

Annual Report for Accomplishments and Results Guam FY2001

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Introduction

Guam, an Unincorporated Territory of the United States, is located at latitude 13.2 degrees North and 144.4 East longitude. Guam being the largest of the 16 islands in the Mariana archipelago in the Western Pacific. Guam is approximately 3,600 miles West, South-West of the Hawaiian Islands and ca. 1,500 miles due East of Manila, Philippines. The 2000 population census estimates Guam population around 155,000. The ethnic backgrounds of the people on islands include: Chamorros (native islanders), Caucasians (including members of the U.S. Armed Forces and their dependents), Filipinos, Micronesians, Japanese, Chinese, Koreans, Vietnamese, Thai, Indians, and Polynesians. The composition of the ethnicity on island is approximately 37% Chamorros, 6.8% Caucasians, 26.3% Filipinos, and 29.9% other (i.e., Pacific Islanders other than Chamorros, Asians, and African Americans).

On June 22, 1972 the US Congress, through Public Law 92-318, designated the University of Guam as a member of the 1862 Land Grant institutions. In recognition of the University's Land Grant status, the Guam legislature, through Public Law 13-47, assented to the federal provisions dealing with the research and extension functions of a land grant institution. In March 1974, the University Board of Regents created the College of Agriculture and Life Sciences (CALs) to facilitate the tripartite functions of the college including research, extension and teaching. The mission of CALs, in partnership with public and private sectors, is to improve economic, environmental and social conditions for the people of Guam and the Western Pacific region by providing creative and integrated research, education, and extension programs in agriculture and related sciences.

The Agriculture Experiment Station (AES) conducts research for the advancement and protection of the island's agriculture and related fields. The Guam Cooperative Extension (GCE) translates and delivers technical information as well as conducts informal education programs to farmers, homemakers, families, youths and the community. The primary mission of AES is to conduct applied, adaptive and basic research in agriculture and on issues pertaining to family well being, youth development, human health/nutrition, consumerism, human resource development and the environment. The

Extension mission enables the multicultural community of Guam to make informed decisions through non-formal education programs based on research and identified local needs.

The Hatch and Smith-Lever formula funds and their respective Government of Guam matching funds are utilized to maintain the regular operations of the University of Guam Agricultural Experiment Station and Guam Cooperative Extension. These funds principally support the salary of the more permanent personnel and day to day operations of AES and GCE.

The September 11th terrorist attacks on the United States continue to have a significant impact on Guam. Our key economic indicator, tourism, has declined with reduced benefits from the airlines, hotels, and the agricultural sector that sells its local produce to the hotel industry. The latest unemployment figures show an alarming rate of 18 to 22 percent after the 9-11 attacks. Many individuals who have lost their jobs, due to layoffs or bankruptcies, are in the process of moving to the US mainland or taxing the already fragile welfare system that exists on Guam. It is important that both AES and GCE strives to implement programs to aid the agricultural community and at the same time help deal with the financial crisis of the community that effects each household's financial obligations. Economic and social stress breeds unrest and unrest can be detrimental to a any community. The economic and social challenges that Guam faces are greater than the means to support them and yet we, the College, must be able to help bridge the gaps in our community to over come our present situation. It will take greater outreach from both AES and GCE faculty to deal with the present economic/social situation that faces our island.

National Goals 1 - 5

Goal 1. An Agricultural system that is highly competitive in the global economy

Executive Summary - More than 90 percent of Guam's food supply is imported. The primary source is wholesalers and markets on the US West coast. Locally grown, fresh produce must compete with US imports in the island's markets. By value, the major component of agriculture on Guam is the production of fresh produce for local markets. Fruits and vegetables accounted for 81.3 percent of the value of agricultural production on Guam. Imported produce has several advantages in this competition: imports are reliable in their supply, imports are graded and consistent in maturity and quality, and finally, the importers have to take possession of the produce at the time of shipment. Local produce has its own advantages in the competition with imports: local produce is often much fresher than imported produce, there are no shipping costs and much of the local fruits and vegetables are cultivars or crops which are not commonly available in US. Given the current situation on Guam, a three prong research/extension attack on the marketing problems is suggested. First, an investigation and quantification of local marketing channels will be undertaken. Second, an import substitution econometrics model will be developed to estimate the elasticities of demand for the primary local products. And third, investigation of the potential for new cultivars and crops to be

introduced into local production will be undertaken. Agricultural Development Fund (ADF) program allows farmers access to financing based on a low 4% interest rate with a maximum of 12 years. As a result ADF programs representing four projects for this period total \$114,500.00. Micro lending programs provided by banking institutions provide financing options for small farms seeking alternative funding. Bank of Hawaii (Guam Division) has expressed interest in developing and linking their micro lending programs for farm enterprises. In an effort is to provide technical training to low-income clientele particularly housing association constituents participating in projects to help augment income and technical skills building using Aquaponics grow-out systems.

Key issues that were specifically targeted during the 2001 year include: tropical fruit and vegetable production, the use of irrigation water and fertigation/chemigation systems, the use of soil amendments to improve soil fertility in the region, and to increase the aquaculture industry through investigations of culture methods, species diversification and aquatic farming systems. They issues and other issues and impacts are listed below.

This year's accomplishments under goal 1, continues to provide great benefits to the island of Guam and to the region as a whole. We are in line with the goals set forth by our 5 year plan of work.

* Total expenditures for Goal 1 - was \$751,301(Federal and State) with \$509,000 for Research (Federal \$391,538 and State \$117,462) and \$242,301 for Extension (Federal \$186,385 and State \$55,916). Total FTE 16.3 with Research 10.4 (Prof 3.2, ParaProf 0.6, Staff 6.0, and Admin. 0.6) and Extension 5.9 (Prof 3.0, ParaProf 0.5, Staff 2.0, and Admin 0.4)

Goal 1 - Key Themes, Impacts

Key Theme - Adding Value to New and Old Agricultural Products (Research)

- a. The research project focuses to promote post-harvest activities to increase marketability of traditional root crops on Guam. The study was designed to conduct field evaluation of sweetpotato (*Ipomoea batatas*), and a market study of sweetpotato, taro (*Colocasia esculenta* and *Xanthosoma* sp.), cassava (*Manihot esculenta*). This study also included sweetpotato preference test of purple and yellow sweetpotato. New accessions of sweetpotato germplines were deposited for future field evaluation as value-added products. Sweetpotato chips and boiled sweetpotato as popular forms of sweetpotato product will be studied by a sensory evaluation. The attributes evaluated include color, flavor, appearance and texture. The development of processed products made from traditional root crops will promote agriculture and agri-business on Guam and other tropical islands of this region.
- b. Impact - Results of survey and field trials have encouraged to create new forms of processed products in agribusiness on Guam. Establishment of post harvest activities of traditional root crops will increase the production.

- c. Source of Federal Funds - 406 T-Star
- d. Scope of Impact - State Specific

Key Theme - Gardening and Ornamental Horticulture (Research and Extension)

- a. The purpose of this project is to survey local plants for uses including urban forestry, windbreaks, living fences and specimen plants for the landscape. The plant material will be evaluated for use because of its adaptation to certain conditions, for some aesthetic quality or for some functional uses such as shading or as a living barrier. Selected plant material will be collected for propagation by seeds and/or cuttings to determine efficient ways to increase quantities of the plant material.
- b. Impact - Plant material has been collected and is being propagated. Flash cards and fact sheets are being produced to replace 2 out-of-print publications using information obtained from this project. These publications aid in the identification of plant material and the propagation and use of various plants.
- c. Source of Federal Funding - Hatch
- d. Scope of Impact - State Specific

Key Theme: Plant germplasm/Plant Production Efficiency (Research)

- a. Collection of vegetable germplasms was continued and deposited to the Vegetable Research Unit of the Agricultural Experimental Station. Crops included sweetpotato (*Ipomoea batatas*), vegetable soybean (*Glycine max*), and tomato (*Lycopersicon esculenta*). The accessions of vegetable soybeans and sweetpotato, and commercial tomato cultivars were evaluated in Guam cobbly clay soil. Samples of commercial tomato cultivars were also distributed to eight farmers for on-farm trials. Tissue cultured cooking and desert bananas were distributed to local community.
- b. Impact - Superior plant accessions would be selected and recommended to extension agents to disseminate information to community on Guam. This project would help improve local production of vegetables. "Æ Solar Set" and "Heat wave" were preferred tomato cultivars by farmers. Production of vegetable seeds and disease-free planting materials using tissue culture is now in progress to increase clean planting materials available to farmers on Guam. Tissue-cultured banana plants were distributed to nearly 50 farmers and home gardeners.
- c. Source of Federal Funds - Hatch
- d. Scope of Impact - State and Regional

Key Theme - New and Value Added Agricultural Products (Extension)

- a. Fourteen people were trained in value-added processing of lada juice and in sustainable production and management of lada. Issues related to sustaining biodiversity and preserving the local genetic resource of lada plants were also covered.
- b. Impact - A post test showed that more than 70% of the participants were interested in lada production and processing. More than half of the respondents showed good understanding of the issues related to sustaining lada production while preserving the natural wild population and managing the soil to ensure sustainable harvests from the wild lada population.
- c. Source of Federal Funds - Smith-Lever
- d. Source of Impact - State Specific

Key Theme - Agriculture Competitiveness (Extension)

- a. To improve the viability of Guam's agricultural through increasing the proficiency of farmers to identify plant diseases. Teaching of plant ailment diagnosis techniques is provided directly to clients through contact in the office and in the field as well as indirectly through fact sheets.
- b. Impact - Guam Vegetable News reaches about 400 people and direct contact result in nearly 1000 individuals being instructed in diagnosis of one or more plant problems.
- c. Source of Federal Funds - Smith Lever
- d. Scope of Impact - State Specific

Key Theme - Aquaculture (Extension)

- a. Through existing collaborative linkages with both Government and Non-government organizations continued support is again realized through the various projects and forums of interactions. This is apparent in grants preparation, participation in planning sessions and providing input to agencies regarding aquaculture issues. Specifically, the need to access equipment resources resulted in an established Memorandum of Understanding to facilitate related projects and programs. The intent of this effort is to provide technical training to low-income clientele particularly Housing association constituents participating in projects to help augment income and technical skills building using Aquaponics grow-out systems. As result idle damaged equipment was put into productive use through

shared resources allowing identified participants to continue with their training and projects.

- b. Impact - Specifically, alliance with both line agencies and a non-government organization resulted in both funding and equipment support augmenting the training sessions. Eight participants attended a 3-day training series covering the following topics: Basic business and marketing concepts, Concept of cooperatives: Producer & Marketing Coops, Business organizations and structures, and Identifying basic costs and break-even point. Participants are able to demonstrate the use and application of determining production cost concepts as well as having a better understanding of the trappings of business operations and requirements. The end result is a piloted training module on these specific topics that will ultimately be structured as an Aquaponics business curriculum module.
- c. Source of Federal Funds - Smith-Lever
- d. Scope of Impact - State Specific

Aquaculture (Extension)

- a. Through continued collaborative linkages with Department of Commerce, Extension continues to provide technical input and servicing to line agencies resulting in a grant project for addressing the marketability of Red Tilapia.
- b. Impact - Based on the progressive programming of the Pond to Table project. The initial taste testing surveys proved to be valuable information needed to address sampling and survey issues for the grant project. The Taste testing surveys (150) showed interest in salt-water conditioned tilapia. As a result of this project the potential to factor color in to the equation harmonizes both taste (salt-water conditioned) with color (visual quality). Although the project activities continue to build on promoting aquaculture production and industry linkages, the industry potential continues to grow by investments in these projects and developments by the industry collectively recognizing its importance.
- c. Source of Federal Funds - Smith-Lever
- d. Scope of Impact - Regional

Key Theme - Agricultural Communication (Extension)

- a. To improve the efficiency of distribution of materials and information to the public. To reach more clients we have fostered a relationship between Guam Cooperative Extension and private businesses to increase the use of sunnhemp for soil enrichment and erosion control.

- b. Impact - Sunnhemp seed was purchased in bulk (160 kg) and provide free to three stores for distribution. In exchange for the seed, they agreed to charge no more than one-dollar a pound, limit 5 pound per customer and to distribute our sunnhemp publication. As a result about 50 individual on island, planted sunnhemp in their gardens and yards.
- c. Source of Federal Funds - Smith Lever 3(d) (IPM)
- d. Scope of Impact: State Specific and Regional

Key Theme - Animal Production Efficiency (Extension)

- a. Recent surveys revealed that government workers involved in livestock production programs lack the basic knowledge and skills to deliver Extension and Research programs to animal producers. These surveys also indicated that the very basic management procedures remain unknown to the producers leading to low but costly production. As a result, poor service to the animal producers in the region is encountered. Most of these workers have never had the chance to attend training and staff developments in swine production and management. A grant from SARE-PDP was approved to develop a training program for extension agents, livestock personnel of agriculture agencies and hog producers in Micronesia.
- b. Impact - Sixteen fact sheets and piglet management posters were produced and mailed to participants. There are 60 participants from the region who are receiving these fact sheets. Evaluation and feedback from participants are very encouraging. One participant actually started his own pig farm after attending the workshop. Extension agents who attended the workshop gained higher respect from their clients. The level of awareness of efficient management increased by 60% among producers and extension agents. Producers started making changes in the way they mate and feed their breeders. Each producer has the capacity to obtain basic farm supplies such as piglet medications and equipment.
- c. Source of Federal Funds - Smith-Lever SARE
- d. Scope of Impact - State Specific and Regional

Key Theme - Plant Production (Combined Research and Extension)

- a. To improve crop production and water use efficiency by using switching tensiometers as part of a best micro-irrigation management practice. Increase grower usage of switching tensiometers through instruction publications and workshops.

- b. Impact - Field experiments have shown that switching tensiometers, when properly maintained and set to the proper soil matric potential for a particular crop, perform better than timers in both crop yield and water use efficiency in micro-irrigation systems. Four publications for dissemination by extension services have been produced in this area. Workshops for local farmers will be scheduled in the near future.
- c. Source of Federal Funds: W-128
- d. Scope of Impact: State Specific

Key Theme – Plant Health/Plant Production Efficiency (Research)

- a. The purpose of this research is to determine the influence of horticultural management practices of papaya seedlings in the nursery and early growth period on production. Papaya is a precocious perennial herb. Part of the production strategy on Guam is to achieve early fruit production to shorten the production cycle. Papaya’s rapid growth habit allows rapid response to any horticultural input.
- b. Impact - The influence of soil chemistry on papaya root growth was studied. In one study, the ability of papaya roots to induced iron reductase activity was determined. Four cultivars of papaya expressed very high capacity for reductase activity when exposed to iron deficiency. In a second study, acid soil was amended with various amends to determine the possible chemical reasons for limited root growth in acid soils. The results indicated that both calcium deficiency and aluminum toxicity play a role. This information is valuable for selecting planting sites for papaya production, and determining the types of amendments that may improve production.
- c. Source of Federal Funds - Hatch
- d. Scope of Impact - State Specific and National

Plant Health/Plant Production Efficiency (Research)

- a. This project is designed to identify the limitations on photosynthetic rates at the canopy level, and how development and physiological characteristics may be deployed to optimize yields during times of environmental limitations.
- b. Impact - We studied the level of photosynthetic plasticity of a native tree species, *Elaeocarpus joga*. This is a climax species in the typhoon forests of Guam. Growth, maximum photosynthesis, leaf size, and most other measured characteristics were greater in 25% sunlight transmission compared with 50%, 75%, or 100% sunlight transmission. Seedlings of this species live for many years in the forest under-story, partly due to highly efficient shade leaves.

- c. Source of Federal Funds - Multi-Regional Hatch
- d. Scope of Impact - State Specific

Key theme - Plant Health (Research)

- a. *Cocos nucifera* L, the coconut palm, is a very important tree species in the Western Pacific region. Coconut Tinangaja is the most important disease occurring throughout Guam, and possibly in other Mariana islands. It poses a threat to all other coconut growing areas of the Pacific, and the world.
- b. Impact - Development of a PCR technique for highly sensitive detection of the Tinangaja Viroid. During the past year we have been able to fine-tune an RT-PCR technique, developed the previous year, and are now capable of detecting viroid at 100,000 x dilutions, improving our previous capability by some 3 orders of magnitude. Using the newly developed RT-PCR technique, we have been able to verify that coconut seedlings inoculated 3 years ago are infected with the Tinangaja Viroid, thus proving that the Coconut Tinangaja Viroid is the causal agent of Tinangaja disease. We have shown that Coconut Tinangaja can be transmitted mechanically. For the first time ever, Tinangaja symptoms have been described in coconut seedlings. Previously it had not been possible to verify the presence of the viroid in seedlings.
- c. Source of Federal Funds - 406 T-STAR
- d. Scope of Impact - Regional

Plant Health (Research)

- a. Coconut, banana, and taro are important traditional crops in Pacific islands. The most important diseases of these crops on Guam are Coconut Tinangaja, Banana Bunchy Top (BBTV), Black Leaf Streak (BLS) and Panama Wilt (PW), and Taro Leaf Blight (TLB), respectively. The aim of this project is to facilitate the way to develop control measures for these important diseases.
- b. Impact - A state-of-the-art technique has been developed and fine-tuned for early detection of CTiVd. Disease-free banana plants were propagated via tissue culture and distributed to banana growers. Some of these banana cultivars were resistant to BLS or PW. The third objective is also being addressed by applying for a grant to develop resistance against PW in local bananas (for Guam and Kosrae).
- c. Source of Federal Funding - Hatch
- d. Scope of Impact - Regional

Plant Health (Research)

- a. Papaya Ringspot Virus (PRV) is the main production constraint of papaya in Hawaii, Guam, and the Western Pacific. No resistance is available in papaya. Transgenic resistance has been shown to work in Hawaii, but existing plants are resistant only to the Hawaii strain of the virus. We propose to develop a transgenic papaya that is resistant to our strain of PRV. Also, we aim to look at the variability of the virus with respect to its coat protein gene, to determine if we have potential new strains capable of posing a threat to our region in the future.
- b. Impact - We have some papaya cultivars in the field and are planning to self-pollinate them to produce seed that can then be sent off to Cornell University for transformation. By developing resistance to PRV we hope to favor papaya production and increase yields for the local market. This resistance can also be used in other islands of the region. By studying the variability of the coat protein gene in PRV throughout the Pacific, we intend to have an idea if new strains of the virus are a potential threat to the region in the future.
- c. Source of Federal Funding - 406 T-STAR
- d. Scope of Impact - Regional

Key theme - Biotechnology (Research)

- a. The College of Agriculture & Life Sciences at the University of Guam needs to upgrade its teaching capability to remain competitive. Its graduates need to be trained in the most important and up-to-date techniques being used for research and production in the field of agriculture. We aim to acquire instrumentation to give us the capability of teaching molecular biology techniques in the various lab sessions of our agricultural science courses. Our researchers will also benefit from having access to upgraded molecular biology instrumentation, in order to remain competitive in obtaining research grants.
- b. Impact - We have received a grant to purchase instruments that will allow us to teach our students the latest molecular biology techniques being used in research and production. These instruments will also enhance our research capability in molecular biology. Already we have purchased a state-of-the-art gel documentation system that can handle non-radioactive probes of different sorts, and an UV spectrophotometer.
- c. Source of Federal Funds - Department Of Defense
- d. Scope of Impact - State and Regional

Key theme - New and value added agricultural products (Research/Extension)

- a. Organic waste products can be used to generate more food for the local community. We have previously developed techniques for tropical mushroom production with *Pleurotus ostreatus sajor-caju* and *Volvariella volvacea*. This technique is good enough for the amateur, but we need to fine-tune it for commercial production, in which volume and profitability are critical issues.
- b. Impact - We hope to develop a large-scale production system that is profitable. If we succeed, the region will benefit from having mushrooms locally produced. This would benefit those involved in growing the mushrooms, any intermediaries marketing the produce, and consumers enjoying fresh, delicious and exotic tropical mushrooms.
- c. Source of Federal Funding - Smith-Lever (SARE)
- d. Scope of Impact - State Specific

Key Theme - Tropical Agriculture (Research)

- a. Species and cultivars of *Heliconia* will be collected for evaluation as a cut flower and landscape plant in Guam. Selected plant material will be propagated aseptically for use by growers in Guam. Incidence of insect and disease will be recorded.
- b. Impact - Forty-five cultivars have been obtained are being established in 3 different soils on Guam. Yield and time of flowering is being recorded. *Heliconia rostrata* was successfully tissue cultured. Other species/cultivars will be increased as plant material becomes available. Tissue cultured plant material will be made available to growers in Guam lessening the incidence of insects and disease.
- c. Source of Federal Funding - Section 406 T-STAR
- d. Scope of Impact - Regional

Key Theme - Small Farm Viability (Extension)

- a. The Agricultural Development Fund (ADF) Program allows farmers access to financing based on a low 4% interest rate with a maximum of 12 years. Farmers interested in the program submit a proposed farm plan, which in turn is routed through a technical review conducted by the College of Agriculture Life Sciences extension specialist. This program continues to be a much sought after program for expanding farm operations and acquiring equipment and farm supplies. This review provides insights and serious consideration for farmers to make before committing resources and time.
- b. Impact - The established protocols and tracking continues to improve the quality of proposals and comments. This contributes to a reasonable period of review

conducted by agents as appropriate. Applicants are required to participate in exit-interviews as well as submit completed documentation. As a result ADF programs representing four projects for this period total \$114,500.00. Applicants considering ADF financing have access to a standard packet guiding the applicant through the process.

- c. Source of Federal Funds - USDA
- d. Scope of Impact - State Specific

Small Farm Viability (Extension)

- a. Developing strategic alliances continue to be a vital part of fostering effective programs within extension. Micro lending programs provided by banking institutions provide financing options for small farms seeking alternative funding. This also includes effective collaboration and providing assistance to line agencies in shoring up program areas or providing needed support.
- b. Impact - As a result of our active efforts and collaborative linkages with banking institutions specifically the Bank of Hawaii expressed interest in developing and linking their micro lending programs for farm enterprises. Although no results of actual loans have been made the connection to our programs and eventually our farmers will provide an alliance that ensures overall farm viability and support. We are now partnered with both industry and institutional banks. This also resulted in collaborative effort involving two colleges (College of Agriculture and Life Sciences and College of Business and Public Administration) and the Guam Department of Commerce and the Guam Department of Agriculture to revisit and formalize a farm survey program. The process will include identifying a sustainable mechanism.
- c. Source of Federal Funds - Smith-Lever
- a. Scope of Impact - State Specific

Goal 2. A safe and secure food and fiber system.

Executive Summary - As a tropical island, Guam's year around summer like condition makes for a natural haven for economic pests in agriculture. Unlike temperate areas which have cold periods that naturally "check" pest populations, Guam's weather only makes for prolific pest growth and recurrences of insects and diseases. In most instances, farmers almost always use pesticides to combat these pests. This practice often leads to the use of varying pesticides as other pesticides appear to become ineffective in dealing with a particular insect or disease problem. To assist farmers in the marketing of safe agricultural products, research and extension focus in finding and implementing new or alternative methods to safely and economically deal with these pests. During the past year AES and CES faculty continue to develop a multi-faceted plant protection and urban

entomology as well as plant pathology research program for Guam and the region. To develop an integrated pest management awareness program for Guam and the regional much work has been centered on reducing chemical pesticide usage. Highlight - by introducing micro-hymenopteran parasitoids that prey specifically on aphids in a comprehensive aphid bio-control program by AES faculty have begun to reduce the amount of insecticides used against aphids on Guam and in the Northern Mariana Islands. The College continues to update current environmental impacts and alternatives to toxic chemical usage. Highlight - A variety of insecticides, emphasizing insect growth regulators, systemics insecticides, and other novel compounds recently available on the commercial insecticide market have been tested against *I. glabrescens* on field-planted ifit tree seedlings. In addition, new research programs that have been responsive to finding new solutions and alternative methods to dealing with economic pests without the use of pesticides. Highlight - *Coccinia grandis* (L.) Voigt (Cucurbitaceae), known as ivy gourd, is a serious problem in Hawaii and Saipan and it has become one of the fast spreading weeds in Guam. Therefore three natural enemies of these weeds will be introduced into Guam from Hawaii where they have shown to very effective. When pesticides are applied on Guam farmlands our pesticide applicator training program continues to strive to make a difference in peoples lives. Highlight - Over 232 clientele contacts were made on this program alone servicing via phone calls, site inspections, workshops, certification and re-certification. Persons working with and around pesticides are now better informed about the hazards associated with handling pesticides and the risks to the environment.

Food safety issues also continue to play an important role in extension training. A total of 120 participants completed the 20 hours of combined food safety and HACCP workshops. Ninety-two (92) participants evaluated themselves and all adopted the food handling practices related to food safety and HACCP practices. Adopted practices by participants were: Good personal hygiene and adopting the 20-second proper hand-washing requirement for food preparation; Checking incoming food deliveries and storing them at right away at the proper storage and right temperature; Monitoring food temperature by adopted the principles of serving hot foods hot (at or above 140 degrees F) and cold foods cold (at or below 40 degrees F); Disinfecting of equipment and work surface in contact with food before food preparation and service; Practicing pest management program; Avoiding food contamination and cross contamination; Monitoring the flow of food through the operation from purchasing, receiving, storage, preparation, and service; and as applies the 7 major principles involved in operating a HACCP system by assessing Hazard, identifying critical control points (CCP), setting up procedures for CCP, monitoring CCP, taking corrective action, setting up a record system, and verifying that the system is working.

Highlight - As a result of this program, participants increased their knowledge about food safety and HACCP principles: improved their knowledge about food safety practices: planned to adopt food safety/HACCP practices by reducing health risk behaviors; and are now equipped with necessary knowledge, attitude and skills to maintain better foods safety related habits.

This year's accomplishments under goal 2, continues to provide great benefits to the island of Guam and to the region as a whole. We are in line with the goals set forth by our 5 year plan of work.

Total expenditures for Goal 2 was \$231,917 (Federal and State) with \$105,500 for Research (Federal \$81,154 and State \$24,346) and \$126,417 for Extension (Federal \$97,245 and State \$29,172). Total FTE 5.1 with Research 2.2 (Prof 0.5, ParaProf 0.4, Staff 1.0, and Admin. 0.3) and Extension 2.9 (Prof 1.0, ParaProf 0.5, Staff 1.0, and admin 0.4)

Goal 2 - Key Themes, Impacts

Key theme - Integrated Pest Management (Combined Research and Extension)

- a. Cucurbits are among the most important cash crops grown on Guam and in the Commonwealth of the Northern Mariana Islands (CNMI). Of the cucurbits, cucumbers and watermelons predominate and are produced in sufficient quantities to fill most of the local demand. A number of serious insect pests infest cucurbit crops on Guam and the Mariana Island archipelago. A truly integrated cucurbit pest management system must address the effect that controlling each pest might have on populations of other pests. Among the serious pests of cucurbits in the Mariana Islands are several species of whiteflies. The major objective of the proposed research is to lay a foundation for developing and implementing IPM strategies, emphasizing non-chemical pest management techniques, for cucurbits on Guam.
- b. Impact - Comprehensive aphid surveys on Guam have been conducted on Guam and in the CNMI. Aphid surveys are now conducted once every 3 months, and concentrated on release sites where aphidiid parasitoids have been released. Surveys on other islands continue as opportunity arises to visit them, and in collaboration with PPQ and agriculturists. Surveys of whiteflies and their associated natural enemies on Guam were conducted monthly throughout the year. No Encarsia parasites have yet been located in any sampling area. This sharply contrasts with surveys conducted in years past on Guam.
- c. Source of Federal Funds - Smith-Lever
- d. Scope of Impact - State and Regional

Integrated Pest Management (Combined Extension and Research)

- a. To improve the viability of cucurbit crop production on Guam in light of potential reductions in the availability of insecticides in the near future, experiments were initiated to evaluate the efficacy and economic feasibility of using summer squash trap cropping and floating row covers to control insects of watermelon. Aphids and orange cucumber beetle are the main insect pests of cucurbit crops.

- b. Impact - Although no quantifiable results have been attained yet, the goal of this research is to decrease chemical insecticide dependence. Trap cropping with summer squash, though usefully employed in the southwest US, failed on Guam. As a result of a preliminary field trials using row covers in spring of 2001, more extensive trials were begun in the fall of 2001. The information obtained from this study will be used to develop a fact sheet on the benefits and trade-offs of using floating row covers in watermelon production. It is hoped that growers will adopt the use of floating row covers once its profitability can be demonstrated.
- c. Source of Federal Funds - Smith Lever/Hatch
- d. Scope of Impact - State and Regional

Key theme - Biological Control (Research Multi-State)

- a. The purpose of this project is to reduce the amounts of insecticides used against aphids on Guam by introducing micro-hymenopterous parasitoids that prey specifically on aphids. In a comprehensive aphid biocontrol program on beans, melons, and taro; integrate aphid biological control with crop management tactics used against other insect pests on the target crops by determining the effect of commonly used insecticides on aphid natural enemies; identify aphids and associated natural enemies on Guam by continuing comprehensive aphid and natural enemy surveys currently ongoing throughout the island; educate Guam's agricultural community to distinguish aphids and associated natural enemies on crops, and to recognize the necessity of biorational pest management strategies.
- b. Impact - A comprehensive survey of aphids and their plant hosts, and aphid natural enemies was conducted in the CNMI in April 2001. Sites where aphidiid parasitoids had previously been released on these islands were sampled, as were other organic gardens and conventional farms. *Lysiphlebus testaceipes* was commonly observed on Rota, but was not present on Tinian or Saipan. No other aphidiids were observed on Rota, Tinian or Saipan.

A comprehensive survey of aphids, their host plants, and associated natural enemies was also conducted in April in the Republic of Palau on the islands of Koror and Babeldaup. The primary aphid species collected included *Aphis gossypii*, *Pentalonia nigronervosa*, and *Aphis craccivora*. No aphidiid or aphelinid natural enemies were observed on any of the Palauan islands.

Approximately 1000 *L. testaceipes* were released on the island of Babeldaub in the Republic of Palau in August 2001 on *A. gossypii* and *A. craccivora*.

- c. Federal Funding Source - Western Regional (multi-state) W-185
- d. Scope of Impact - National

Biological Control (Research)

- a. The project seeks to reduce the amount of insecticides used against aphids on Guam and in the CNMI by introducing micro-hymenopteran parasitoids that prey specifically on aphids in a comprehensive aphid biocontrol program on beans, melons, taro, and bananas. The project will integrate aphid biological control with current chemical control tactics used against aphids and other insect pests by determining the effect of commonly used insecticides on aphid natural enemies. Aphids and associated natural enemies on Guam and the CNMI will be identified by continuing comprehensive aphid and natural enemy surveys currently ongoing throughout the island. The agricultural communities of Guam and the CNMI will be trained to distinguish aphids and associated natural enemies on crops, and to recognize the value of biorational pest management strategies.
- b. Impact - Follow-up surveys continue in release areas on Guam, and a follow-up survey on Saipan suggested that *A. colemani* may be reproducing on *T. citricida* on lemon. Ants associated with aphid colonies that may be affecting aphidiid parasitism in aphids on Guam were collected and have been sent to Dr. Laurel Hansen in Washington state, for identification. Additional ants from the University of Guam's reference insect collection have been sent to Dr. J. Wetterer in care of Harvard University's Museum of Comparative zoology for identification. Local farmers throughout Guam continue to be contacted regarding participation in aphid biological control activities. Those desirous of receiving parasitoid releases undergo pre-release field surveys for aphids and pesticide use. Those using little or no insecticide are selected as field release candidates. Similarly, managers of non-farm properties are contacted and informed about the project prior to granting permission to survey aphids and parasites on their property. We have prepared dichotomous illustrated keys to the aphids and aphidiid parasitoids of Guam, and are currently formulating a field handbook targeted towards Department of Agriculture technicians and farmers that will allow them to identify aphids and biocontrol agents in their fields. One article describing work accomplished in this project has been published and others are nearing completion for submission to scientific journals. Additional articles describing project activities are in preparation for farmers and agriculture technicians.
- c. Source of Federal Funds - Section 406 TSTAR
- d. Scope of Impact - State and Regional

Key Theme - Developing "Soft" Insecticide Pest Management (Research)

- a. The objective of this project is to identify environmentally safe insecticides, and formulate appropriate application methodologies, for use against the psyllid, *Insnesia glabrascuta* (Caldwell), on ifit trees, *Intsia bijuga* (Colebr.) O. Kuntze on Guam that are target specific, possess low residual activity, and pose minimal impact to the environment or human safety. A variety of insecticides, emphasizing insect growth regulators, systemics insecticides, and other novel compounds recently available on the commercial insecticide market have been tested against *I. glabrascuta* on field-planted ifit tree seedlings using a single tree replication design. Application methodologies are being determined for use by government and commercial nurseries.
- b. Impact - The effects of five pesticides on populations of the psyllid, *Insnesia glabrascuta* (Caldwell), were examined on ifit trees, *Intsia bijuga* (Colebr.) O. Kuntze from 1998 through 2001. The pesticides tested were a commercial over-the-counter formulation of the organophosphate dimethoate, Avid[®], a commercial formulation of avermectin, an experimental neonicotinoid CGA 293343 25WG, Conserve[®] and Actara[®]. All five pesticides provided significant immediate mortality in psyllid densities. However, psyllid populations rapidly rebounded to pre-treatment levels in the dimethoate spray and drench treatments, while densities remained low in the Avid[®], CGA 293343 25WG, and Actara[®] spray treatments. Psyllid population suppression in these treatments is likely linked to residual systemic activity as well as to physiological changes in tree leaves. Conserve[®] provided only temporary psyllid population suppression.
- c. Source of Federal Funds - McIntire-Stennis
- d. Scope of Impact - State Specific

Key Theme - Biological Control

- a. *Coccinia grandis* (L.) Voigt (Cucurbitaceae), known as ivy gourd, is a serious problem in Hawaii and Saipan and it has become one of the fast spreading weeds in Guam. The vines have been observed growing over the fences, walls, shrubs and trees and suppressing economic and native plants. The canopy causes severe damage of the understory plants when high winds are experienced. Waxy leaf surface of the ivy gourd impedes the foliar uptake of herbicides. In addition, the tuberous root system of this weed makes it difficult to kill using conventional herbicides and application methods. The red cucumber-shaped fruits serve as a reservoir for melon fly, *Bacfrocer cucurbitae* (Coquillett) (Diptera: Tephritidae), a serious fruit fly pest which attacks economically important food crops, and restricts Guam's ability to export produce. Three natural enemies of this weed, will be introduced from Hawaii.
- b. Impact - This project was begun late in 2000. Eggs and larvae of *Melittia oedipus* are being reared in Guam for host specificity testing.

- c. Source of Federal Funds - Section 406 T-STAR
- d. Scope of Impact - State and Regional

Key Theme - Pesticide Application (Extension)

- a. Pesticide Applicator Training (PAT) program. The GCES serves as the pesticide content expert responsible for pesticide curriculum development, delivery and examination. Funded by The Federal United States Department of Agriculture (USDA)/ Environmental Protection Agency (EPA) pesticide applicator training program, in collaboration with Guam EPA responsible for enforcement of the program and the use the information gathered from clients and stakeholders pesticide curriculum is kept relevant and addressing issues related to safe pesticide use.
- b. Impacts - Over 232 clientele contacts were made on this program alone servicing via phone calls, site inspections, workshops, certification and re-certification. Clients surveyed, credit the need for education and certification to job security in these hard economic times. Persons working with and around pesticides are now better informed about the hazards associated with handling pesticides and the risks to the environment. Clients now see increased job opportunities and upward mobility in the private and public sectors. PAT clients service the \$250 million dollar island industries comprising of the hotel, restaurant, landscape, golf course, food and farming businesses.
- c. Source of Federal Funds - Smith-Lever/US-EPA
- d. Scope of Impact - State Specific

Food Safety (Extension)

- a. A local publication is underway addressing a need regarding excess mango supply. The intent is to develop a series of value-added recipes and uses of local mangos. The publication is in progress begun in 2001 and hopes to be completed shortly. This will be used as a mail-out program promoting the use of local fruits with an educational component promoting food safety and processing issues.
- b. Impact - As a result of this effort, 4 visiting faculty from Tuskegee University participated in a taste testing of several sample trial recipes resulting in several trials of gelatin mango. This was part of the Inter-science Congress.
- c. Source of Federal Funding - Smith-Lever
- d. Scope of Impact: State and Regional

Goal 3. A healthy, well-nourished population.

Executive Summary - When compared to the U.S. population the residents of Guam have a higher incidence rate and earlier onset of chronic diseases including, diabetes, hypertension, obesity and cancer. Thirty percent of all deaths each year are attributed to diabetes, heart disease, or cerebral-vascular disease. The local dietary patterns reflected in studies completed in the early 90's show low consumption of vitamin A, folate, and some minerals especially calcium. Protein intake is a 1.5 to 2 times the recommended levels. Total fat intake is above the recommended 30 percent level. Furthermore, ten percent of the calories from carbohydrates were from refined sugar. For children and adults alike the carbohydrate source most frequently identified was fruit flavored drinks including soft drinks.

Guam also has an increasing incidence of infant mortality and low birth weight. Smoking and inadequate prenatal care are both known to contribute to these negative birth outcomes. Furthermore, there are increasing rates of adolescent pregnancy. Many of these adolescents and adult women do not have insurance coverage, and therefore do not have prenatal care. Access to health care will decrease further as welfare reform is implemented. Guam's performance plan addresses the following areas of concern: (a) the need to increase objective data regarding nutrient intake in the region, (b) the need to improve nutritional education materials and methodologies for pregnant and lactating women, teens, adults, and children at risk of chronic and communicable disease, and (c) the need to train more professionals in the field of human nutrition and consumer family sciences.

Highlight - During this past year, short-term extension teaching on food and nutrition were conducted in Guam to assist individuals and families in acquiring knowledge and necessary skills for healthy lifestyles. The main objective for the non-formal education program was to improve participants dietary habits in order to reduce the risk factors of chronic diseases: obesity, hypertension, blood cholesterol, blood sugar through increased consumption of vegetables and fruits, milk products, and consuming less meat, fats, salt, and sugars. The workshops focus on eating varieties of balanced nutrient-dense meals and for the participant to plan healthful diet using the Food Guide Pyramid model. Various other methods used to reach other clienteles were: quarterly newsletter, Food and nutrition displays and food demonstrations, field trips to supermarket. Guam Cooperative Extension Services collaborated with EFNEP, Team Nutrition Group, Public Health and Social, Senior Citizen/SPIMA, Catholic Social Services, Guam Diabetes Association, Pacific Island Cancer Network, and AARP, collaborated and provided to provide information and motivation to improve nutritional Status in individuals, families and the community at large. Successes - a total of 175 participants completed the food and nutrition workshops (124 adults and 51 youths). Practice changes reported were: 120 adult respondents evaluation results, 70% increased nutrition knowledge and food preparation skills, 50% improved in planning meals and using grocery list. Forty eight percent used the Food Pyramid Guide to plan healthful meals, 38% read label. Fifty-five percent budget for food, 41% ate low fat foods, 36% reduce salt intake, 25% removed skins and fats from meats, 61% read labels and chose more nutritious foods, 60% increased fruits and vegetables by 2/3 requirements, 70% ate the minimum daily requirement, 37% consumes 1 or more dairy product. Forty-nine youth respondents

evaluation results, 97% gained knowledge, 79% ate breakfast, 61% gained knowledge and skills, 41% improved eating varieties of foods, 61% eats healthful meals and snacks, 35% ate 2 or 3 fruits and vegetables. 90% reads labels before shopping. Thirty-seven diabetics and support group received education reported, 60% improved daily exercised to 1 hour daily, 81% followed diabetic food exchange balanced diets, 91% supported diabetic support group monthly activity meetings, 95% were involved in 5-K-fun-run-walk annual event where about 1000 individuals and family attended. Two hundred and twenty-five diabetes newsletters mailed out quarterly, 94% expressed gratitude for gaining knowledge and skills by applying the news articles and recipes suggested. 60% used newsletters, 1% called in for further clarification of technical articles. Five hundred senior citizens another participants with obesity, hypertension, blood cholesterol, blood sugar reports, improved consumption of vegetables and fruits, milk products, and consuming less meat, fats, salt, and sugars, 56% improved diet consumed, 67% increased nutrition knowledge, 70% improved diet behavior. Twenty participant in the cancer forum resulted in 98% improved in knowledge about causes and prevention, all expressed there gut feeling about cancer, all improved healthy lifestyle change through better knowledge about nutrition, diet, and exercise.

This year's accomplishments under goal 3, continues to provide great benefits to the island of Guam and to the region as a whole. We are in line with the goals set forth by our 5 year plan of work.

Total expenditures for Goal 3 was \$263,551 (Federal and State) with \$21,250 for Research (Federal \$16,346 and State \$4,904) and \$242,301 for Extension (Federal \$186,385 and State \$55,916). Total FTE 6.15 with Research 0.25 (Prof 0.25, ParaProf 0.0, Staff 0.0, and Admin. 0.0) and Extension 5.9 (Prof 3.0, ParaProf 0.5, Staff 2.0, and admin 0.4)

Goal 3 - Key Themes, Impacts

Key Theme - Food Resource Management (EFNEP) (Research/Extension)

- a. As the local, regional, and global economy continues to remain unstable, and as unemployment rates increase, consumers have less financial resources to purchase food and other basic life necessities. The Guam EFNEP program is addressing this current economic challenge by helping Guam residents to not only select and buy food that satisfies nutritional needs, but to also effectively manage food resources such as limited income to purchase food, food stamps, and WIC vouchers.
- b. Impact - Out of the one hundred forty-three (29 men and 114 women) participants in the Guam EFNEP program, 93 percent showed improvement in one or more food resource management practices including planning meals, comparing prices, and using grocery lists. Seventy-two percent of the participants reported they intend to plan meals before shopping, 76 percent reported plans to shop from a list, 50 percent plan to compare food items to get the best buy, and 58 percent

reported they plan to develop a family budget to assure adequate expenditures for food until the end of the month.

- c. Source of Federal Funds - Smith-Lever - EFNEP
- d. Scope of Impact - State Specific

Key Theme - Human Nutrition

- a. Extensions coordinated efforts through the various organizations and volunteer groups promote healthy and sustainable lifestyle choices among Guam families. Through the many sponsored forums hosted by Extension and the collaborative partnership with local agencies and national organizations appropriate and timely health Diabetes education readily available to local residents students and faculty.
- b. Impact - A diabetes Forum featuring two speakers representing the national endocrinology organization who presented topics on type I & Type II diabetes. As a result 200 students learned more about the topics and the significance of the disease. A stronger collaborative system amongst organization continues to support this campaign on servicing the Diabetes indicators. Over 45 participants attended the session.
- c. Source of Federal Funding - Smith-Lever
- d. Scope of Impact - State Specific

Human Nutrition (Research/Extension)

- a. The Guam EFNEP program reached one hundred forty-three families and 1,276 elementary school-aged children, who completed five lessons of the non-formal nutrition education program to improve dietary habits, food safety practices, and food resource management skills. An additional 1,418 elementary school-aged children were exposed to one lesson of the EFNEP curriculum which reviewed the Food Guide Pyramid and the importance of '5-a-day'.
- b. Impact of Adult program - Out of the one hundred forty-three (29 men and 114 women) participants in the Adult Guam EFNEP program, 90 percent showed improvement in two or more nutrition practices including planning meals, making healthy food choices, reading nutrition labels, or feeding children breakfast. Fifty-four percent of the participants reported they thought about healthy food choices when deciding what to feed their families, 72 percent reported using the 'Nutrition Facts' on food labels, and 52 percent reported their children ate breakfast more often. Ninety-one percent of participants showed improvement in one or more of the food safety practices such as thawing and storing foods properly.

Impact of Youth program - Eighty-five percent of the 1,276 children completing the 5-lesson EFNEP curriculum increased their knowledge of the essentials of human nutrition.

- c. Source of Funding - Smith-Lever - EFNEP
- d. Scope of Impact - State Specific

Goal 4. Greater harmony between agriculture and the environment

Executive Summary - The primary environmental problems addressed by the College of Agriculture and Life Sciences can be grouped into seven sets of issues. The first issue is water quality and quantity. The sole source aquifer is under the center of urban population and most of the agricultural activity on island. Almost all agriculture irrigation is done with potable water for public mains. The public is concerned about contamination of its drinking water source and competition for drinking water with agriculture. Highlight - During this past year an automated leachate measurement system was designed to find the best irrigation management practices that minimize the negative environmental impact of chemical leachate. Results will be combined with other best irrigation management practices when assisting farmers and gardeners to design site specific irrigation systems. The second issue, is the maintenance of soil fertility and controlling of soil erosion. Tropical soils lose fertility rapidly without the use of proper agricultural practices and soil erosion threatens to kill the coral reefs that surround the island. Highlight - this past year, the Guam Water Planning Committee (WPC) identified the Northern Guam watershed and the Ugum/Talofofu watersheds as the island's two top priority watersheds. Over the past year the WPC has sponsored the planting of over 40,000 acacia seedlings over forty acres in the Ugum watershed. Sixty three elementary and middle school student volunteers assisted in the tree planting activity. Two school teachers volunteered to deliver educational material and lessons on Watershed management to over 30 students. The third issue, is the toxicity of the pesticides used on island. The farmers and the public want less toxic alternatives. Much of the pesticides use on island comes from the turf industry. Pesticide usage by the turf grass industry is under tight control and many regulations have been enforced to protect the environment. Highlight - preliminary studies indicated that ocean water has the potential to act as a herbicide. Results indicate that ocean water could be used as an alternative to herbicides in turf grass management. This research has substantial impact on weed control in the West Pacific Regions. The fourth issue, is management of organic wastes. An isolated island environment limits the choices of waste disposal and amplifies the problems arising from their disposal. Turf areas on Guam are ideally suited for effluent irrigation because turf grass can be grown year round providing continuous disposal of usually reach in nitrogen effluent. Highlight - conducted studies demonstrated that nitrate content of effluent can be reduced to safe levels by turf via uptake. Research has begun this past year in utilizing turf grass in the management of organic wastes. The fifth issue, is one of bio-diversity - the introductions of exotic species, extinction of indigenous species and habitat loss are all current problems on Guam. The Siam weed, *Chromolaena odorata* is a neotropical invasive alien weed that got established in the

1960s on Guam. A biological control agent, *Pareuchaetes pseudoinsulata* (Lepidoptera: Actiidae) was introduced on Guam to reduce its invasiveness. Highlight - as a result of the release of *Pareuchaetes pseudoinsulata* about 25, 000 hectares of infested area on Guam has been cleared. The sixth issue, is public policy. The public policies of Guam do not place an emphasis upon environmental protection. Highlight - both AES and GCE faculty continue to serve and provide expertise on government, public and private boards and committees that influence public policy in the Territory of Guam. The seventh issue, is a lack of knowledge specific to dealing with tropical environmental problems within the U.S. regulatory framework and a lack of transfer of the technology and educational materials that have been developed in the mainland U.S. However, this past year we continue to produce 60 new PEOPLE (Portable Extension Office Program Literature Exchange) CD's to clientele. Highlight - CD's were distributed to clientele ranging from teachers to professionals and paraprofessionals from various local government and foreign NGOs participating in health and agriculture education. All information deals with specific tropical environmental conditions.

This year's accomplishments under goal 4, continues to provide great benefits to the island of Guam and to the region as a whole. We are in line with the goals set forth by our 5 year plan of work.

Total expenditures for Goal 4 was \$450,161 (Federal and State) with \$250,000 for Research (Federal \$192,308 and State \$57,692) and \$200,161 for Extension (Federal \$153,970 and State \$46,191). Total FTE 10.5 with Research 5.6 (Prof 1, ParaProf 1.0, Staff 3.0, and Admin. 0.6) and Extension 4.9 (Prof 2.0, ParaProf 0.5, Staff 2.0, and admin 0.4)

Goal 4 - Key Themes, Impacts

Key Theme: Water Quality (Research)

- a. An automated leachate measurement system was designed to find the best irrigation management practices that minimize the negative environmental impact of chemical leachate. The leaching of chemicals out of the root zone and into the groundwater can effect drinking water and coastal reefs. Typically the root zone in much of Guam is limited vertically by a very shallow soil depth. Research has been completed in one farming area of Guam (with a particular soil type and soil depth). Results show that irrigation can be applied without chemicals leaching out of the root zone and with no reduction in yield.
- b. Impact - Dissemination of information through seminars and conferences has led to a graduate student using our design and technology for his thesis research concerning leaching under turf grass. We are continuing research in other areas of Guam. Results will be combined with other best irrigation management practices when assisting farmers and gardeners to design site specific irrigation systems.
- c. Source of Federal Funds - Hatch

- d. Scope of Impact - State Specific

Key Theme – Weather Stations (Research)

- a. Weather stations provide important climatic information to the agricultural community. The Guam Agricultural Climatic Data System (GACDS) has been created to assist scientists, students, golf course managers, farmers and gardeners. Climatic data from two weather stations (northern and southern Guam) is collected on a daily bases. Rain, temperature, relative humidity, wind speed, wind direction, total solar radiation, photosynthetic radiation, pan evaporation, and estimated turf grass evapotranspiration are measured via sensors and a datalogger. Modems allow data to be collected to a central location.
- b. Impact - The next phase will require seminars and workshops to instruct the community about accessing and using the information.
- c. Source of Federal Funds - Hatch
- d. Scope of Impact - State Specific

Key Theme - Recycling (Research and Extension)

- a. To explore ways of reducing feed cost and dependency on imported feed, a study was conducted to examine the feasibility of utilizing restaurant and hotel food waste as animal feed using the dry-extrusion feed processing technology. Restaurant food waste is a major source of potential feed on Guam and CNMI due to their tourist based economy. There is also a need in the region to reduce the burden on limited landfill capacity.
- b. Impact - Four trials were conducted to determine the best machine settings and optimum combination of food waste to other complimentary dry ingredients to arrive at an acceptable, stable product. Due to the high water content of food waste from restaurants, we have determined that unless some other means of moisture reduction such as mechanical press or drying is used, we can only incorporate 20% food waste with 80% dry feed ingredients to have a post processing stable product with 12% or less moisture. Considering the added cost of power, labor and machine maintenance, the 20% usage does not economically justify using the present procedure for large scale feed processing. Further research in moisture reduction of food waste is needed before this processing method could be recommended.
- c. Source of Federal Funds - Western Region SARE
- d. Scope of Impact - Regional

Key Theme - Biological Control (Research)

- a. The Siam weed, *Chromolaena odorata* is a neotropical invasive alien weed that got established in the 1960s on Guam. It has occupied roadsides, vacant lands and disturbed areas. It formed thickets and became a fire hazard. A biological control agent, *Pareuchaetes pseudoinsulata* (Lepidoptera: Actiidae) was introduced and established and another agent, *Cecidochares connexa* (Diptera: Tephritidae) is being assessed in the quarantine laboratory for field release.
- b. Impact - As a result of the release of *Pareuchaetes pseudoinsulata* (a) about 25,000 hectares of infested area has been cleared, (b) need for the use of herbicide for control of this weed has been reduced, (c) labor required for slashing and burning the weed has also reduced, (d) fire hazard in the road sides has been reduced, and (e) an awareness for biological control has been created among the public. Success of this project resulted in supplying this natural enemy to Indonesia, Thailand, Ivory Coast, Ghana, South Africa, Commonwealth of the Northern Marianas, Palau, Yap, Pohnpei and Kosrae.
- c. Source of Federal Funds - Hatch
- d. Scope of Impact - State Specific

Integrated Pest Management (Research)

- a. Taro, *Colocasia esculenta* (L.), is a culturally important and profitable crop grown on Guam and throughout the tropical Pacific that is beset by insect pests and diseases that restrict its production in the Pacific, and impede expansion of its use elsewhere in the US. Aphid and TLB resistant taro lines identified in this project will be made available to breeders and growers to hasten the development of commercially suitable taro varieties for US and Pacific region growers. Primary aphid and disease screenings and work on *T. proserpina* will be performed on Guam, while a taro nursery with differential aphid resistance will be created through collaboration with University of Hawaii-Maui.
- b. Impact - In preliminary tests, varieties of taro, *Colocasia esculenta* (L.), collected from the Western Pacific were screened for aphid resistance on Guam by evaluating the extent of naturally occurring infestation by *Aphis gossypii* Glover, and by assessing survivorship and reproduction of *A. gossypii* caged on the leaves. Significant differences were observed among taro varieties in the number of aphids naturally infesting plants in the field. Similarly, significant differences in reproductive rate and longevity were observed between taro varieties. We therefore concluded that resistant varieties identified in this study might be used as parents in crossing blocks designed to combine *A. gossypii* resistance with other desirable agronomic traits such as disease resistance and yield.

During the current year, taro varieties collected from the Western Pacific and obtained from the University of Hawaii have been planted in screening nurseries at two sites on Guam. Eight other varieties suspected of being aphid-resistant

have been obtained from workers at the University of Hawaii, and are being propagated in tissue culture on Guam, prior to planting in field screening nurseries. Aphid and plant hopper clip cages have been constructed for use in field screening trials once plants are sufficiently mature to begin insect screenings. Refinements in constructing aphid life tables and estimating aphid reproductive capabilities are being investigated.

- c. Source of Federal Funds: Section 406 - TSTAR
- d. Scope of Impact - State and Regional

Key Theme - Agricultural Waste Management

- a. Turfgrass areas on Guam are ideally suited for effluent irrigation because turfgrass can be grown year round providing continuous disposal of usually reach in nitrogen effluent. Conducted studies demonstrated that nitrate content of effluent can be reduced to safe levels by turf via uptake. There is little information available on Guam concerning quality of effluent water especially its biological and chemical composition. Commonly pathogenic organisms are eliminated during secondary treatment however some residues of unwanted biological components may remain and are of serious concern. Proposed research will start with assessment of chemical and biological composition of effluent discharged from sewer treatment plant and effluent stored in retention ponds and then a long term effect of effluent on soil will be conducted.
- b. Impact - Project started in the fall 2000. Samples of discharged effluent water were collected and analyzed. Secondary treated effluent has been applied on the experimental plots since June 2001 and leachate samples have been continuously collected and analyzed. Stainless steel lysimeters are presently being installed and collection of data will start in March-April 2002. Preliminary data indicated elevated level of phosphorus and similar level of other nutrients when compared to effluent collected in south-western and south-eastern USA. No heavy metals were found. Research should assess the level of essential nutrients, toxic nutrients, and level of E. coli in water discharged from sewer treatment plant. Research should also determine the effect of irrigation with effluent on soil properties such as soil aggregate stability and infiltration rate as well as on turfgrass quality (color, density, uniformity), thatch buildup, and rooting.
- c. Source of Federal Funds - 406 T-STAR
- d. Scope of Impact - State Specific

Key Theme: Sustainable Agriculture (Research)

- a. Response of vegetable crops to a vesicular-arbuscular mycorrhizal fungus, *Glomus aggregatum*, is studied to increase vegetable crop yield. The fungus is

being maintained by inoculating corn seedlings at the Vegetable Horticultural Laboratory, University of Guam. Phenological response of yardlong beans (*Vigna unguiculata* subs. *sesquipedalis*), mungbean (*Vigna radiata*) and sweet corn (*Zea mays*) with the mycorrhizal inoculation was evaluated. The result indicated that all three kinds of vegetable seedlings grown more vigorously with *G. aggregatum*.

- b. Impact - The project would increase in knowledge of symbiotic relationship between mycorrhiza and tropical vegetable crops. It would also assist in development of an environmentally sound crop production system through the reduction of chemical fertilizers. The result of sweet corn study was presented at an international conference. A graduate student of the Environmental Science Program has started to work on a part of the research problem as his thesis topics.
- c. Source of Federal Funds - 406 T-STAR
- d. Scope of Impact - State and Regional

Key Theme - Sustainable Agriculture (Research)

- a. Nitrogen fixing trees (NFTs) provide many benefits to tropical island farming system in the Western Pacific. Hedgerow intercropping with NFTs, as an example, prevents soil erosion, provides a barrier for disease and pest spread, and suppresses weeds by mulching with leaf litter generated from NFTs. This farming operation would help reduce usage of fertilizers and pesticides which potentially contaminate the island environment. Our work during this period emphasized the study of adaptability of NFTs to three different soil regimes on Guam. The study result indicated that fresh biomass production was greatly influenced by soil types as well as plant species. *Leucaena leucocephala* K636 was the most adapted NFT to calcareous soil (Lithic Ustorthents) which is a dominant soil type in northern Guam. In the central part of the island with Udic Haplustalfs soil, most of eight NFT species performed very well. In contrast in Oxic Haplustalfs soil of southern Guam, most NFTs yielded poorly. The 9-month biomass production of eight NFTs was summarized
- b. Impact - Based on the previous work, three new experiments were initiated in the second year of the project. First, selected NFTs were planted at a farmer's field to find plant adaptability to farm's soil, and to test the palatability of NFTs as fodder for goats on the farm. The second experiment was erosion control study. Selected NFT's were planted at two sites with southern soil with slopes. The depth of soil accumulation and the loss of soil will be measured periodically to evaluate effects of NFT's on erosion control. Thirdly four germplines of *Leucaena* spp. were obtained from the University of Hawaii for field evaluation in calcareous soil. The importance of selecting suitable NFT's for different soil types was presented at the 10th Pacific Science Inter-Congress Conference as a poster presentation in June 1-6, 2001. The result was also disseminated as a

educational factsheet to local community.

- c. Source of Federal Funds - USDA-SARE
- d. Scope of Impact - Local and Regional

Key Theme - Pesticide Application/IPM (Research)

- a. The turf industry has grown exponentially in the Pacific Islands during the past years. Pesticide usage by the turfgrass industry is under tight control and many regulations have been enforced to protect the environment. Preliminary studies indicated that ocean water has the potential to act as a herbicide. When applied on salt tolerant turfgrasses invaded by weeds, ocean water demonstrated a high level of weed control. The research proposed in this project looks at combining readily available ocean water with reduced herbicide rates for weed control in turf, thereby reducing negative environmental impacts associated with high herbicide usage
 - b. Impact - Sensitivity to ocean water of several tropical weeds including crabgrass, mimosa, purple nutsedge, yellow nutsedge and one-leaved clover was evaluated. Secondly, salinity tolerance of hybrid bermudagrass, seashore paspalumgrass, zoysiagrass and St. Augustinegrass to ocean water were evaluated initially in the screen-house and then in the field conditions. Results indicate that ocean water could be used as an alternative to herbicides in turfgrass management. This research has substantial impact on weed control in the West Pacific Regions, as well as in coastal areas of numerous tropical countries of South and South East Asia, where environmental issues are of increasing concern.
- a. Source of Federal Funds - Section 406 T-STAR
 - b. Scope of Impact - State, National, and International

Key Theme - Water Quality & Natural Resource Management (Extension)

- a. Extension, along with representatives from GEPA, GWA, DOA Forestry and Aquatic & Wildlife, Bureau of Planning, WERI, Department of Commerce, the Navy, Air Force and NRCS make up the Guam Water Planning Committee (WPC). The WPC is charged with overseeing the development and implementation of the Clean Water Action Plan for Guam. The WPC identified the Northern Guam watershed and the Ugum/Talofofu watersheds as the island's two top priority watersheds. Over the past year the WPC has sponsored the planting of over 40,000 acacia seedlings over forty acres in the Ugum watershed. The WPC allocated about \$70, 000 for the tree planting aimed at reducing soil erosion and sedimentation and turbidity levels in the Ugum river. Over \$150,000

is committed toward various restoration activities in the Yigo/Tumon sub basin of the northern Guam watershed.

- b. Impact - Sixty three elementary and middle school student volunteers assisted in the tree planting activity. Two school teachers volunteered to deliver educational material and lessons on Watershed management to over 30 students. All the students live in the watershed and now have a greater appreciation for the value and function of watersheds especially trees and their importance as soil conditioners and water filters.
- c. Source of Federal Funds - Smith-Lever (Water Quality)
- d. Scope of Impact - State Specific

Key Theme: Sustainable Agriculture (Extension)

- a. Over sixty new PEOPLE CDs were distributed to clientele ranging from teachers to professionals and paraprofessionals from various local government and foreign NGOs participating in health and agriculture education.
- b. Impact - Nine of the CD recipients have contacted Extension for more information on topics covered in the CDs. Users report finding material relevant and useful in their work.
- c. Source of Federal Funds - Smith-Lever (SARE)
- d. Scope of Impact - State and Regional

Key Theme: Nutrient Management (Extension)

- a. Fertigation Systems play an important role in nutrient management of vegetable, fruit and ornamental crop production. The use of fertigation has increased by 15% over the past year. Estimates based on field observations and interviews of equipment distributors show about a 20% increase in the use of drip irrigation equipment and supplies. The demand for high quality, water soluble sources of nitrogen and potassium has been increasing steadily over the past couple of years. Although the number of requests for information on fertigation systems and general drip irrigation management has remained steady at about fifty to sixty requests per year, the number of producers using these systems has increased. This is an indication that Extension educational programs have impacted the industry to the extent that producers are adopting the technology not only based on Extension educational programs but also based on farmer to farmer contact. Fertigation allows producers to apply fertilizers in small doses directly in the crop root zone. Fertigation with small doses increases the efficiency of fertilizer use by crops and minimizes the risk exposure of plant nutrients leaching or running off into ground and surface waters.

- b. Impact - The change in demand for high quality water soluble fertilizers indicates an increase of about 20% usage. The adoption that resulted in this increase means that 20% of the nutrients applied are exposed to reduced risk of being subjected to leaching and run-off.
- c. Source of Federal Funds - Smith-Lever (Water Quality)
- d. Scope of Impact - State Specific

Goal 5. Enhanced economic opportunity and quality of life for Americans.

Executive Summary - Today the economic and social challenges facing Guam's youth, families and communities have been heighten by the five year downfall of the Asian economy and the most recent events of the terrorist attacks in New York City and Washington D.C. Much of the economic growth of the late 80's and early to mid 90's have all but disappeared from the picture of prosperity and development on Guam. Every year the predictions say, "we must be at the bottom of the economic downsizing" and every year for the past 5 years it keeps getting worse. People are being laid off in record numbers. Welfare programs can not keep up with the needs of the community. There is no unemployment benefits to Guam residents. A family who once needed two jobs to keep their families feed and clothed now are lucky to have one parent employed. The entire public infrastructure is hurting. Yet with our small number of faculty at the College of Agriculture and Life Sciences we continue to play a vital role in maintaining certain community needs.

Highlights - To annually increase the research and knowledge-base on family and youth risk behaviors among the population of Guam, and increase its utilization within public and community programs, as a key element for increasing the capacity of communities, families, and individuals to improve their own quality of life. The aim is to increase community-based applied uses of health risk behavior surveillance data sets, which are collected by Guam agencies. These efforts have involved increasing awareness of, and access to these knowledge resources through workshop seminars and educational presentations to a variety of stakeholder groups. During the past year have included: (a) conducted a Client Satisfaction/Needs Assessment Study” for the Guam Department of Mental Health and Substance Abuse, leading to organizational program decisions promoting the improvement of services for the approximate 200 daily clients and patients receiving services; (b) conducted the Guam 2001 Youth Risk Behavior Study (YRBS) obtaining data samples of 1,386 high school youth and 1,704 middle school youth and publication of a monograph reporting its major findings; (c) Extension faculty in CRD/4H/CRD helped strengthen and empower seven (7) inter-agency health program coalitions by soliciting and responding to requests for fact-sheets, newsletter articles and bulletins on specialized research analyses needed for decisions and public education events. These have been made available on-line for increasing a wider-range of accessibility. Coalitions assisted were: (1) Superior Court’s “Juvenile Drug Court”, (2) Department of Youth Affair’s “Safe Drug Free Schools and Communities Service

Providers Group,” (3) Public Health’s HIV/AIDS Community Planning Group, (4) Department of Education’s “Comprehensive School Health Education Network,” and (5) Department of Mental Health/Substance Abuse “Tobacco Prevention Coalition,” (6) Public Health’s “Guam Diabetes Advisory Body,” and (7) the inter-agency “Team Guam Nutrition Association.”

Impacts - “Using The Life Skills: A Guidebook for Volunteers” is a current work in progress. Core sections of the guidebook have been completed. An informal trial run of some section of the guidebook were completed by extension mentors. Mentors reported that they found the worksheets helpful in creating “life skill lesson plan activities.” Established external linkages to carry out 4-H program values and Extension mission in the community through MOU and other agreements through participation in professional committees and organizations. These include:

1. Safe and Drug Free Schools Community Act
 - a. Department of Youth Affairs – Division of Youth Development
 - b. Department of Mental Health and Substance Abuse – Prevention Unit
 - c. Sanctuary, Inc. – Community Outreach Programs
 - d. Guam Police Department – Juvenile Crime Prevention
 - e. Department of Education – Youth Crime Watch
 - f. Inafamolek – Conflict Mediation
2. Guam Systems of Care – Providing a flexible array of services for children who are or at risk for serious emotional disturbances
 - a. Department of Mental Health – Division of Children’s Services
 - b. Department of Youth Affairs – Division of Youth Development
 - c. Department of Education – Special Education Services
 - d. Department of Integrated Services for Special Needs
 - e. Guam Legal Services
 - f. Judiciary Branch – Juvenile Probation, Public Guardian, Clinical Services
 - g. PROCEED – non-profit parent organization
 - h. Catholic Social Services – Social Services Unit

Community Development – Children, Youth and Families at risk- Guam’s inter-agency health coalitions have made efforts to reduce the level of smoking and health risks associated with tobacco use. One component of these activities is public education and awareness campaigns to increase enforcement of restricted tobacco sales to minors. Guam’s Youth Risk Behavior data has stimulated collaborative planning, and in comparing data from 1999 and 2001, has documented the impact of community efforts. Although Guam’s programs have not yet reduced the level of “current smoking” among youth 12-18 years of age (defined as smoking within prior 30 days of survey) which remained unchanged between 1999 (29%) and 2001 (30%), they have increased

enforcement of restricted tobacco sales to minors which has contributed to an increase in youth who have never tried smoking. Among Guam youth 12 to 18 years of age, the percent reporting that they were asked proof of age when trying to buy cigarettes increased from 34% (1999) up to 44% (2001), and the percent of students reporting that they buy their own cigarettes “at stores” decreased from 26% to 18%. The percent of students who reported they have never tried to smoke has increased from 35% up to 44%, while there was a decrease in those admitting to “experimenting” (tried cigarettes but are not current smokers) from 36% down to 26%.

This year's accomplishments under goal 5, continues to provide great benefits to the island of Guam and to the region as a whole. We are in line with the goals set forth by our 5 year plan of work.

Total expenditures for Goal 5 was \$266,026 (Federal and State) with \$23,725 for Research (Federal \$18,250 and State \$5,475) and \$242,301 for Extension (Federal \$186,385 and State \$55,916). Total FTE 6.15 with Research 0.25 (Prof 0.25, ParaProf 0.0, Staff 0.0, and Admin. 0.0) and Extension 5.9 (Prof 3.0, ParaProf 0.5, Staff 2.0, and admin 0.4)

Goal 5 - Key Themes, Impacts

Key Theme - Family Resource Management (Extension)

- a. Through a collaborative partnership Extension Agents participated in delivering educational non-formal programs on extension services and how to access program resources. This was part of a community outreach orientation in concert with a banking partner providing servicing to employees and family members. This was initiated by the employer via extending community redevelopment outreach efforts to both employees and family members particularly in response to addressing displaced workers in the community. This presentation consisted of Extension’s Tri-fold mission summary to include core programs and resources available to all stakeholders.
- b. Impact - 20 participants representing both employees and family members attended this orientation forum. As a result of this ongoing collaboration, earlier workshop sessions on financing and managing family resources allowed participants to become more intimately aware of the services and programs of the Guam Cooperative Extension Service. Through this established linkage and active collaborative partnership not only are students from the University interning with this partner but are also requested to coordinate with Guam Extension for continued servicing. Past efforts and repeat requests to service employees and now extend to employee family members. This continued service is finally reaching and providing a forum that now includes institutional clientele as well as paving new areas for future partnerships.
- c. Source of Federal Funds - Smith-Lever

- d. Scope of Impact - State Specific

Key Theme - 4H (Extension)

- a. As part of the Youth Development and the efforts supporting positive environments for youth experiences, a youth finance presentation was made. The session reinforced basic concepts important for Youth to understand and gain greater appreciation for the value of money, the role of banks in our community and family decisions involving money. Through the theme program: 4-H Sports Enhancement Program-Basketball Camp
- b. Impact - (59) Youths participated in the *Youth Finance* session as part of the summer camp program. Children ranging from 6-14 year old were grouped accordingly and learned about different money issues, its importance and the many roles it serves in addressing family needs.
- c. Source of Federal Funds - Smith-Lever
- d. Scope of Impact - State Specific

Family Resource Management (Extension)

- a. Ongoing collaboration with sponsors of the Talk show Host Soroptimist International, Women making a Difference featured our Guam Extension personal finance series covering topics on Budgeting and Credit Repair Basics over the Holiday season. This is a timely and effective medium to offer financial tips on important matters affecting family resources. This avenue provides yet another reach that extends beyond the traditional workshop presentation. Participating in through this medium provides added avenues for students to participate in developing information cards and tips for listening audience consumption. Listening audience varies and from time to time positive comments about our show and topics have been well received.
- b. Impact - As a result of these sessions, the need to develop basic information summaries on a host of consumer topics generated the idea of the Info Card series. This was in part in response to a request to submit tidbit pieces of information. The programs continues with 4 cards generated and are part of the extension program brochures circulated in the various meetings and workshops and training. A total of four students are intimately aware of the programming and development of shows and the type of reach such programming efforts provide to the community. This is now part of a class structure to align student projects to prepare materials and attend actual sessions of interviews.

A Consumer Family Science (CFS) Newsletter publication: Entitled CFS Roundup was established to focus on important consumer family issues ranging

from Nutrition and family resource issues. The Roundup also serves as a resource for additional information and current events informing stakeholders, students as well as our University community of our programs. This is the second issue. Regular feature topics include: Budgeting Basics for the Holidays, Credit Repair, Product Labeling, Consumer Protection, How to Complain Effectively

c. Source of Federal Funds - Smith-Lever

d. Scope of Impact - State Specific

Key Theme- Youth Development/4-H (Extension)

a. Over a period of 3 years, the Guam 4-H Youth Mentorship program continued to enjoy successful programming. As a result of this piloted program. Extension members across the different Extension Units developed a proposal integrating the Youth Mentorship model into a Extension Mentorship Program involving all Units anchored to the Life Skills Model framework.

b. Impact - As a result of this effort, a proposal that originally was made for \$32,000 increased to \$150,000.00 per year. This funding comes from program funds administered by the Guam Department of Education. The proposal has been adopted as Guam's Community Learning Center anchor program for delivering the Life Skills curriculum through the initial Extension theme modules and workshops.

c. Source of Federal Funds - USDA/USDOE

d. Scope of Impact - State Specific

Key Theme 4H Fisheries (Extension)

a. 4-H flagship program: Summer Fisheries program continues to evolve allowing new components that include finances and economics topics important aspects for youth to understand and relate through a fisheries program. A basic module on fish marketing and fisheries economics was developed.

b. Impact - Using the framework of the Fisheries program 20 youths received basic concepts on the importance of fisheries as an industry and learns the fundamentals of fish marketing, pricing and options as a means to make money selling their excess catch. A general brochure of this module was developed for students to review. Participants learn basic underlying concepts about factors making up Guam's Fishery industry, pricing.

Due in part to Extension's many reaches with collaborative partners, the Guam Fishermen's Cooperative provided a forum for our youth fisheries program participants to observe first hand a HACCP compliant facility as well as observed

fish handling and quality control practices. Students participated observed and learn fish handling and filleting techniques and safe fish and processing tips.

- c. Source of Federal Funds - Smith-Lever
- d. Scope of Impact - State Specific

Key Theme - Retirement Planning/Estate Planning (Extension)

- a. As part of an ongoing partnership with other organizations and with Extension assistance requests for co-hosting a workshop on retirement planning specifically Social Security basics seminar provided an opportunity for participants to understand and learn more about program offerings and requirements
- b. Impact - As a result of an effective collaborative partnership with the Guam Legal Services Corporation, American Association of Retired Persons and Guam Extension, a Social Security Workshop provided by the Social Security Administration serviced 20 participants. Not only did 20 participants know more about their Social Security programs, Extension continued to strengthen our federal partnership among other Federal Government agencies and local and regional organizations.
- c. Source of Federal Funds - Smith-Lever
- d. Scope of Impact – State Specific

Key Theme - Community Development (Extension)

- a. Through our continuing collaborative partnership with the Guam Legal Services and the American Association of Retired Persons (AARP) Extension was a co-sponsor of the Governor’s Conference on Elder Law. This forum provided an opportunity for participants and service providers to be intimately aware of programs and training areas. This also served as a forum for lawyers to receive credits for attending and being informed on the latest programs and laws of intestacy and incapacity planning. The Office of the Guardian was formally established.
- b. Impact - 270 participants representing both government and non-government agencies attended the 3-day training sessions. As a result of our collaborative partnerships Extension was instrumental in videotaping the series, which now serves as invaluable references on a range of issues and topics important to both our elderly population and government organizations servicing senior citizens. A series of extension publications are planned along these topics. Tapes have already been requested and sessions are also planned to replay these topics or present mini-seminars on these issues. This also resulted in a Legislative

resolution recognizing the efforts of Extension's as co-sponsors and the importance of this event. Our local clientele now includes both local AARP Chapter and National Chapters recognizing our activities and membership needs.

- c. Source of Federal Funds - Smith-Lever
- d. Scope of Impact - State Specific

Key Theme - Leadership Training and Development (Extension)

- a. As part of the Guam's Adolescent Growth and Development Train-the-trainer State Plan, Guam's Extension trainers continue to recruit, educate, develop, and orientate collaborators and volunteers in understanding and participating in the A G & D program. This program is a series of sessions that allow participants to help understand learning and communicating styles as well as adopting new skills in dealing with Youth in the many settings, programs.
- b. Impact - 3 sessions using the Personality I.Q. module was employed with a total of 102 participants understanding their personality traits and how to recognize differences in others by using the Personality I.Q. tool. Participants and evaluations supported the technique as important in understanding their learning and communication styles inclusive of personality traits.
- c. Source of Federal Funds - Smith-Lever
- d. Scope of Impact - State Specific

Key Themes – Agricultural Profitability (Combined Research and Extension)

- a. Through this program people in the region will be provided with technical production, processing and marketing skills needed to engage in post-harvest processing and marketing of surplus agricultural production as a means of increasing economic self-sufficiency and self-reliance. In meeting this goal the project aims at enhancing the instructional capabilities of the University of Guam, Palau Community College (PCC) and College of Micronesia, FSM (COM, FSM) in addressing the human resource requirements for agricultural development in the Western Pacific by devising innovative solutions for providing baccalaureate degree training to regionally based vocational agriculture teachers. The baccalaureate degree program will be delivered by the University of Guam and the agricultural science programs of the jurisdictional community colleges via classroom and distance education. Initially, the project targets a group of 150 K-12 agriculture teachers assigned to remote island schools in Yap, Chuuk, Kosrae, Pohnpei and Palau.
- b. Impacts - Project activities have focused on establishing the project team and operational structure, and assessing the capabilities of the region's agricultural

science programs at PCC and COM, FSM through on-site visits to the institutions' main campuses and their satellite facilities. An assessment report regarding the quality of instructional infrastructure (i.e., laboratory facilities and equipment, field demonstration plots, library resources, media-based classrooms, curricula and instructional skills) is currently being assembled as a precursor to the development and delivery of a 5-day workshop to be carried out in August, 2002. Assessment of the impact of the project will not be determined until 2004.

- c. Source of Federal Funds - CSREES (Higher Education Grant)
- d. Scope of Impact - Western Pacific – Guam, Republic of Palau, and Federated States of Micronesia

Key Theme: Youth Development/4-H (Extension)

- a. With an MOU with Governor's Office, extension personnel developed and implemented "Youth At Risk Life Skills Mentorship Training Program". Life Skill workshops will be delivered for at risk youth in the schools and non-profit organizations.
- b. Impact - Program reached 4,499 students from the public school system, community outreaches to villages, and public displays during community sponsored events. 88% of participants increased their knowledge about a drug free lifestyle by incorporating the life skills they learned in daily living.

Three accredited schools (Daniel L. Perez Elementary, F.B. Leon Guerrero Middle and Simon Sanchez High School's) who adopted the Mentorship Model last year continue to offer the school's peer mentorship program. 36 Peer Mentors were trained in mentorship by the 9 trained teacher mentors. Peer Mentors served as youth leaders, working together with teachers to develop their schools reading mentorship program. Mentees will participate in schools program to improve reading skills as well as life skills. The impact of training last year is evident in today's ongoing program at the schools.

- c. Source of Federal Funds - Smith-Lever
- d. Scope of Impact - State Specific

Key Theme: Volunteer Development (Extension)

- a. Through the Adolescent Growth and Development State Plan developed in 2000, Extension Agents prepared and incorporated a series of training workshop for volunteers on Youth Development and Life Skills using the "Moving Ahead" Curriculum. Participants planned for the in training include educators from the

Department of Education and Department of Defense Education System, 4-H Volunteers, youth service professionals.

- b. Impact - The “Moving Ahead” curriculum was the primary resource implemented. Fifty-four persons were trained in the various 5 youth development training modules taken from the curriculum. As a result of the training, volunteers reported overall increased knowledge in cultural diversity, communication dynamics, personality strengths and conflict management. Volunteers reported they will use the techniques learned in the training with their youth group. Furthermore, volunteers reported the structured format of training by combining both the Life Skills model and “Moving Ahead Curriculum” improves their level of knowledge and skill as volunteers.

As a result of stakeholder input during a faculty retreat early 2001, we are developing a course “Life Skills and Youth Development” into our Resident Instruction Program. Already the course has been piloted through our Continuing Education Program. The AG&D Curriculum will serve as a primary reference for reading and activity assignments. Components have already been integrated into the CF 309 course: Prevention Programming for Youth At-Risk, as well as other courses in the Consumer Family Science Degree Program.

A component of the AG&D program, Personality I.Q., was presented at the 2001 Western Region Teaching Symposium in Honolulu, Hawaii. The 11 participants from region, including one from USDA, CREES attend the training. As a result of the workshop, 80% of participants became more aware of their personal strengths and reported that they will apply it with the teams they work with on grant/research projects.

- c. Source of Federal Funds - Smith-Lever
- d. Scope of Impact - State Specific

Key Theme: 4H Character/Ethics Education (Extension)

- a. To implement 4-H Youth Leadership Development workshop and formalize a 4-H Club for a private school in the South.
- b. Impact - The 4-H Youth Leadership Program was a 1 week intense training workshop for 11 youth and 1 volunteer leader. As a result of the program, students learned the basic qualities of leadership using science as the subject matter. Students visited the weather center and Civil Defense to learn about the process of weather tracking and community response to a natural disaster. In addition, students visited the Legislature and was given a brief instruction on how Bills are passed by the Vice-Speaker as well as, the importance of leadership by the Speaker. As a result, students all reported that their knowledge increased

about the how Laws are passed, preparedness, and character qualities of leadership.

The 4-H Soaring Royals Club of Notre Dame High School was established. Five members and one adult volunteer formed the Club. Students are in the process of forming by-laws, learning how to manage a meeting and conducting fundraising projects for their Club.

- c. Source of Federal Funds - Smith-Lever
- d. Scope of Impact - State Specific

Key Theme: Community Development (Extension)

- a. Extension Agents to tailor a workshop on the Collaboration Framework model for community partners and parent volunteers involved in developing the “Guam System of Care” for children, youth and their families on Guam where a child has been identified with a serious emotional disorder.
- b. Impact - An orientation workshop was offered to 6 professionals and 5 parents who serve on the “Guam Systems of Care”. As a result of the training, all participant realized that they had differing perceptions toward “collaboration” and was an indicator toward their frustration in working together collaboratively. Participants reported their knowledge of collaboration increased and their expectations toward collaborating was more realistic. 6 months after the workshop, the concept of “we” was the central effort for the “Guam Systems of Care” team as they worked together to establish the roles and responsibilities for the Community Mental Health Initiative Grant to improve system of services for these families at-risk.
- c. Source of Federal Funds - Smith Lever with the National Institute of Mental Health and the Guam Legislature
- d. Scope of Impact - State Specific

Key Theme: Children, Youth, Families At Risk (CYFAR) (Extension)

- a. To corroborate with the CYFAR Project in the development of the “Suicide Prevention Manual” - A Prevention, Intervention and Postvention community resource publication.
- b. Impact - 15 stakeholders volunteered to provide articles to the first edition of the “Suicide Prevention Manual”. Two initial drafts have been completed with the final version pending prior technical review and publication.
- c. Source of Federal Funds - Smith Lever

- d. Scope of Impact - State Specific

Key Theme: Parenting/Child Care (Extension)

- a. In 1998, GCE in collaboration with Sanctuary, Inc. developed a “Parent Program” using extension educational resources. The program has since been in operation for four years.
- b. Impact - The program design team proposed a research project to assess the impact the program has had for Sanctuary, Inc. and the parents served over the years. The project will document the efforts of this collaboration toward creating a parent program for families with youth who are disruptive and “beyond control”. The project (along with the focus group questions) has been approved and as a result, a parent/trainer orientation was conducted. The 15 participants, with the exception of one, agreed to participate in the focus groups. Participants reported positive responses to contribute toward this project to improve parent programs using a collaborative framework.
- c. Source of Federal Funds - Smith-Lever
- d. Scope of Impact - State Specific

Key Theme: 4-H Horticulture Educational Program (Extension)

- a. The 4-H Budding Gardener Project is designed for participants to gain knowledge in horticulture as well as basic life skills. Participants will learn basic plant propagation and the following life skills: making decisions, planning and organizing and communicating with others. The project ran for nine days with a total of 15 participants between the age of 6-39 years old.
- b. Impact - 98% of the participant indicated that they know more about plant parts, seed germination’s, dicot and monocot, cutting nodes & buds then before they enrolled in the project. 88% of the participant indicated that they will use what they have learned within six months. 92% of the participant said they have the ability to graft a plant and air layering a plan as well. 100% said they would plan to use these skills within 6 months. 13% of the participants indicated they lack the knowledge before the training. 78% of the participants gain skills in making decisions, planning and organizing and communication with others.
- c. Source of Federal Funds - Smith-Lever
- d. Scope of Impact - State Specific

Key Theme - Children, Youth and Families at Risk (Extension)

- a. Merizo Elementary School and Community Site, Computer Literacy and Internet Connectivity Education Programs were conducted daily and weekends (Saturday's only) to pre-school children and elderly.

Participants included, 11 pre-schools, 755 elementary schools, 526 middle schools, 690 high schools and 247 parents. A total of 25 adult volunteers and 27 youth volunteers contributed three to eight hours per week on the project.

- b. Impact - During the course of the year participant enrollment increased by 56%. According to parents children who participated in the project have improved their grades and study habits. 98% of the participants increased their leadership skills. 100% of the participants learned to use Microsoft Word, 100% could connect to the Internet, and 95% were able to complete Desktop Publishing projects.
- c. Source of Federal Funds - Smith-Lever
- d. Scope of Impact - State and Regional

Key Theme - 4H CYFAR (Extension)

- a. In collaboration with Sanctuary Incorporated, an educational program titled Community Outreach Recreation Education at the low cost housing in Pagachao, Agat, Guam implemented with emphasis on small scale gardening. The primary purpose was to provide opportunity to develop life skills that are associated with teamwork, problem solving and decision making. A total of 482 youths participated in the educational activities.

- b. Impact - 482 participants have developed the necessary skills and knowledge to create and maintain the garden at the youth center. Participants have been able to include their families in the gardening activities and parent's involvement has increased. Several participants started their own gardening project at home with the left over seedlings. In collaboration with the youth, the community leaders have increased their involvement within their communities by 50%. Participants improved their self-esteem and developed a sense of accomplishments and ownership's. Currently, community leaders and community peer leaders have taken over the project ensuring sustainability.

- c. Source of Federal Funds - Smith-Lever
- d. Scope of Impact - State Specific

Key Theme - Youth Leadership Training and Development (Extension)

- a. Many of Guam youth aspire to become the leaders of tomorrow. These youth also want to give their time and effort to insure that their community is a better place to live. To this end they have ask Guam Cooperative Extension to assist in this endeavor. Extension created a program to assist in the needs of the community by creating a mechanism that trains youth and adult volunteers. A program called “Youths and Adults Working Together” was established.
- b. Impact - Initially, thirty-five youth and ten adults completed the eight-hour program. The forty-five individuals have taken their gain knowledge back to their schools and to their community and have taught their peers what the have learned from the training. The thirty-five youth have built their self-confidence and self-esteem and have re-focused their energy by joining school group and community youth centers. Adults have assisted municipal planning council, private civil and church groups. A total of eighty-five youths and adults have completed the program.
- c. Source of Federal Funds - Smith-Lever
- d. Scope of Impact - State Specific

(3) Stakeholder Input Process

In years past, the University of Guam Agricultural Experiments Station and Cooperative Extension generated stakeholder input by conducting periodic Island-wide Needs Assessment Survey and by maintaining an advisory board. While it has been awhile since a “needs assessment survey” was conducted, stakeholder input continues within various aspects of community involvement, including organizations, associations, government agencies and one-on-one contacts. The input we receive are continually considered and incorporated into our research project design and extension program development and delivery. This past year however, the University held an island-wide Congress for all of its stakeholders. There was a very wide concern towards issues that concern nutrition, children, youth, and families at risk. In addition, our Resident Instruction Program a three day retreat with its community business stakeholders and a great deal of information was gather with regards to educational desires that employers are looking for in future graduate students. Below is a list of the organizations and associations in which our professionals have membership and/or connection in one form or another:

Northern and Southern Guam Soil and Water Conservation Districts
 Guam Resource and Conservation District Board
 Association of Pest Control Operators
 Golf Course Superintendent association
 Guam Department of Agriculture
 NRCS, USDA
 Team Nutrition (A school meals and children’s nutrition group.)
 Diabetes Education Workgroup

“I Familiata Finenen’a” (Translated: Our Family. A family preservation and support group.)

Guam Community College Early Childhood Education Advisory Group

Island-wide Breastfeeding Coalition

Healthy Mother, Healthy Babies task Force

Consumer and Family Sciences and Agriculture Student Major Organizations

Women and Gender Studies Core

WIC Farmer’s Market Planning Committee

Sanctuary Inc. (A home for troubled, abused and runaway youth.)

Department of Mental Health & Substance Abuse

Client and Family Services, Superior Court of Guam

Department of Public Health and Social Services

Department of Youth Affairs

Guma Mami, Inc.

Department of Education

(4) Update of the Program Review Processes

There have been no significant changes in Guam's program review processes since our 5-Year Plan of Work.

(5) Evaluation of the success of multi-state, multi-institutional, and multi-disciplinary activities, joint research and extension activities

The College of Agriculture and Life Sciences participates in several multistate research projects and coordinating committees. During the past year we have initiated a new multistate project by joining the NC-174 project, Management of Eroded Soils for Enhancement of Productivity and Environmental Quality. The focus of the local research will be on maintenance of tropical soil fertility through the use of compost mulching and fallow cover crops combined with reduced tillage. An experiment with 12 field plots has been established at the Inarajan farm

We have participated in the W-185 project, Biological Control in Pest Management Systems of Plants, since at least 1992. The purpose of our participation in this project is: to reduce the amounts of insecticides used against aphids on Guam by introducing micro-hymenopterous parasitoids that prey specifically on aphids in a comprehensive aphid biocontrol program on beans, melons, and taro; to integrate aphid biological control with crop management tactics used against other insect pests on the target crops by determining the effect of commonly used insecticides on aphid natural enemies; to identify aphids and associated natural enemies on Guam by continuing comprehensive aphid and natural enemy surveys currently ongoing throughout the island; and to educate Guam’s agricultural community to distinguish aphids and associated natural enemies on crops. A comprehensive survey of aphids and their plant hosts, and aphid natural enemies was conducted in the CNMI in April 2001. Sites where aphid parasitoids had previously been released on these islands were sampled, as were other organic gardens and conventional farms. *Lysiphlebus testaceipes* was commonly observed on Rota, but

was not present on Tinian or Saipan. No other aphidiids were observed on Rota, Tinian or Saipan. A comprehensive survey of aphids, their host plants, and associated natural enemies was also conducted in April in the Republic of Palau on the islands of Koror and Babeldaup. The primary aphid species collected included *Aphis gossypii*, *Pentalonia nigronervosa*, and *Aphis craccivora*. No aphidiid or aphelinid natural enemies were observed on any of the Palauan islands. Comprehensive surveys of aphids and associated natural enemies on Guam, emphasizing hymenopteran parasitoids, have been scaled back to monthly examinations of parasitoid release sites. Colonies of *L. testaceipes* collected on Guam were reared in a newly established insectary on the UOG campus. Reared *L. testaceipes* were then released on *A. gossypii* and *T. citricida* at agricultural sites where they had not previously been observed on farms in northern and southern Guam. Approximately 1000 *L. testaceipes* were released on the island of Babeldaub in the Republic of Palau in August 2001 on *A. gossypii* and *A. craccivora*. Studies on ant-aphid-parasitoid associations have begun in Guam, the CNMI and in Palau as part of aphid surveys conducted there during the reporting period. A collaborative network of ant/aphid/aphidiid taxonomists has been established to work on aphid-associated questions of the Western Pacific Basin.

We have participated in the W-128 project, Micro_Irrigation: Management Practices to Sustain Water Quality and Agricultural Productivity since 1994. A field experiment to evaluate five popular driplines for their clogging potential was setup in October 2000 and continued through 2001 at Yigo Agricultural Experiment Station, Guam. Five driplines – H-Tape from Toro, Typhoon 20 from Netafim, Turbulent Twin 9” were tested. The Chapin Turbulent Twin 24” had the lowest clogging at 5% while the Chapin Turbulent Twin 9” had the highest clogging at 8.25%. However, the Netafim Typhoon 20 and Toro H-Tape 12” that were considered the best driplines on the Island had clogged about 8% during this period. This information on dripline clogging will help local farmers with water management during the production of watermelons and reduce the negative environmental impacts of over irrigation.

We have participated in the NC-142 project since 1994. During the past year, the purpose of this research on Guam has been to determine the influence of horticultural management practices of papaya seedlings in the nursery and early growth period on production. Papaya is a precocious perennial herb. Part of the local production strategy is to achieve early fruit production in order to shorten the production cycle. Papaya’s rapid growth habit allows rapid response to any horticultural input. The influence of soil chemistry on papaya root growth was studied. In one study, the ability of papaya roots to express induced iron reductase activity was determined. Four cultivars of papaya expressed very high capacity for reductase activity when exposed to iron deficiency. In a second study, acid soil was amended with various amends to determine the possible chemical reasons for limited root growth in acid soils. The results indicated that both calcium deficiency and aluminum toxicity play a role. This information is valuable for selecting planting sites for papaya production, and determining the types of amendments that may improve production.

We joined the S-009 project in 2000. Our work on this project center on the tropical root crops, particularly sweet potato. We have added local sweet potato ascensions from Guam, Rota and Saipan during the past year. Tissue culture of all of our local ascensions is underway in preparation to sending the plantlets to the USDA Beltsville Laboratory for virus screening prior to adding them to the sweet potato germplasm collection at Tuskegee University. New cultivars of edible soybean have been obtained from Japan and Taiwan (AVDRC) and a field trial is underway the the Yigo farm. Finally, tissue cultured bananas have proven to be a profitable enterprise for the undergraduate agriculture majors and a good way to provide local farmers with disease free planting stock.

We participate in several Western Regional Coordinating Committees: WCC-011 - Turfgrass Research, WCC-067 - Western Coordinating Committee for Sustainable Agriculture, WCC-205 - Integrated Water Quality Research and Extension Programs for the Western United States, and WCC-206 - Pacific Basin Tropical Agriculture. Our membership in these Multistate coordinating committees is important to both the Cooperative Extension Service and to the Agricultural Experiment because it allows our agents and scientists to interact with their counterparts from within the region and across the country. The Multistate projects and committees allow agents and scientists to interact with personnel from other government agencies and institutions and for a small isolated institution like ours, these interactions are vital to the continuing professional development of our faculty.