

2007 College of Micronesia Combined Research and Extension Annual Report

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I. Report Overview

1. Executive Summary

At the College of Micronesia, programs were implemented through the Department of Cooperative Research and Extension (CRE) at the three partner colleges: College of the Marshall Islands (CMI), College of Micronesia – FSM (COM-FSM), and Palau Community College (PCC). Integrated research and extension programs in FY 2007 continued to address economic, social, and ecological issues that are critically important to the people in small island communities in Micronesia. Programs provided were the continuation of past efforts in disseminating new knowledge and technologies to sustain and improve the quality of life of all Micronesian citizens in the Republic of Palau (ROP), Federated States of Micronesia (FSM), and Republic of the Marshall Islands (RMI).

With a mostly rural population that lives on mostly low-lying coral atolls, Micronesian farming of both crops and livestock were mostly on a subsistence nature. Research and development activities to promote agricultural productivity, self-sufficiency, provide for food security, and enhance quality of life are continuing. The potential of simplified hydroponics to improve health and the economy, and utilization, processing and development of new products from banana, taro, breadfruit and cassava that are acceptable to the native population and in local markets are ongoing projects. The trials on taro varieties (*Cyrtosperma* spp. & *Colocasia* spp.) for their suitability to grow under atoll conditions and the trials on banana varieties resistant to the black leaf streak (BLS) and other diseases and the micro propagation of elite (disease-free and high yielding) of certain banana varieties that will improve the quality and quantity of certain banana varieties for the export market are also continuing. A research project looked at determining comparative resistance of different taro varieties to the taro leaf blight disease. Other research projects were the germplasm of staple root crops, namely banana, sweet potato, cassava and taro, has ensured the genetic conservation of these valuable resources for future generations. This has also facilitated the continue supply of planting materials to growers and allow in-vitro multiplication of other food crops such as breadfruit and pandanus.

Aquaculture/mariculture demonstration projects are continuing with new advances in technology to transfer the technical know-how to Micronesians to enable them to actively engage in projects that could improve health, support the local economy and provide for employment. Aquaculture activities were reinstated in Palau with hiring of an aquaculture researcher. As a result, rabbit fish were reared in tanks and preliminary outcomes showed survival of larvae increased to 20% when rotifers for larval food was increased from 3 to 5 rotifers per ml. As of last year, 30,000 fingerlings were released in clam farms. On giant freshwater prawn research, facility and technical problems associated with its culture are being ironed out. The developing technology for the farming of black-lip pearl oyster has enabled the establishment of pilot farms in the outer islands of Pohnpei and the Marshall Islands and plans are underway for the transfer of this technology to other parts of Micronesia. The hatchery-based pearl farming project will encourage local pearl oyster juveniles production that will benefit potential farmers, develop a culture black pearl industry, pearl shell-related value-added businesses, create job opportunities, and support national revenues.

Outreach programs continued to focus on a wide range of critical issues ranging from food safety and quality, health and nutrition, food security, soil management, strengthening families and developing youth, water quality, developing leadership and volunteerism, and managing limited natural resources and the environment. The nutrition, diet and health programs continued thru a consortium of the five land-grant institutions in the American-Pacific region to stress the importance of healthy lifestyles, which include behavioral changes (physical activity and consumption of safe, nutritious local food) to combat the ever rising tide of obesity, diabetes and heart diseases and other NCDs among both children and adult. A project on endangered species of banana is trying to multiply these rare banana varieties to help with the nutritional needs for Vitamin A among both children and adult. The youth development programs at the schools and with out-of-school children provided information to increase their knowledge and appreciation of marine and terrestrial flora and fauna. Summer programs also provided information on basic survival skills on small island communities and home economics and appropriate island lifestyles. More students are now exposed to computers through computer training programs at schools that provided the opportunity for children to use the Internet as an introduction to electronic connectivity and information gathering. Water quality education programs continued in some of the island communities as collaborative efforts with international and regional organizations, government agencies, and community groups on monitoring and surveillance testing of water sources in selected areas continued. Sustainable agriculture and integrated pest management programs continued to provide farmers awareness, understanding, and information regarding the adoption of sound agricultural production practices that sustain or protect the fragile island ecosystem integrity and

biodiversity.

Activities are ongoing on resistant crop varieties and practical biological pest control measures to provide useful tools to the stakeholders for combating crop pests and diseases and increase productivity of tropical food crops. The use of beneficial organisms was the emphasis in reducing pest threats on crops. Biological control agents such as mirid bugs (*Cyrtorhinus fulvus*) to control the taro leafhopper, predatory mites (*Neoseiulus longispinosus*) to control the cassava spider mites and the parasitic wasp (*Aphidius colemani*) to control the melon aphids on taro were reared in the greenhouse and released several times on field plantings of taro and cassava in four States of Palau. The biological control of the melon aphid and mile-a-minute is progressing well with the successful control of gallflies and mired bugs with *Chromolaena* and taro leafhopper. Activities are ongoing for the biological control of the *Mimosa diplotricha*, which is still growing along roadsides through the use of the psyllid insects.

Multi-state, multi-institutional and multi-disciplinary efforts continued through the consortium of the American-Pacific land-grant universities and colleges through the Agricultural Development in the American Pacific (ADAP) Project and with the College of Tropical and Subtropical Aquaculture (CTSA) on aquaculture projects. A cost-sharing agreement with Pohnpei State Government continued, whereby Extension Agents from the Agriculture Station have been working side-by-side with Pohnpei CES staffs.

There is still a continuing shortage of necessary human resources and professional staff, therefore human resource and capacity building efforts continued to be a top priority. Several programs and activities toward developing this area included a Financial Assistance & Scholarship Program for high school students through a summer research/extension apprenticeship program and financial assistance for college students enrolled in agriculture and home economic courses. Other capacity building activities included sustainable agriculture workshops, pesticide application, tissue culture and nursery practice, integrated pest management, EFNEP, and basic sewing attended by farmers, producers, homemakers, the youth and adult sectors of the society and the underprivileged and underrepresented.

Total Actual Amount of professional FTEs/SYs for this State

Year:2007	Extension		Research	
	1862	1890	1862	1890
Plan	49.1	0.0	11.9	0.0
Actual	51.2	0.0	17.2	0.0

II. Merit Review Process

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

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

2. Brief Explanation

At PCC-CRE, a 4-member publications committee reviewed proposals. The proposals were evaluated by two external reviewers, who are experts in the areas of the proposals. After the evaluation by the external reviewers, the proponent incorporated the comments of the reviewers. Once it is finalized, the Vice President of CRE through the PCC President endorsed the proposals and submitted them to the COM Executive Director/Interim CES/AES Director, who endorsed proposals and sent them to USDA CRIS for final approval.

At CMI-CRE, all project proposals were submitted to the Dean for review. Two internal reviewers from the college reviewed proposals and provided feedbacks. It took several days to receive the reviewers' feedbacks. External reviewers were faculty and researchers from other Land Grant colleges/universities and international organizations such as (SPC, UNDP, SOPAC, SPREP, etc.). Two external reviewers followed the same process as the internal reviewers. Feedbacks were provided to the researchers and after they made changes, they were sent to the AES/CES Interim Director for endorsement and submission to USDA CRIS.

At COM-FSM-CRE, the peer review of all Hatch research proposals is made prior to submission to the Interim Director of AES/CES for his endorsement before submission to CRIS for approval. These included both internal and external reviewers and must be supported by three reviewers. Funded programs including matching funds programs, whether Research or Extension were submitted to the College of Micronesia-FSM Sponsored Programs review committee for review as outlined in the Terms of Reference of that committee. Seventeen diverse members of the college community, including all state campuses reviewed proposals and advised the President of concerns or support of the proposals.

III. Stakeholder Input

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

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals

Brief Explanation

PCC-CRE through its outreach programs brought into the community of each state in Palau the products of its research and extension activities and through the exchange of ideas and problems, comments, views, and suggestions during scheduled meetings. These suggestions and emerging issues related to extension and research were incorporated into our research programs. Also concerns from other agencies of the government within and outside Palau are compared with current priority areas of work so that a consensus could be reached on priority programs.

Stakeholders were identified in meetings held by local and national government agencies, traditional and political leaders together with CRE staff. They were assigned to be involved in the implementation and evaluation of the projects. In some instances, some projects required participation of the farmers from the start of the project until they were completed. In that way, the transfer of technology to other people can be easily facilitated through the help of the clientele. Furthermore, research and extension results were translated into simple English or in the local dialect/language in brochures, bulletins and reports for easy dissemination to the public.

At CMI-CRE, before any research proposal is written, the researchers met with traditional and government leaders, government agencies, and NGOs to collect their inputs on agriculture, aquaculture, and home economic issues that they would like to see addressed. Stakeholder meetings were held once or twice a year depending on needs of the communities. The CMI-CRE strategic plan and COM Plan of Work were presented to them and they were asked for their feedback and inputs.

The FSM stakeholders were kept informed of activities through direct communication or electronic sharing of information. Stakeholders' inputs were solicited when priority areas of action were identified. In addition, presentations were made to the Pohnpei State Legislature prior to and during negotiations for the development of the Memorandum of Understanding covering the CES state budgets. The Farmers Cooperative of Pohnpei met regularly and provided input to the CES programs by identifying priority areas of concern.

2(A). A brief statement of the process that was used by the recipient institution to identify individuals and groups stakeholders and to collect input from them

1. Method to identify individuals and groups

- Use Internal Focus Groups
- Needs Assessments

Brief Explanation

PCC-CRE staff approached political and traditional leaders for their assistance in identifying individuals or groups who should attend meetings / trainings. These individuals and groups were informed through radio announcements or were personally approached to inform them when and where meetings / trainings were to be held.

CMI-CRE announced the plan event on the local radio station inviting interested individuals or groups. Letters were also sent to traditional or political leaders requesting their assistance in identifying individuals or groups to participate in the events.

In the FSM, known individuals involved in particular program areas were contacted for specific input and guidance. Information was solicited from collaborators by individual contact. Interest expressed for specific programs such nutrition and home gardening by the head of the local governments or state governments were considered. Local governments and the traditional leaders have been very helpful in identifying segments of the population for specific target program.

2(B). A brief statement of the process that was used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Meeting with the general public (open meeting advertised to all)
- Meeting with invited selected individuals from the general public

Brief Explanation

At PCC-CRE, extension staff conducted personal visits to stakeholders in their homes and on their farms and through these visits, one-on-one interviews were held to get the relevant information needed to facilitate work in each respective state.

CMI-CRE staff met with stakeholders individually to collect their inputs. Also, during public meetings and training workshops, inputs were also collected from stakeholders.

In the FSM, stakeholders' inputs were gathered during meetings, workshops, visits by individuals, farm visits, and response to specific problems. Often exchange of information is casual and often not formally recorded. The information is gathered and used as anecdotal background in decision-making. At other times when a specific agenda is required, formal meetings of stakeholders were organized with information recorded. Such events were arranged for strategic planning efforts, collaborative project efforts, legal agreements and identification of professional positions in the organization. Often these meetings were addressing issues of interest to other collaborating organizations.

3. A statement of how the input was considered

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

Brief Explanation

At PCC-CRE, many of the ideas given by stakeholders are relevant with the current or proposed activities on research and extension. Therefore, in several instances, suggestions from stakeholders were included to modify and strengthen proposals or activities in research and extension.

The collected input were used to help write and revise research and extension proposals at CMI-CRE. They also helped the staff in designing and redesigning lessons and programs.

In the FSM, stakeholders input were considered when making decisions on two vacant research positions, preparation for matching fund proposals, and to identify critical issues such as the effect of sea level rise and its effects on food supply on the atolls.

Brief Explanation of what you learned from your Stakeholders

At PCC-CRE, stakeholders in some cases were good sources of traditional knowledge, which can be used to improve the research and extension strategies employed.

At CMI-CRE, we learned that some of our stakeholders were knowledgeable and could be used as technical advisors in some of our projects. They provided good and useful information about the history of the islands that can be used for comparing traditional and modern methods as we conducted our research and extension projects.

At COM-FSM-CRE, stakeholders provided most current information on climate change and the sea-level rise. They also expressed concerns about atoll agriculture and food security as it relates to climate change. People understand the effects of global warming, but do not know what they can do to help. The general public is not aware of the potential dangers in our water supply and in many cases do not associate diseases and health to water quality.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
959051	0	1299774	0

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	995893	0	649398	0
Actual Matching	299051	0	48700	0
Actual All Other	0	0	0	0
Total Actual Expended	1294944	0	698098	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous years				
Carryover	834641	0	71236	0

V. Planned Program Table of Content

S. NO.	PROGRAM NAME
1	Aquaculture
2	Small Island Agricultural Systems
3	Families, Youths & Communities
4	Food, Nutrition & Health

Program #1

V(A). Planned Program (Summary)

1. Name of the Planned Program

Aquaculture

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
135	Aquatic and Terrestrial Wildlife	13%		3%	
136	Conservation of Biological Diversity	17%		3%	
301	Reproductive Performance of Animals	12%		37%	
302	Nutrient Utilization in Animals	5%		0%	
307	Animal Management Systems	23%		17%	
308	Improved Animal Products (Before Harvest)	13%		23%	
315	Animal Welfare/Well-Being and Protection	15%		13%	
511	New and Improved Non-Food Products and Processes	2%		4%	
Total		100%		100%	

V(C). Planned Program (Inputs)

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

Year: 2007	Extension		Research	
	1862	1890	1862	1890
Plan	6.9	0.0	5.0	0.0
Actual	5.1	0.0	5.2	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
99589	0	180442	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
29905	0	29000	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

In Palau, the rabbit fish spawners maintained in a 6 - ton capacity circular tank started to spontaneously produced millions of eggs. A total of 2.5 million fertilized eggs were collected after two days of successive spawning. About 400,000 newly hatched larvae were stocked in a 10-ton capacity concrete tank for larval rearing. The larvae were fed mainly with rotifers on their onset of feeding at a density of 3 rotifers/ml. After 35 days, 5,700 fingerlings were distributed to clients who wanted to stock these rabbitfish fingerlings on their fishponds. Larval rearing runs were conducted to improve the survival rate, which has the initial density of rotifers increased to 5 individuals per ml. About 30,000 fingerlings have already been released to 10 clam farm sites in Airai and Koror.

Preliminary attempt to stock freshwater shrimp for broodstock at the R&D station was hindered by gross water seepage encountered in the earthen grow-out pond. Due to pond's high elevation and porous sandy clay, the pond bottom was not able to hold supplied freshwater, making the pond empty after 1-2 days. Plastic lining used throughout the pond bottom was an option to improve the water holding capacity. Local sourcing for endemic giant freshwater prawn, in major freshwater bodies of Palau was another constraint in implementing this project. Sourcing for supplier of fingerlings is ongoing. Some other extension activities conducted included on-site technical support on natural food production and larval rearing of groupers, technical assistance in milkfish fry collection and pond management, transport and stocking of hatchery-bred rabbit fish at clam farms, participation in international and local events by presenting posters and aquarium exhibit, and lectures to high school and elementary students.

Two research projects were implemented in the Marshall Islands: (1) Research and Extension Training in Black-Lip Pearl Oyster in the Atolls, which is a project that impacted on the black pearl industry. The project was successful in researching ways in which it could enhance the percentage of survival and growth-out of spat in farms by using more efficient rearing methods, reduction of fouling, predation, etc. The new settlement substrate feedback from the industry was good and need further refinement to increase efficiency. This information would be a great boon to the more refinement and success of the commercial black pearl oyster culture. The other research project was on the full or partial replacement of live algal feeds in the hatchery production of *Pinctada margaritifera* (Linnaeus). A hatchery spawning was undertaken for the purpose of assessing the effect of live feed and algal paste on the hatchery rearing of the pearl oyster. Preliminary results showed that the larvae could be reared on the dead algal feeds. These findings had an immediate impact on the black pearl hatchery and farming industry where the farming is entirely based on hatchery produced spat and any way to reduce the cost of operation in the hatchery is a must to be competitive in the global market.

In the FSM, USDA-Hatch funded pearl quality improvement research continued by assessing experimental results from the operations at Nett Point and follow-up harvest was conducted at Pakin Atoll. Hands-on training on hatchery, ocean nursery and pearl cultivation continued for the project's staff and the outer island communities under the USDO/OIA funding. Technical advices on pearl farm maintenance were provided by the pearl project staff who began monitoring the hatchery-produced oysters at commercial pilot farms at three new sites with collaboration of the Pohnpei State Marine Development. A new research project was also implemented in July 2007, which was funded for two years by the CTSA titled "Improving Pearl Quality by Grafting Technologies and Husbandry Methods for a Hatchery-Based Black Pearl Industry Development in Pohnpei, Federated States of Micronesia". The pearl project also provided advices to Pakin Atoll community people on establishing the island's community association (NGO) as a decision making body of Pakin Atoll for preparation of its community-based commercial pearl farming and Marine Protected Areas (MPAs) development. From the project's demonstration pearl harvest, sample pearls and pearl shells were donated to local craftsmen and shops for making pearl accessories and pear-shell handicraft to encourage local business people and to increase local awareness of pearl industry development.

2. Brief description of the target audience

Target audience in Palau included the individuals who were engaged in aquaculture activities, their family members, and their technicians. Personnel of the BMR hatchery, as well as Ngatpang State Aquaculture Project have benefited from the technical assistance that was provided. College, secondary and elementary school students were taught about the importance of aquaculture and basic ideas on how to grow fish.

Other target audience included trainees, community members, students, local government and traditional leaders on the outer islands of Pohnpei and the Marshall Islands who are involved in the aquaculture projects. Business people and foreign investors are also part of the target audience.

V(E). Planned Program (Outputs)**1. Standard output measures****Target for the number of persons (contacts) reached through direct and indirect contact methods**

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	350	1000	150	1000
2007	347	500	226	250

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

Year	Target
Plan:	0
2007 :	0

Patents listed**3. Publications (Standard General Output Measure)****Number of Peer Reviewed Publications**

	Extension	Research	Total
Plan			
2007	0	0	0

V(F). State Defined Outputs**Output Target**

Output #1**Output Measure**

- Number of demonstration farms established.

Year	Target	Actual
2007	6	13

Output #2**Output Measure**

- Number of publications for lay use.

Year	Target	Actual
2007	4	4

Output #3**Output Measure**

- Number of conference paper and publication/presentation.

Year	Target	Actual
2007	5	2

Output #4**Output Measure**

- Expected Professional Journal publications.

Year	Target	Actual
2007	3	0

Output #5**Output Measure**

- Expected Gray Literatures.

Year	Target	Actual
2007	6	0

Output #6**Output Measure**

- Expected publications for lay use.

Year	Target	Actual
2007	5	3

V(G). State Defined Outcomes**V. State Defined Outcomes Table of Content**

O No.	OUTCOME NAME
1	Increase awareness in the communities and prospective and existing industry about sustainable, site-specific, and low energy aquaculture technologies.
2	Adoption of sustainable aquaculture technologies by commercial and community groups.
3	Number of established aquaculture operations.

Outcome #1**1. Outcome Measures**

Increase awareness in the communities and prospective and existing industry about sustainable, site-specific, and low energy aquaculture technologies.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	30	1048

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

As fish population dwindled, people in small island communities are becoming alarmed. They are beginning to see the importance of aquaculture as a way of promoting sustainable fish production to help with deteriorating health and decreasing food choices and the importance of fish for the enhancement of economic and social well being of Micronesians.

What has been done

At PCC-CRE, poster and aquarium display of hatchery-produced rabbit fish fingerlings were shown at various local and international events and activities. A series of lectures about fish and aquaculture were conducted in different schools and students and the general public made on-site visits to the hatchery facilities. Site visits and technical assistance was provided in some aquaculture farms in Ngatpang and Ngechesar States. Their clam pens and fish cages were stocked with rabbit fish.

At CMI-CRE, six outer islands trainees attended an extensive training in hatchery and farming technology for pearl farming at the CMI-CRE hatchery. The trainees returned to their home islands and established pearl farms there. Oyster spats were provided to all 6 demonstration farms on these atolls and they were monitoring and measuring the growth rate of the spats for information to be provided to the researcher.

At COM-FSM CRE, pearl harvest and seeding work were demonstrated at the Pakin Atoll pearl farm in July - August 2007 for the community. The project's hatchery, ocean grow-out and pearl culture methods were filmed at Nett Point by the USDA Land Grant Video News team and by the Japanese filming team.

Results

At PCC-CRE, visitors were able to understand the early life history of rabbit fish and how to rear them from eggs to juveniles. Students gained knowledge about the basics of aquaculture and fish farm workers in Ngatpang and Ngechesar states learned how to identify and collect wild milkfish and tiger shrimp fry as well as the proper feeding and pond management. Existing clam farmers in Airai learned the importance of growing rabbit fish in their clam pens to control the growth of filamentous algae that usually damage their stock.

The trainees in the Marshall Islands have shown their interest in pearl farming and have been diligent in monitoring and collecting data. Everyone on those atolls felt a sense of ownership of the farms and had contributed a lot of their time to their maintenance.

In FSM, Pakin people from the groups of youths, women, church, school and fishermen participated to pearl harvest and seeding operation, which enhanced their awareness and practical planning toward implementing their community-owned pearl farming. Pakin Elementary School children were also invited to observe the farming operation as a part of school program. People in Pohnpei were able to watch the project's low tech methodologies and activities through the Islands Cable TV and tens of thousands of Japanese became aware of a new industry development work through BS Hi-vision TV program.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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308	Improved Animal Products (Before Harvest)
301	Reproductive Performance of Animals
307	Animal Management Systems
136	Conservation of Biological Diversity
315	Animal Welfare/Well-Being and Protection
135	Aquatic and Terrestrial Wildlife

Outcome #2

1. Outcome Measures

Adoption of sustainable aquaculture technologies by commercial and community groups.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	10	46

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

At PCC-CRE, aquaculture workers and operators were asking for hands-on technical advise on milkfish fry collection, needed help on proper pond management, seed production of economically important marine fin fishes in the hatchery, grow-out of rabbit fish and grouper in fish pens and fish cages.

At CMI-CRE, people in the six atolls are becoming more interested to learn about hatchery work and pearl farm management.

At COM-FSM-CRE, atoll communities of Pakin and Mwoakilloa expressed their eagerness toward establishing a community-based black pearl farm as a feasible economic development measure and requested direct involvement in the pearl project's demonstration work and implementing their own trial farming.

What has been done

At PCC-CRE, on-site technical support in the natural food and seed production of grouper and rabbit fish was done at the hatchery. Hands-on technical assistance/demonstrations on how to collect milkfish fry from the wild and improved pond management was also done in Ngatpang and Ngchesar States. Rabbit fish were transported and stocked in ponds, clam pens and fish cages in Ngechesar, Airai and Koror States.

CMI-CRE aquaculture staff visited the six atolls where farms were established and held community meetings with the traditional and political leaders and community members to explain the status and progress of the pearl farms. The trainees on these atolls were given the opportunity to update community members of successes and problems encountered in the operation of those farms.

At COM-FSM-CRE, 3500 each of hatchery-produced adult oysters were transported to Mwoakilloa and Pakin for simulate a small-scale commercial farming. The project staff attended community meetings to instruct farm maintenance and to advice commercialization process. Six youths from Pakin and Mwoakilloa were included in the farming skill training at the project's Nett Point as apprentices, who learned grow-out farming protocols and later returned to their atolls to continue farm maintenance work by demonstrating to their own people.

Results

An increasing number of local governments and community members are adopting the aquaculture technologies and are showing interest in engaging in aquaculture programs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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301	Reproductive Performance of Animals
307	Animal Management Systems
315	Animal Welfare/Well-Being and Protection
136	Conservation of Biological Diversity
308	Improved Animal Products (Before Harvest)
511	New and Improved Non-Food Products and Processes
135	Aquatic and Terrestrial Wildlife

Outcome #3

1. Outcome Measures

Number of established aquaculture operations.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	3	7

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

At PCC-CRE, owners of an existing fishpond in Ngechesar and clam farms in Airai were interested in stocking rabbit fish for grow-out.

At CMI-CRE, currently there is only one existing commercial pearl farm in the Marshall Islands. One of the objectives of setting up the farms in the different atolls was to raise awareness of the potential of establishing a black pearl industry and providing employment and income to indigenous people.

At COM-FSM-CRE, the project's two demonstration farms at Pakin Atoll are in a transition to community-based commercial farms. People became aware of self-sustainable activities inspired by the project's demonstrations of pearl production on-site Nett Point and Pakin Atoll. Other communities in Pohnpei and private sector requested the project's assistances and advices on forming associations such as community association (NGO) and/or pearl farmers association to by-pass a local government bureaucracy. As expectation became increasing, the project shifted its effort to a mass hatchery production methods and skill training in order to cope with demand by start-up commercial farms for seedable adult pearl oysters in a year or two.

What has been done

At PCC-CRE, about 30,000 of hatchery-produced rabbit fish have been released in 5 separate grow-out facilities.

At CMI-CRE, proper fish handling and transport procedures were demonstrated to fish farmers. The Rongelap Atoll Government provided funds to CMI-CRE to assist them in becoming a full-scale black pearl commercial farm. Spats have been provided to them and the researcher has been working with the project manager and staff in providing technical assistant and monitoring of their existing farms.

COM-FSM-CRE, the project arranged and participated to several meetings with the Pakin community people to establish Pakin Community Association (NGO), which represents all walk of the community and acts as a decision making body of the community. The project developed a close collaboration with the Pohnpei State Marine Development to realize orderly and sustainable pearl industry development, which includes commercialization of pearl farming as an integral part of community improvement activities such as MPAs development and community-based fisheries management program. A trial restocking of hatchery-produced blacklip pearl oysters was conducted in the reef areas of Pakin Atoll to encourage community involvement.

Results

At PCC-CRE, fish farmers obtained their rabbit fish fingerling requirements. However, success in production was not significant because some of their fish stock had escaped and were infested by predatory birds. The major problem observed was the failure of fish farmers to conduct regular and thorough monitoring of their stocks as well as provision of feeds.

At CMI-CRE, no data collection and monitoring were done due to a problem with the small airplanes that service those atolls. However, the people on those atolls did maintenance work and monitoring of the farms.

At COM-FSM-CRE, Pakin community developed by-laws of its island council (NGO), which is to be registered in October 2007 under the Pohnpei State registration. A preliminary monitoring work of the restocked and farmed pearl oysters was commenced at Pakin and Mwoakilloa with participation of Pakin and Mwoakilloa communities. Approximately 2000 round pearls were harvested from quality experiments at Pakin farm and about 1,000 half-pearls, or 'Mabe' pearls. Half-pearl nuclei had been implanted in the previous year by two of the project staffs, who have been learning seeding skill from the project's hired seeding technician.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife
308	Improved Animal Products (Before Harvest)
315	Animal Welfare/Well-Being and Protection
307	Animal Management Systems
302	Nutrient Utilization in Animals
301	Reproductive Performance of Animals
511	New and Improved Non-Food Products and Processes
136	Conservation of Biological Diversity

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Public Policy changes
- Government Regulations

Brief Explanation

Extreme weather in the forms of tropical storms and super typhoons are common phenomena in this part of the world, so they had a major impact on the outcomes of aquaculture projects. Maintenance work had to be done on some of the demonstration farms and field trips to these outer islands were cancelled due to fuel. In addition, public policy changes affected implementation of programs as priorities changed with new and different administrations.

Success in grow-out may be possible if fish farmers will open themselves to follow the design and management recommended by the extension agents. As to what have been noticed, some fish farmers have followed their own ideas despite recommendations that were provided to them. Also, fish farmers have to consider allocating capital for the feed requirement and other contingencies needed in their fish grow-out projects.

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

1. Evaluation Studies Planned

- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)
- Comparison between locales where the program operates and sites without program intervention

Evaluation Results

There was success in seed production of rabbit fish in Palau and there was an increase in the number of individuals who developed an interest in aquaculture and who wish to invest in aquaculture activities. The establishment of practical feeds as well as local sources was done so that fish farmers could buy for their fish culture requirements.

In the RMI, people came to realize the potential economic benefits of establishing a pearl industry and the outer islands and atolls were the most suitable for pearl farming with their pristine lagoon water and clean environments.

In FSM, the project developed recommendations of 5-year pearl business plan for a community-based pearl farming with collaboration with the Pohnpei State Division of Marine Development, which is an integral part of a Community-Based Fisheries Management Programs (CBFMP) in the State of Pohnpei. Pakin Atoll is considered to be the least advantaged outer island community and Mwoakilloa Atoll is one of the most advantaged. These two atolls are located to the west and the east off the Pohnpei, having uniquely different social infrastructure, language, religion, politics and traditional leadership, land ownership and other life styles. It has been a slow process to encourage the islands people for pearl farming but we share the same goal to improve the island's livelihoods from economically and environmentally sustainable activities. Now they are ready for launching commercial farming based on the project's technical advices. Because almost all the wild stock had been wiped out several decades ago, all the oysters have been produced successfully from the project's hatchery and ocean grow-out operation at Nett Point.

The pearl quality improvement experiments continued to provide a basis of pearl export business development in future. From the harvesting operation conducted in July, 2007 at Pakin Atoll farm, 84.2% survived from 260 seeded in August 2006 for the "flaw-reduction" experiments and 174 oysters (66.9% pearl success rate) produced pearls. In another experiments, 80.9% survived after re-seeding of 246 oysters with 67.9% pearl success rate. Among 1945 oysters seeded in 2005, 967 oysters produced pearls after two year cultivation. Pearl quality assessments for the "flaw-reduction" experiments are ongoing for comparisons from previous results. High rates of survival and pearl success suggest that re-seeding (the second nucleus implantation) could be effective if a quality of product such as luster and shape is assured. The re-seeding has advantage over the first seeding operation to produce larger pearls in a shorter culture period. As given in the previous report, the shape of the second (or pearl from the re-seeding) tended to increase its roundness compared to the first (or pearl from virgin oyster). A preliminary assessment from the harvest of the flaw-reduction experiments in 2007 indicates a repeated results of circle-flaw reduction by the experimented re-seeding procedure, in some cases, the oysters produced circled pearls were able to produce non-circled or round pearls. The quality evaluations could provide more details to develop economic and effective use of pearl seeding operations.

Key Items of Evaluation

The success in natural spawning of captive rabbit fish breeders triggered the development of practical methods in larval rearing. The embryonic and larval development of rabbit fish had been well documented and a better feeding protocol was established. After conducting a series of larval rearing trials, the larval production and survival rate were improved. The evaluation of various extension activities was based on observations on the client's reactions immediately after conducting the program.

Program #2

V(A). Planned Program (Summary)

1. Name of the Planned Program

Small Island Agricultural Systems

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	8%		15%	
111	Conservation and Efficient Use of Water	5%		2%	
112	Watershed Protection and Management	10%		0%	
123	Management and Sustainability of Forest Resources	2%		0%	
133	Pollution Prevention and Mitigation	3%		3%	
136	Conservation of Biological Diversity	3%		5%	
202	Plant Genetic Resources	15%		15%	
204	Plant Product Quality and Utility (Preharvest)	3%		2%	
205	Plant Management Systems	13%		20%	
212	Pathogens and Nematodes Affecting Plants	3%		10%	
216	Integrated Pest Management Systems	15%		15%	
315	Animal Welfare/Well-Being and Protection	5%		0%	
601	Economics of Agricultural Production and Farm Management	15%		13%	
Total		100%		100%	

V(C). Planned Program (Inputs)

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

Year: 2007	Extension		Research	
	1862	1890	1862	1890
Plan	19.8	0.0	7.0	0.0
Actual	23.0	0.0	6.9	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
448152	0	267232	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
134573	0	12000	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The germplasm collection in Palau consisted of 22 varieties of sweet potato, 53 varieties of cassava and 98 varieties of taro, which were maintained at the R&D station by continuous replanting, weeding and fertilization. This served as the core collection of root crops and as sources of planting materials for farmers. There were 5,101 cultures maintained in the laboratory, 2,302 plantlets acclimatized in foam cups in the greenhouse, while 3999 plantlets were transferred in plastic bags. A total of 6795 tissue-cultured taro plants were distributed to farmers in different states of Palau and thirty varieties of taro were conserved in vitro in the laboratory. Research and demonstration farms were established in three farmer cooperators' land and at the R&D station to showcase appropriate banana production technologies. Some of the farms were planted with tissue cultured Lacatan bananas that have no manure and fertilizer (control), some with manure and fertilizer at planting time, some with manure and fertilizer application every two months, and manure application every 2 months. Data gathering, fertilizer application, weeding and removal of sick leaves were done every two months. Over a year, the plants that were applied fertilizer and manure every two months were significantly taller and more vigorous growing than those applied with manure only every two months and other two treatments, which showed the need for continuous nutrient management as an appropriate banana production technology. An alarming problem was the increase incidence of the disease caused by the fungus, *Marasmiellus* sp., which affects the pseudostem. Four varieties of sweet potato consistently showed the absence of scab-infected leaves and shoots while the Hawaiian variety was susceptible to fungal infection. A collaborative project with the Northern Marianas College on Dry Litter Waste Management System in pigpens was undertaken with the use of coconut husk and wood chips as bedding materials, which conserves water and protects water and land from contamination with pig manure and urine.

Research in the FSM included testing of different types of media formulation and preparation using various combinations of plant growth regulators with other components like organic and inorganic nutrients, vitamins and amino acids to develop suitable multiplication and maintenance protocol for local and acquired germplasm. Inoculation, aseptic culture establishment and multiplication of different varieties of banana, sweet potato, and taro were done. Varieties of banana, sweet potato and taro were inoculated for micropropagation and conservation. An effort to remedy prevailing citrus canker prompted a literature search to identify the best available germplasm for rootstock and budwood. Initial communication has started with the University of California to procure virus-indexed rootstock and budwood of lime. A nematode research project assessed the potential damage to plants by parasitic nematodes and since nematodes are a limiting factor in crop production, it is important to gather information thru surveys and collection of soil and root samples. Data on nematode density are necessary to elucidate whether a given type of nematode is causing any significant damage to crops. Periodic surveys were carried out on a wide spectrum of field grown and pot-grown plants to identify, record and document plant-parasitic nematodes and several parasitic species known elsewhere in the Pacific were documented.

Extension activities included farm visits and on-site demonstrations, community meetings and training workshops on acclimatization of tissue-cultured plantlets, soil-based issues in sustainable agricultural practices, noni production and marketing, paravet and Avian Influenza. Eradication measures continued for false kava and other alien invasive species. Extension staffs were involved in a survey of all the wood pigeons in preparation for the eradication of an exotic and invasive parrot in Pohnpei. Collaboration continued with appropriate agencies to address agricultural production and marketing, pest and diseases, and degradation and degeneration of biodiversities.

In the Marshall, meetings between farmers, government agencies, and regional and international programs (Taiwan Technical Mission and SPC) were held to discuss community needs and strengthen partnership in addressing these needs. A task force was organized by the government as a rapid response team to address any outbreak in the bird flu and the agriculture extension agent was a member. The agent continued to provide appropriate information and demonstrated proper ways of managing home gardens and domestic livestock (pigs and chickens). Sweet potato was the focus of backyard gardening as it is easy to cultivate and has high nutrient value. A taste trial on 12 sweet potato varieties resulted in a number of varieties accepted by the local population. Educating students and teachers on water quality issues occurred at several elementary and high schools. Presentations on conserving water, treating drinking water, and water purification techniques were made at these schools.

2. Brief description of the target audience

In Palau, the main target audience were the root crop farmers, college, high school and elementary school students and faculty who visited the R&D station and viewed our exhibits during various civic events such as Earth Day, Vocational Education Week, Olechotel Belau Fair, World Food Day.

Information on control of pests of crops and improving crop production, use of tissue culture techniques and importance of root crops germplasm conservation, water quality education and dry litter waste management were disseminated to all our target audiences.

In both Marshall Islands and FSM, the target audience included both crop and livestock farmers, producers, exporters, students, youths, homemakers, traditional and political leaders and colleagues from local and international and organizations.

V(E). Planned Program (Outputs)

1. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	600	3000	300	600
2007	1116	3500	500	1200

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

Patent Applications Submitted

Year Target

Plan: 0

2007 : 1

Patents listed

Esguerra, N.M. and Del Rosario, A.G. (2007). Economic Entomology in Micronesia. PCC. 214 pp.

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan			
2007	0	0	0

V(F). State Defined Outputs

Output Target

Output #1**Output Measure**

- Expected Professional Journal Publications.

Year	Target	Actual
2007	0	3

Output #2**Output Measure**

- Expected Gray Literatures

Year	Target	Actual
2007	0	4

Output #3**Output Measure**

- Expected publications for lay use.

Year	Target	Actual
2007	0	6

Output #4**Output Measure**

- Conference presentations

Year	Target	Actual
2007	0	20

Output #5**Output Measure**

- Conference publications

Year	Target	Actual
2007	0	6

Output #6**Output Measure**

- Number of publications for lay use.

Year	Target	Actual
2007	0	8

Output #7**Output Measure**

- Number of conference paper publication/presentations.

Year	Target	Actual
2007	0	6

Output #8**Output Measure**

- Number of demonstration farms established.

Year	Target	Actual
2007	0	12

V(G). State Defined Outcomes**V. State Defined Outcomes Table of Content**

O No.	OUTCOME NAME
1	Number of persons with increased knowledge on appropriate production technologies.
2	Number of program participants adopting recommended practices.
3	Number of established farms and farm related businesses by individuals and cooperatives.

Outcome #1**1. Outcome Measures**

Number of persons with increased knowledge on appropriate production technologies.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	2400	1900

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

School children, youth, farmers and officials from government agencies had increased knowledge and awareness on importance of conservation and preservation of different varieties of root crops in Palau, use of tissue culture technique as method for the rapid mass propagation of taro, control of pest of crops using IPM techniques with the aim of preserving environmental health. They also became aware of new ways to control animal waste that flows down to water sources and protects the environment and rainwater catchments.

The program educated and provided awareness to young and old, farmers and non-farmers, government and private businesses, health and environmental agencies in order to protect or preserve our plant genetic resources, and the pristine natural resources of the island. There is now continuous availability of information related to current technologies in agricultural science, promotion of clean water conservation, and prevention of animal waste and contaminants from polluting our water sources and environment. In addition, the Dry Litter Waste Management Project was adopted and constructed for demonstration to swine operators on Palau because the traditional swine operation uses lots of water to clean the pens that washes away the animal waste to the water sources and the environment. This project promotes water conservation and prevents animal waste contaminants to the environment and water sources.

At CMI-CRE, food security and water quality and quantity have always been important issues that needed to be addressed. Extension staffs have worked hard as a team to find appropriate solutions through traditional methods and applied research to provide to their clients to use to improve their quality of live.

In the FSM, every household is affected by the incidence of non-communicable diet relate diseases directly or indirectly related to increased cost of health care, therefore, efforts to improve local food supplies affected all. There is a greater pressure on farmers to produce for family use or for the export market. Due to the costs of agriculture inputs from outside, some farmers have shown interest in adapting techniques and technologies that can be generated locally through extension and research advice. The economy has been severely affected by the increased cost of fuel, the cost of shipping food, feed and other commodities. Utility has become a major expense on the households, businesses, and governmental agencies.

What has been done

At PCC-CRE, farmers, school children, government officials were briefed on programs dealing with conservation of plant genetic resources, integrated pest management, water quality education and dry litter waste management during their visits to the R&D Station and also during civic activities. Thus, they learned new developments and technologies in agricultural science.

The CMI-CRE agriculture staff conducted workshops, made presentations at meetings, and visited homes and established demonstration plots to showcase cultivation of certain food crops.

In the FSM, vegetable variety trials were conducted to identify preferred and adapted varieties. Collection of local and imported germplasm of banana, sweet potato and taro is continuing and different types of media formulation and preparation for tissue culture has been developed for multiplication of these varieties of crops. A survey was conducted to identify and document plant parasitic nematodes affecting crops in Micronesia.

Results

In Palau, school children, youth and farmers are now aware of new developments and current technologies in agricultural science. Students who have participated in the water quality education campaign are now aware and knowledgeable with the water contaminants, water maintenance and the value of water sources to the islands. The students are more conscious about the contaminants that can be found in their drinking water. Government agencies that deal with regulating environmental issues including water are now referring clients to PCC-CRE for awareness and adoption of the Dry Litter Waste Management System and Rainwater Catchments system maintenance. Swine farmers who have visited the demonstrations showed interest to adopt the model and they want to tell their fellow farmers to adopt this model. Several farmers and school farms are also in the process of adopting the model for their piggeries.

At CMI-CRE, clients asked for information on gardening, composting, water testing and sanitization, and pest managements, so this information was provided via a weekly radio program. Through an established partnership with the Ministry of Resources & Development and the RMI Environmental Protection Authority, programs and resources have been shared to achieve our shared mission and goals.

At COM-FSM-CRE, thirty-four varieties of banana, twelve varieties of sweet potato and one variety of taro have been inoculated for micropropagation and conservation. More than 10,525 elite seedlings of different varieties of banana, taro and sweet potato were produced through micropropagation and nursery management system. Total 6,114 seedlings of different varieties of banana, taro and sweet potato were distributed to the interested farmers. Sow management techniques were developed and shared with swine farmers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
315	Animal Welfare/Well-Being and Protection
601	Economics of Agricultural Production and Farm Management
111	Conservation and Efficient Use of Water
205	Plant Management Systems
216	Integrated Pest Management Systems
136	Conservation of Biological Diversity
102	Soil, Plant, Water, Nutrient Relationships
133	Pollution Prevention and Mitigation
123	Management and Sustainability of Forest Resources
212	Pathogens and Nematodes Affecting Plants

Outcome #2

1. Outcome Measures

Number of program participants adopting recommended practices.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1200	345

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

At PCC-CRE, planting materials of root crops were distributed to farmers to increase their food production capacity and biological control agents were released in farms infested with insects that were affecting the growth and development of their crops. These activities hopefully would improve their productivity and yield in their farms. Ways to test, clean and decontaminate rainwater catchments are now available to the school children and the public. The dry litter waste management project has served as a model for swine farmers to promote water conservation and prevent environmental pollution.

At CMI-CRE, recent studies have stated that one of the leading causes of death for Micronesians is diabetes. Therefore, it is important that people begin eating and living healthy. Bacterial tests have indicated that 50% of the previous water tests indicated that the communities' collected rain water were not safe for drinking and cooking.

At COM-FSM-CRE, about 30 youths and adults have started establishing their farms and gardens, cultivating different varieties of banana, colocasia taro, sweet potato and noni. Nine youth teams (78 youths) were taught environmental science through water testing and later shared their information with adult members in the communities.

What has been done

At PCC-CRE, planting materials of root crops and biocontrol agents were given to farmers. School children were taught how to test, clean, and decontaminate their rainwater catchment's systems at home and in school. The dry litter waste management project also served as a showcase to farmers, school children and government officials on a very efficient way of preventing environmental pollution, conserving water resources and having a good source of compost material for crop production.

At CMI-CRE, planting materials and demonstrations on composting have been provided to interested farmers who have already identified space for their garden. Visits to homeowners and communities were made to explain to them about their test results and to provide demonstrations on how to clean their water catchments.

In the FSM, a market survey sponsored by Island Food Community of Pohnpei (IFCP) indicated an increase of sales of Vitamin A rich banana varieties. Extension staffs have been collaborating and working closely with the IFCP and other NGOs.

Results

At PCC-CRE, farmers now have the assurance that they can successfully grow crops every year thru tissue culture and micropropagation techniques.

At CMI-CRE, it was observed that farmers are maintaining their gardens and looking forward to harvesting time. Homeowners have followed the advice of extension agent and cleaned their catchments and roof gutters from debris, which was the reason the water tested positive for coliforms. People are also beginning to boil their water rather than drinking it straight from the catchments.

The availability of Vitamin A-rich produce in the market is a good indication of program participants adopting recommended practices. All participating households in a targeted village on nutrition program started to use more local food including yellow-flesh banana and swamp taro varieties and vegetables. Four families in a resource poor community in Yap are producing vegetables through appropriate hydroponics and composting systems.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
202	Plant Genetic Resources
133	Pollution Prevention and Mitigation
315	Animal Welfare/Well-Being and Protection
136	Conservation of Biological Diversity
601	Economics of Agricultural Production and Farm Management
111	Conservation and Efficient Use of Water
123	Management and Sustainability of Forest Resources
216	Integrated Pest Management Systems

Outcome #3

1. Outcome Measures

Number of established farms and farm related businesses by individuals and cooperatives.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	80

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

At PCC-CRE, the demonstration farms showcased the importance of proper nutrient management and other cultural technologies for successful banana production as well as preventing environmental pollution, conserving water resources and having a good source of compost material for crop production. Farmers are always interested to learn new production technologies.

In the Marshall Islands, imported fruits and vegetables are very expensive. Land space is limited in the Marshall Islands. Trainings are provided to interested people who want to start a garden in their backyards.

In the FSM States, most people are farmers in their own rights because that is the only way they can sustain their livelihood and stop depending on the outside world and most of them (men, women and children) engaged in farming of staple food crops such as banana, breadfruit, taro, cassava and varieties of green leafy vegetables. Individuals and families formed farmers cooperatives to sale their surpluses at the local and export markets.

What has been done

On farm trials have been established for staple food crop production, including new varieties of taro and banana that were imported and mass propagated by way of tissue culture. The distribution of planting materials continued to be made to farmers in the communities. Other demonstrations were established for the dry litter waste management and pig feed projects. And backyard gardens for the imported sweet potato varieties continued in many of the low-lying coral atolls for food security purposes with the assistance of agriculture staff.

Results

There is a decreasing dependent of imported food products as farmers, students and government and private sector officials established new farms and started relying on their own produce. Several new farmers markets have sprung up and farmers now have found places where they can sale their surplus produces.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
136	Conservation of Biological Diversity
205	Plant Management Systems
601	Economics of Agricultural Production and Farm Management
315	Animal Welfare/Well-Being and Protection
216	Integrated Pest Management Systems
202	Plant Genetic Resources
212	Pathogens and Nematodes Affecting Plants

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Appropriations changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

The administration of PCC has repeatedly refused to implement an important Western SARE approved component of the banana project, which has adversely affected the outcome of the project and the agency responsible for providing the biocontrol agent has difficulty rearing the good insect thus causing a much delayed implementation of the project.

At CMI-CRE, results indicated that people would like to continue working on their gardens and that they have learned a lot from the trainings they attended. During the El Nino drought, clients mentioned that they boiled their drinking water instead of drinking straight from the catchments. They clean out their roof gutters that connect directly to their catchments at least once a month.

At the COM-FSM-CRE, high increase in fuel prices has negatively impacted delivery of programs and increased the cost of farm inputs. On the other hand, there has been a positive effect as demand for local produce increased tremendously.

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

1. Evaluation Studies Planned

- Before-After (before and after program)
- Comparisons between program participants (individuals, group, organizations) and non-participants
- Comparisons between different groups of individuals or program participants experiencing different levels of program intensity.
- Comparison between locales where the program operates and sites without program intervention

Evaluation Results

The increased areas for crop production are due to the availability of planting materials and the reduced incidences of pests are due to the availability of biological control agents. There was also an increased understanding of IPM techniques and the improved growth rate of crops is due to adopted practices of continuous fertilization. An increase understanding of the dry litter waste management system has conserved water and prevents animal waste and contaminants from polluting water sources and the environment.

Key Items of Evaluation

Through the tissue culture technology, farmers are assured of continuous supply of planting materials that are disease-free and as a result of the dry litter waste management system, animal waste and other contaminants were prevented from polluting water sources and the environment.

Program #3

V(A). Planned Program (Summary)

1. Name of the Planned Program

Families, Youths & Communities

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
608	Community Resource Planning and Development	30%		30%	
801	Individual and Family Resource Management	10%		10%	
802	Human Development and Family Well-Being	30%		30%	
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures	10%		10%	
806	Youth Development	20%		20%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

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

Year: 2007	Extension		Research	
	1862	1890	1862	1890
Plan	12.4	0.0	0.0	0.0
Actual	15.4	0.0	3.4	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
298768	0	133116	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
89715	0	6500	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

At PCC-CRE, the after-school science program was conducted to 11 10th graders at an all-boys high school twice a week for a month. The boys learned the importance of Palau’s natural resources such as water, land, mangroves, forest and marine plants and animals. They also learned the importance of aquaculture and agriculture to people’s life and how to conserve Palau’s precious natural resources. The students were involved in hands-on activities, took field trips, and discussed topics and issues pertaining to marine lives and the environment. The Upward Bound Program math and science students and Koror State Boy Scouts visited the R&D Station where they were exposed to various programs on biodiversity, aquaculture and fish biology, invasive species, insects, tissue culture, and water quality. In addition to the lab activities, the students had field trips to the sites where the actual activities are implemented. They learned important information from the tours. A half-day nature’s walk to the waterfall with about forty boy scouts members was provided and the boys had shown their appreciation of Palau’s forest, rivers, streams and waterfalls. The nature walk was part of the program that promotes environmental and marine science programs. Upward Bound students participated in a half-day invasive weed (Mile-a Minute weed) clean up at college’s old taro patch. They were shown different methods of killing or eradicating invasive weeds from spreading and killing food crops.

At CMI-CRE, a new 4-H extension agent was hired and she started working with at-risk students from the fourth, fifth and sixth grades of two public elementary schools and provided lectures on health and social issues. She also visited a neighboring atoll and visited two public elementary schools there to work with students in the lower grades and worked with a church youth group and shared the process of preparing and preserving breadfruit into a traditional dish called Bwiro. Preparing Bwiro is a long and tedious process, therefore the art of making it no longer appeals to the younger generations. The objective of this project was to introduce to the youth the process so that they can learn and be able to prepare it themselves for their families and for social gatherings.

Implementing the CYFAR project is one of the responsibilities of the 4-H/Youth Extension Agent. She had met with NGOs and appropriate governmental agencies on the CYFAR project.

At COM-FSM-CRE, different hands-on training workshops were conducted to homemakers and women groups in the communities on new knowledge and skills on food processing techniques and in sewing and embroidery to enable family clothing production and small scale entrepreneurship to produce new and improved products for family use and for income. Entrepreneurial development training and business skills was provided to handicraft artisans and community groups. Food processing demonstrations were given to adult and youth clientele to produce jams from fruit, flour and chips from root crops and breadfruit to allow for longer self life at home and to encourage entrepreneurship through sales.

2. Brief description of the target audience

Target audience included students in elementary, high school and college; some of whom are members of boys and girls and boys scout clubs and students with the Upward Bound Program. Other target audiences were young mothers and other family members, traditional and elected officials, church leaders, and staff from governmental and non-governmental organizations.

V(E). Planned Program (Outputs)

1. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	900	2700	1200	3600
2007	450	2000	500	3000

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

Patent Applications Submitted

Year	Target
Plan:	0
2007 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan			
2007	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of training conducted targeting youths.

Year	Target	Actual
2007	12	9

Output #2

Output Measure

- Number of training conducted targeting families and youths in the communities.

Year	Target	Actual
2007	6	4

Output #3

Output Measure

- Total number of youth clubs organized.

Year	Target	Actual
2007	3	2

V(G). State Defined Outcomes**V. State Defined Outcomes Table of Content**

O No.	OUTCOME NAME
1	Number of youths with increased awareness and understanding of roles and relationship with parents.
2	Number of families adopting interpersonal skills to improve quality of life and harmony in the family.
3	Total number of families and youths benefiting from the use of learned skills.

Outcome #1**1. Outcome Measures**

Number of youths with increased awareness and understanding of roles and relationship with parents.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	900	415

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

At PCC-CRE, programs strived to reach the goal of promoting the science programs to students who were struggling with science or who have wrong impressions of science. Most of the teachers in science courses are foreigners and that shows that few native Palauans have science background from college. In that case, the program is trying to change the mentality of the students about science so the activities that were conducted are for educating the students more on science that are relevant to the island ecosystem.

Youths and their families gained knowledge and awareness of science and marine science impacts to the island. Relationship between families and youths were strengthen through established close working relationship and increased respect and trust for each other.

At CMI-CRE, a lot of young children were raised by their grandparents and they do not have a strong relationship with their parents. Youth programs emphasized appropriate behaviors and social values of respecting elders and cooperation with other community members.

In the FSM, youngsters exhibited respect for parents, for village clubs and schools, and for the island communities. Twenty-seven youths developed a better understanding of practical science application, 2 have entered college in science related studies. Community members in all states became aware of the importance of clean water through the outreach campaigns of each youth group. Adults began developing entrepreneurial capacity or experienced family savings due to improved food processing and/or the sewing training on Kosrae. One group of 20 women in Chuuk State began producing and selling handicrafts and clothing.

What has been done

Students who participated in the programs have been evaluated and the results showed that the students did learn from the programs and activities that were offered to them. The students did share the information to their friends because when they were recruited, they were already familiar with the program. Students show that they do know what's happening in the environment because they can answer the questions concerning the environment and marine science. After school programs were provided where students learn personal values, local customs and culture, and family responsibilities.

Other programs offered to youths to promote a sense of personal responsibility and community involvement were gardening, sports activities, creative art and craft, and community beautification. There were also youth club activities on leadership and volunteer development. Basic, intermediate and advanced sewing were provided to students and young mothers as way of earning an income and provide for family clothing needs.

Results

Students are now more involved with community clean up, recycling practices and some of them started participating in environmental issues contests and debates. Students are even sharing the information to their younger or older siblings and even their parents. Evidence of the programs shows that the students, who are now extending their education to college level are increasing in the science field. Schools are also starting their after school science programs at their site to motivate the students to like science because that students from that particular school have participated in the program. Students now are becoming more aware of the ill effects of littering and trashing the environment.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development
802	Human Development and Family Well-Being
608	Community Resource Planning and Development
801	Individual and Family Resource Management

Outcome #2

1. Outcome Measures

Number of families adopting interpersonal skills to improve quality of life and harmony in the family.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	300	626

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In this day and age, there is a decrease appreciation of the traditional customs and culture by youths as they adopted the Western lifestyles. This has led to decrease in respect for the parents and elders in the communities and as a result, teenage pregnancy has skyrocketed and juvenile delinquency is a major concern for families, traditional and government leaders.

What has been done

After school programs have been conducted where resource persons from collaborating agencies worked with youth leaders in providing information to youths on personal and family values. Programs included awareness of personal and community responsibilities and civic obligations for community improvement.

Results

There is an increased in the number of children who participated in youth programs such as boys and girls scout and after school programs. Additional students were actively participating in community clean up and beautification activities and both male and female youths had enrolled into the Upward Bound program where they learned survival skills and how to stay away from drugs and alcohol and to actively involve in civics activities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being
801	Individual and Family Resource Management
806	Youth Development
608	Community Resource Planning and Development

Outcome #3

1. Outcome Measures

Total number of families and youths benefiting from the use of learned skills.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	300	288

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Youngsters who have little self-confidence exhibit negative behaviors to camouflage uncertainties and negative self-worth. The youth groups brought information to their community to raise awareness and improve the health standards of the water resources.

What has been done

4-H mini-projects intervene in providing positive activities to redirect youths from idleness and a possible wrong road. Girl Scouts learned entrepreneurial skills and improved nutrition. Nine groups of youth addressed the water quality concerns and raised the community awareness by presenting their information in community forums. Undisciplined youth in Chuuk were re-introduced to better study and living habits and returned to school.

Results

Positive outlook by youngsters about themselves, their peers, their families and their communities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
802	Human Development and Family Well-Being
806	Youth Development
801	Individual and Family Resource Management

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

External factors which affected outcomes of programs included the increased in fuel cost that made it quite difficult for staff to visit locations where programs are being implemented. In addition, tropical storms and typhoons prevented visits to be made to the outer islands where staff were to go on boats to conduct meetings and monitor their projects.

In the FSM, natural disasters and lack of funding are the primary external causes affecting outcomes. Long term medical leave by one agent reduced the project effects in one state. Delays in identifying a suitable candidate for an open extension position in another state reduced the annual impact.

In the Marshall Islands, the only local airplane was grounded for several months and lack of transportation to the outer islands affected implementation of programs.

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

1. Evaluation Studies Planned

- Before-After (before and after program)
- Comparisons between program participants (individuals, group, organizations) and non-participants

Evaluation Results

Key Items of Evaluation

Testing at the COM-FSM campuses indicated that students are ill prepared to enter college and a high percentage do not complete the college programs. The CRE programs must help to address the low level of education and the high number of youth being under prepared for employment either within the FSM or as out migrant looking for work. An intensive recruitment campaign for laborers to fill construction workers positions is now under way.

Program #4

V(A). Planned Program (Summary)

1. Name of the Planned Program

Food, Nutrition & Health

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
501	New and Improved Food Processing Technologies	5%		25%	
502	New and Improved Food Products	5%		25%	
701	Nutrient Composition of Food	12%		10%	
702	Requirements and Function of Nutrients and Other Food Components	15%		0%	
703	Nutrition Education and Behavior	12%		10%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	16%		10%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	10%		10%	
724	Healthy Lifestyle	25%		10%	
Total		100%		100%	

V(C). Planned Program (Inputs)

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

Year: 2007	Extension		Research	
	1862	1890	1862	1890
Plan	10.0	0.0	0.0	0.0
Actual	7.7	0.0	1.7	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
149384	0	68608	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
44858	0	1200	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

At PCC-CRE, two research projects were implemented; one on processing of root crops and the other on product development for food security. Seventy processed food products were developed utilizing root crops (taro, cassava and sweet potato comprising 34 dried, 5 frozen, 8 baked, 6 fermented and 17 cooked food products). Likewise, 21 processed foods were developed utilizing fish, banana and coconut as raw materials. All 91 food products have been undergoing storage studies using suitable packaging materials at different storage conditions such as ambient, dry, freezing, and refrigeration temperatures. Extension work was likewise conducted by holding three food technology classes, and conducting taste tests of food products serving 1023 clients, 560 of them were adults and 454 youths.

One Adult EFNEP training program was conducted for parents of Head Start students, three Youth EFNEP programs to students at two high schools and one Youth EFNEP program was conducted for the Koror State Boy Scout members. Topics taught in these training programs included choosing healthy foods using the five food groups and the new "My Pyramid", menu planning, reading food labels, home food safety, which included safe food handling and storing, personal hygiene and safety tips in the kitchen, healthy foods on limited budget, and preparation and cooking of selected healthy recipes to enable participants to put into practice the knowledge and healthy eating skills learned.

At CMI-CRE, the EFNEP staff conducted three training workshops where a total of 80 men and women participated. A total of 12 lessons and 6 recipes were presented and reinforced with cooking demonstrations of the recipes. The EFNEP staff also made presentations on nutrition and food safety at local events and continued to collect local recipes as required for her projects with the ADAP Healthy Living in the Pacific Islands (HLPI) project.

At COM-FSM-CRE, the 12 EFNEP lessons on nutrition and cooking demonstrations were the methods used for dissemination of information on food, nutrition, and human health. A range of topics presented during EFNEP training included the 3 general food groups, nutrient sources and values, functions and symptoms of protein, starch, vitamins and minerals, balanced diets, food safety, and non-communicable food related conditions such as diabetes and hypertension. In addition, all extension sites were actively collaborating with government agencies to present nutrition and health related information at hospitals, schools and at public fairs and community meetings. Agents in Pohnpei have supported the Island Food Community of Pohnpei with great success in food use surveys, nutrient analysis of Vitamin A rich local foods and food preservation through both traditional and introduced methods. Collaboration with Island Food Community of Pohnpei (IFCP) has been recognized in international publications and presentations. Group activities included healthy recipe development and practice of healthier food preparation techniques aimed at reducing NCDs and to encourage healthier lifestyles.

The 2007 Go Local campaign was spearheaded by IFCP and the collaborating agencies with the display of local foods, cooking demonstrations and posters on healthy eating, healthy lifestyle and promoted the use of local foods during the World Food Day. Agents at all sites participated in Food Handler/Food Safety training programs for hotel, restaurant, hospital, school and other public institution food handlers. Home gardening training is included in this program area as support to dietary improvement in the home.

There are serious chronic disease problems in FSM and these are considered to be epidemic proportions. Diabetic complications commonly include blindness and amputations of limbs. In Kosrae, 90% of surgical admissions are diabetic-related and amputations of limbs are common. A dietary study carried out in 2001 in Kosrae (Englberger, 2003) involving a random sample of 65 children and 65 women showed that not a single child or woman met the estimated Vitamin A requirements. The study examined food preferences and investigation for vitamin A –rich foods that might be promoted to alleviate the VA deficiency and increasing health problems in Kosrae. Provitamin A carotenoid-rich foods can protect against VA deficiency. Epidemiological research suggests that carotenoid-rich food may also protect against chronic diseases including diabetes, heart diseases and certain cancer. CES staff are concerned about the health issues and worked closely with department of Health Services, Agriculture Department and Department of Education to educate the public on importance of local food production and consumption.

By American standards, the population is very poor and poorly educated in academic and life skills. Throughout the FSM similar conditions exist. No other services provide education and training at the appropriate level to improved nutrition, balanced diets, production and identification of healthy foods and preventative measures to improve health through diets, food security and food safety.

2. Brief description of the target audience

Target audience were participants who attended the 3 food technology training programs in Palau. The profile of the participants included a wide spectrum of groups like women in the food business, hotel/restaurant managers, employees, teachers, homemakers, farmers, and entrepreneurs. The target audience for food products include tourists, men, women, children, youth, students, parents, civic groups, church groups, micro-enterprise owners and the general public interested in food processing.

In the Marshall Islands and the FSM States, both the adult and youth EFNEP programs targeted families and individuals with limited income, young mothers with young children, individuals with little school background, food handlers, women's groups, individuals with special needs, pregnant and at-risk mothers.

V(E). Planned Program (Outputs)

1. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	600	3000	300	1500
2007	1813	5700	1658	1910

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

Patent Applications Submitted

Year	Target
Plan:	0
2007 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan			
2007	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of community workshops conducted.

Year	Target	Actual
2007	12	9

Output #2

Output Measure

- Number of coalitions strengthened.

Year	Target	Actual
2007	6	8

Output #3

Output Measure

- Number of intervention conducted to individuals or small groups.

Year	Target	Actual
2007	134	268

V(G). State Defined Outcomes**V. State Defined Outcomes Table of Content**

O No.	OUTCOME NAME
1	Number of program participants who increase awareness of nutrition related health issues.
2	Number of program participants adopting recommended practices after completing educational programs.
3	Annually increase the number of healthy food snacks or lunch programs in schools and communities.

Outcome #1**1. Outcome Measures**

Number of program participants who increase awareness of nutrition related health issues.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	900	956

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

The prevalence of non-communicable diseases has been escalating during the past decade. The population of FSM in fy'07 was estimated at 107,000. In Chuuk State alone, of a population of 53,595, the number of patients who go to Public Health for diabetes was 6,547 and 9,013 for hypertension. The Needs Assessment Survey conducted in 2003-04; revealed that 54% of the 851 subjects were overweight and very overweight. More people in the survey were eating only the energy and body building foods and do not consume vegetables and fruits. More people combine local as well as imported refined foods in their diet. There is also big consumption of foods high in saturated fats and sugars. These statistics are representative of 50% of the FSM population. Everyone cares!

With people's diet too high in sugars, sodium and saturated fats and very low in fruits and vegetables, the rate of non-communicable disease is escalating everywhere. If this trend continues, the end results is that there will be more cases of cardiovascular diseases, obesity, hypertension and significant disability from these chronic diseases. Another problem was food poisoning or food-borne illnesses. Most of the food consumed in parties, traditional ceremonies, family and public gatherings, including funerals and important events were prepared and packed hours before they were actually served without proper storage.

Participants of food technology classes had gained knowledge about processing food products from local resources. Food products taste test evaluators such as tourists, men, women, children, youth, food business entrepreneurs, hotel and restaurant managers, students, teachers, parents, employees, farmers, local leaders, women's groups, student associations, church groups and the general public have increased their knowledge and awareness of these different processed foods that could be prepared from root crops, fish, banana, and coconut. The participants in the formal trainings and food evaluators became aware of new food products that have potential contributions in food security and business development.

What has been done

A three-week (two hours per day) food technology-training course offered to the public as outreach services of PCC-CRE was conducted in three States. 44 participants attended these. Taste tests of food products were conducted during visits of different groups to the R&D Station, Vocational Education Week, Earth Day Celebration, and Olehotel Belau Fair.

Programs on Adult and Youth EFNEP continued to be conducted by EFNEP staffs throughout the islands to women groups and school children to educate them on healthy eating, healthy diet utilizing local food, and proper food handling and storage.

Other training programs were on proper food handling and storage. Through the ADAP HLPI project, health and nutrition staff continued to provide food safety, nutrition, and health education programs to youths and families throughout the islands in Micronesia.

Results

Results showed that participants in formal Food Technology Training Course have learned how to process about 50 products from local resources like root crops, fish, banana and coconut. Food product evaluators of different age groups, genders and affiliations increased their awareness on the utilization of local crops into value-added processed food products.

According to CRS5 Behavior Checklist Summary Report, 27% or 15 of 56 adult participants showed improvement in planning meals, making healthy food choices, preparing foods without adding salt, reading nutrition labels and having children eat breakfast. For youth, 91% of 68 increased their ability to select nutritious foods.

About 30-50% of homemakers started to apply learned knowledge to their families, especially on food preparation by adding fruits and vegetables to the family meals depending on group and location. About fifteen percent already learned how to read food labels by doing this in the stores and sharing with the storekeepers the problem of selling expired food to customers. About fifty percent of the school children and out of school youths learned the names of the different kinds of local food and the nutrient content of each food by sharing with other family members.

4. Associated Knowledge Areas

KA Code	Knowledge Area
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
724	Healthy Lifestyle
502	New and Improved Food Products
703	Nutrition Education and Behavior
702	Requirements and Function of Nutrients and Other Food Components
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
701	Nutrient Composition of Food
501	New and Improved Food Processing Technologies

Outcome #2

1. Outcome Measures

Number of program participants adopting recommended practices after completing educational programs.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	600	593

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

People who had hands on practice in the processing of food products as well as those who have evaluated the food items by taste tests, demonstrated interest in increasing their productivity in food provision, as well as opening their minds to go into food businesses, having been armed with acquired skills and product ideas for sale.

It has always been difficult to reverse the change in attitudes toward fast and imported processed food, which has become a habit to so many people in the islands. There is a huge change in the preference of imported processed food over local food, which has contributed to an increase in NCDs and the escalating cost of health care.

Surveys showed a high rate of vitamin A deficiency is associated with poor eating habits. Nutrition agents conducted educational programs on human nutrition in order to raise awareness among homemakers and promoted balance diets to reduce nutrition related illnesses.

What has been done

Nutrition agent conducted trainings and workshop to homemakers on human nutritional issues. One major community evaluation and intervention effort was conducted in collaboration with other agencies in Pohnpei. Results have been published internationally through the Food and Agriculture Organization of the United Nations and through the Secretariat of the Pacific Community. Nutrition agents collaborated with the FSM National Government to establish health and nutrition guidelines, food labeling requirements and nutrition standards for the Micronesian population. The 'Go Local' theme to promote the value of local produce was promoted by all agencies addressing the nutrition concerns of the nation.

The participants of the three Food Technology Classes practiced what they have learned by providing their families with novel foods from abundant local resources like root crops, fish and fruits. Some participants prepared selected foods for custom practices. Those who have tasted the food products during civic events signified their interest to learn more about these local products.

After taking the Food Technology Classes, follow up encounters with participants was conducted through personal visits and telephone conversations. Linking the processors with prospective buyers was also explored.

Introduction of new recipes using local food products and demonstrating these new recipes were part of extension education programs on healthy living and healthy diet. These programs are important to the health of people in small island communities whose diets have been influenced by fast food with low nutrition content.

Results

As a result of the follow up activities, two participants working at the PCC Cafeteria started preparing some of the food products that they have learned from the class. These processed foods were served to the students and those who take their meals at the Cafeteria. A storeowner prepared foods for sale. One participant prepared tapioca pancake mix and served them to 50 LEEP students during a 4-week camping activity. Eight other participants prepared some of the foods for traditional events such as funerals and birth ceremony.

People have come to appreciate the value added products from their staple food crops as a result of their gained knowledge in processing them.

Thirty percent of the homemakers started to apply learned knowledge to their families especially on food preparation by adding fruits and vegetables to their family meals. About fifteen percent already learned how to read food label by doing this in the stores and sharing with the storekeepers the problem of selling expired food to customers. About fifty percent of the school children and out of school youth learned the different kinds of local food and the content of each food by sharing with their families and friends.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
724	Healthy Lifestyle
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
701	Nutrient Composition of Food
502	New and Improved Food Products
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior

Outcome #3

1. Outcome Measures

Annually increase the number of healthy food snacks or lunch programs in schools and communities.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	6	11

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

A dietary study carried out in 2001 in Kosrae (Englberger, 2003) involving a random sample of 65 children and 65 women showed that not a single child or woman met the estimated Vitamin A requirements. The study examined food preferences and investigation for vitamin A -rich foods that might be promoted to alleviate the VA deficiency and increasing health problems in Kosrae. Provitamin A carotenoid-rich foods can protect against VA deficiency. Epidemiological research suggests that carotenoid-rich food may also protect against chronic diseases including diabetes, heart diseases and certain cancer.

The processing of local foods gives support to the local tourism industry, the lifeblood of the economy, by providing foods for tourists for them to consume and patronize. This activity also addresses the problem of low agricultural productivity and large food importation in Palau. Production and utilization of local foods will result in self-sufficiency and food security.

Large food importation in the islands is currently decreasing the Gross Domestic Product (GDP) from the agriculture sector. Processing of local food resources is made available as outreach services attempt to entice and train women and entrepreneurs to go into food business enterprise. The development of business enterprises has chain reaction and synergistic effects in helping people meet the needs of tourists and locals for good quality food items, creating job opportunities, increasing tax revenues, reducing food imports, and ensuring food security, which ultimately redound to improved quality of life of the people.

What has been done

Nutrition and food safety training workshops were conducted throughout the four states. Group members shared tips and knowledge in preparing healthy food for daily consumption. The 'Go Local' theme to promote the value of local produce was accepted by and promoted by all agencies addressing the nutrition concerns of the nation. Nutrition education classes were given in schools and as support for the Early Childhood Development programs. Where lunch programs are available in the schools and communities there is a greater offering of local produce.

In order to keep track of the teaching activities conducted among the participants, changes in condition outcome measures was investigated. List of participants and food products learned from the courses that are being marketed were determined.

Results

There was an increase in the number of healthy food snacks or lunch programs in schools and communities. Observations of local markets and quick lunch stands indicate a greater demand for local produce.

One participant has successfully embarked on the commercialization of Taro Sub Sandwich. Another continued to prepare taro wine and selling the product. Tapioca steamed cakes were sold at the Bethlehem market during payday weeks. A participant sold tapioca cookies and cakes during civic events like Tourism Week. One participant is producing tapioca starch for sale at grocery stores. A manager of a big hotel indicated interest in serving local foods to their guests after they tasted the food products that were taught to the participants of the Food Technology Course.

Different recipes of local food content are now being accepted by an increasing number of people in the communities. Varieties of banana and taro that have a high nutrient and Vitamin A content and easy to cultivate have been widely accepted for their taste, which is contributing to a healthy and well-nourished population.

4. Associated Knowledge Areas

KA Code	Knowledge Area
502	New and Improved Food Products
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior

711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sourc
724	Healthy Lifestyle
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
501	New and Improved Food Processing Technologies

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Strict government regulations and expensive permits to obtain licenses to operate small businesses hampered entrepreneurs who would like to go into the food business right away.

The actual number of targeted clients was not met due to holidays such as Thanksgiving, Christmas and New Year, state legislators campaigns, funerals, traditional customs, public priorities such as Constitutional Day and Independence Day that involved all 16 states of Palau. Most people were occupied in preparation for exhibitions, dances, chants, arts and crafts, debates and many other things. It's very difficult to get more than 10 women together in one place for a day or a week even just for one hour. Agents are having a hard time recruiting clients and especially this year with general election coming up in November 2008.

In addition, the sea level rise has destroyed some of the staple food crops in some outer islands, which are much healthier than imported processed foods. Poverty dictates choices of foods by price and not nutrient content, and public policies, government regulations and appropriations were not always in favor of the second class citizens, as well as typhoons and other natural disasters.

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

1. Evaluation Studies Planned

- Before-After (before and after program)
- During (during program)
- Comparisons between different groups of individuals or program participants experiencing different levels of program intensity.
- Comparison between locales where the program operates and sites without program intervention

Evaluation Results

Results of formal evaluation by participants of Food Technology Classes showed that all of them benefited from the activity, for having acquired skills to process food products from local resources. During the closing ceremonies / graduation day, the participants were given opportunities to voice out their favorable comments. They also prepared the food products that they have learned from the course for visitors to comment on. Food evaluators in taste tests recorded their comments in a logbook after signing in. Most tasters commented that the products were very acceptable and promising for business ventures.

Adult in Nutrition practice: 98% of 57 participants more often planned meals in advance; 96% more often thought about healthy food choices when deciding what to feed their family; 30% more often prepared food without adding salt; 95% more often used the "Nutrition Facts" on food labels to make food choices; and 95% reported that their children ate breakfast more often. In food safety practices, 60% more often followed the recommended practices of not allowing meat and dairy food to sit out for more than two hours; 60% always follow the recommended practice and 70% more often followed the recommended practice of not thawing foods at room temperature and 70% always follow the recommended practice. For youth, 90% of 48 youth now eat a variety of foods; 93% of 173 increased knowledge of the essentials of human nutrition; 91% of 68 youth increased their ability to select low-cost and nutritious foods and 92% of 104 improved practices in food preparation and safety. 24-hour diet recall and checklist were used to evaluate adult participants and questionnaire comprised of 10 questions about nutrition and food safety was used for pre and post tests with youth.

Key Items of Evaluation

Educational level of program participants is still low, low income level is reflected in food choices, and influence of culture on food choices at home and at social functions are some areas to be considered.