Output Target

- Journal publications

  2009 :12 **2010 :**12 **2011 :**12 **2012 :**12 **2013 :**12

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

  2009 :15 **2010 :**15 **2011 :**15 **2012 :**15 **2013 :**15

- Abstracts and conference presentations.

  2009 :12 **2010 :**12 **2011 :**12 **2012 :**12 **2013 :**12

V(I). State Defined Outcome

O. No	Outcome Name
1	

Outcome #1

1. Outcome Target

{NO DATA ENTERED}

2. Outcome Type :

: {NO DATA ENTERED} : {NO DATA ENTERED} : {NO DATA ENTERED} : {NO DATA ENTERED} : {NO DATA ENTERED}

3. Associated Institute Type(s)

4. Associated Knowledge Area(s)

- {NO DATA ENTERED}

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

Typhoons are always possible on Guam and may delay advances of research.

Lack of funding (possible cuts in formula funds and unsuccessful efforts for competitive funds) may reduce the scope of research.

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

1. Evaluation Studies Planned

- During (during program)

Description

Program will be avaluated every year

2. Data Collection Methods

- Observation
- Tests
- Sampling

Description

Research data will be collected and analyzed according to the standard methods.