

2009 College of Micronesia Combined Research and Extension Annual Report of Accomplishments and Results

Status: Accepted

Date Accepted: 06/02/2010

I. Report Overview

1. Executive Summary

At the College of Micronesia, programs were implemented through the cooperative research and extension offices 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 2009 addressed economic, social, and ecological issues that are important to the livelihood of people on small islands. Programs continued to disseminate new knowledge and technologies to sustain and improve the quality of life of all Micronesian citizens in the Republic of the Marshall Islands (RMI), Federated States of Micronesia (FSM), and Republic of Palau (ROP).

With the outbreak of H1N1 or swine flu coupled with the seasonal flu on most islands, awareness programs on proper hygiene and healthy lifestyle were important to safeguard the well-being of citizens. The rising sea level due to climate change is of major concern for the many low-lying coral atolls and the increasing cost of food and fuel has forced people to make adjustments necessary for the new economic, social and environmental conditions and find new methods of farming of crops, livestock, and certain aquaculture species. Research and development activities promoted agricultural productivity and food security, self-sufficiency, and enhancing the quality of life for Micronesians. The utilization, processing and development of products from staple food crops that are acceptable to the native population and in local markets continued. Trials on taro varieties (*Cyrtosperma* spp. & *Colocasia* spp.) for their suitability to grow under atoll conditions and the micro propagation of elite (disease-free and high yielding) varieties that will improve the quality and quantity of certain varieties for the export market were ongoing. A research project looked at determining comparative resistance of different taro varieties to the taro leaf blight disease. Germplasm of staple root crops, namely 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.

Aquaculture demonstration projects continued with new advances in technology to transfer the technical know-how to Micronesians to enable them to actively engage in projects that could provide alternate income generation with the overall aim of improving the socio-economic conditions of islanders. Efforts were made to initiate and improve site-specific multi-species aquaculture and transfer simple and appropriate feeding technology for targeted aquaculture species to farmers to formulate and prepare their own feeds. Other projects provided stock enhancement to replenish depleted stocks. A joint project that got underway was to develop the technology for the farming of sea cucumbers in the FSM and RMI to enable the replenishment of lagoons and reefs depleted as a result of over harvesting.

Outreach programs continued on issues ranging from food safety and quality, food security, strengthening families and developing youth, water quality, and managing limited natural resources and the environment. Health and nutrition programs continued on the importance of healthy lifestyles, which included physical activity and consumption of safe, nutritious local food to combat obesity, diabetes, heart diseases and NCDs. The outbreak of melamine infected food from China provided a wake-up call on how vulnerable we are to food borne diseases and that we must be vigilant in combating such diseases. A project on endangered species of banana produced rare banana varieties to support nutritional needs for Vitamin A among children and adult. The youth development programs provided information to increase knowledge and appreciation of marine and terrestrial flora and fauna. Summer programs provided information on basic life skills on small islands. More students are exposed to computers, which provided the opportunity to use the Internet as an introduction to electronic connectivity and information gathering. Water quality education programs continued as collaborative efforts with international and regional organizations, government agencies, and community groups. Sustainable agriculture and IPM programs provided farmers information on agricultural production practices that protect the fragile island ecosystem integrity and biodiversity. Programs continued on resistant crop varieties and practical biological pest control measures to provide useful tools for stakeholders to combat crop pests and diseases and increase productivity. The use of beneficial organisms was emphasized to reduce pest threats on crops. Biological control agents, such as mirid bugs (*Cyrtorhinus fulvus*) to control taro leafhopper, *Aphidius colemani* on melon aphid, and predatory mites (*Neoseiulus longispinosus*) on cassava spider mites. Biological control of the *Mimosa diplotricha* continued with psyllid insects.

Multi-state and multi-institutional efforts continued through the alliance 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 collaborating with Pohnpei CES staffs. There is a continuing shortage of necessary human resources and professional staff, hence 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. Other capacity building activities included sustainable agriculture workshops, tissue culture and nursery practice, IPM, health and nutrition, and basic sewing attended by farmers, homemakers, the youth and adult sectors of the society and the underprivileged.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	49.1	0.0	11.9	0.0
Actual	54.8	0.0	11.5	0.0

II. Merit Review Process

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

- Internal University Panel
- External University Panel
- External Non-University Panel
- Combined External and Internal University External Non-University Panel
- Expert Peer Review

2. Brief Explanation

Project proposals were developed as a result of meetings and consultation with stakeholders and also based on existing plans of work for research and extension. The proposals were submitted to a publication, merit or scientifically acceptable peer review committees for comments and suggestions. Other special project proposals were subject to peer review within and outside of the colleges by other stakeholders and also subjected to review by advisory committees. Proposals were also posted on websites. Once comments were incorporated into the proposals, the Vice-President of Cooperative Research and Extension then submitted them for review and approval at each college. Final proposals were submitted to the AES/CES Interim Director through the college Presidents for approval.

III. Stakeholder Input

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

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Survey of selected individuals from the general public

Brief explanation.

When meetings were called to discuss research and extension planned activities, stakeholders such as community leaders, farmers, homemakers, traditional leaders and political leaders, were directly involved in the discussions. Many of their suggestions and comments were included in the planned research and extension activities. In some

cases, research activities were done in farmers' field and in so doing farmers participated directly in the implementation of projects. Scheduled meetings were also held in the communities to inform community leaders, farmers, homemakers, political and traditional leaders about progress being made with research and extension activities. During these meetings, stakeholders were given the opportunity to ask questions, make comments, share traditional knowledge and even suggested changes or other activities that are more important and relevant to the needs of their communities. Other methods of encouraging stakeholder participation were done through direct meetings and workshops with different sectors of the population to solicit their inputs in identifying priority issues.

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

1. Method to identify individuals and groups

- Use Advisory Committees
- Use Internal Focus Groups
- Use External Focus Groups
- Open Listening Sessions
- Needs Assessments

Brief explanation.

Farmers, homemakers, political, traditional and community leaders were requested to identify names of individuals or groups in their respective communities who should be attending meetings and workshops. Other individuals were those working on similar programs with other agencies and those recommended by peers. Those identified were informed via letter, radio or through personal visits when meetings or trainings were held. Other methods were through strategic planning meetings, interagency collaboration, community associations and direct client contact and needs assessment surveys directly in the field. Meetings/discussions were also held with school authorities, church leaders, parents and the general public on the implementation of community projects.

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

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Survey of traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals
- Meeting specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public

Brief explanation.

Some of the methods used for collecting stakeholder input were one-on-one visits conducted in the communities and through discussions and interviews with community leaders. Surveys and field observations in addition to farmers association and other community meetings were also used. Youth programs were developed through discussions with schools, church and community groups and through direct assistance to government agencies such as the Early Childhood Education (ECE) recruitment programs. Stakeholders were directly involved in identifying positions and hiring of new upper level staff. Other methods used were questionnaires, need assessments, Board of Regents reviews, annual retreat, cabinet level meetings and student recruitment campaigns.

3. A statement of how the input will be considered

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

Brief explanation.

During meetings with stakeholders, suggestions, comments and modifications from them were sorted out and those with positive impacts to research and extension project proposals were incorporated. It also helped with planning and prioritization of the next year's planned program activities. The review of strategic action plans, hiring of senior research and administrative positions, and focusing on special projects were also used to collect stakeholder inputs. State agencies assisted in developing programs and focus budgets for activities supported by matching funds through MOAs.

Brief Explanation of what you learned from your Stakeholders

We learned that farmers, homemakers, community groups and others are good sources of traditional knowledge which can be applied and used to improve crop production and increase value-added food products. Entrepreneurs interested in business development lack marketing strategies and training necessary for them to be successful.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
989758	0	827357	0

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	808428	0	732023	0
Actual Matching	192253	0	65808	0
Actual All Other	0	0	0	0
Total Actual Expended	1000681	0	797831	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from				
Carryover	766391	0	243195	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

V(A). Planned Program (Summary)**Program # 1****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	10%		5%	
136	Conservation of Biological Diversity	10%		10%	
301	Reproductive Performance of Animals	20%		20%	
302	Nutrient Utilization in Animals	10%		10%	
307	Animal Management Systems	20%		20%	
308	Improved Animal Products (Before Harvest)	10%		15%	
315	Animal Welfare/Well-Being and Protection	10%		10%	
511	New and Improved Non-Food Products and Processes	10%		10%	
	Total	100%		100%	

V(C). Planned Program (Inputs)**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	6.9	0.0	5.0	0.0
Actual	7.5	0.0	2.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
110473	0	127198	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	34000	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**

PCC: About 15,000 fingerlings of grouper were produced and distributed to fish farmers for grow out in cages. Natural spawning was observed every month for another species of rabbit fish, *Siganus lineatus*. Eggs collected yielded about 450 fry

after 45 days. Another run showed improved survival rate to 5,200 pieces of fry. About 4,000 pieces of fry were stocked in private fish cages for nursery and grow-out trials. Rabbit fish fed with high protein commercial prawn feeds had fastest growth rate both in the nursery and grow-out stages compared to other feed sources. A series of larval rearing for mangrove crabs were conducted, however the crab larvae survived only up to 5 days after hatching. Efforts to improve the survival rate are undertaken. Wild milkfish fry caught have already grown into broodstock size. The body weights now ranged from 1,500 to 1,850 grams. Program staffs have been assisting a government - owned hatchery in the larval rearing of groupers and maintenance and production of natural food organisms. Technical assistance to solve problems such as fish diseases and mortalities were provided.

CMI: A new aquaculture hatchery was dedicated and ready for operation. A visiting professor from Delaware State University spent three months conducting hatchery research investigating growth differences among the pearl oysters (*P. margaritifera*) stocked at three different densities. Another study was on oyster immunological and pearl oyster seeding trial. The aquaculture staffs, who were assisted by the professor, monitored the oysters in the farm and hatchery. Both elementary and high school students visited and toured the aquaculture facility.

COM-FSM: In one county, a WSARE proposal was approved for a trial/demonstration to improve chicken egg production using a feed from a mixture of the invasive tilapia fish species with other local ingredients. In another, black pearl extension work continued on a commercialization for training of local farmhands to maintain the farms and the pearl hatchery program continued its activity to simulate mass juvenile production for implementing commercial farming at three outer islands. Pearl research continued with the grant from the Center for Tropical and Subtropical Aquaculture (CTSA) to improve pearl quality by grafting and husbandry methods. The sea cucumber project continued on the hatchery technology transfer and resource enhancement in Pohnpei. The wild stock surveys were conducted on a high-value commercial species, the sandfish (*Holothuria scabra*), which indicated high resources in Pohnpei lagoon. Several thousand juveniles were produced successfully of which grow-out work was implemented by a land-based method.

2. Brief description of the target audience

Community fish farmers, government officials, elementary, high school and college students, researchers and extension agents, international and regional organizations, commercial businesses, foreign investors, NGOs and local residents.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	450	2000	300	2000
Actual	468	1500	950	1336

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

Patent Applications Submitted

Year: 2009

Plan: 0

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	0	
Actual	0	0	0

V(F). State Defined Outputs**Output Target****Output #1****Output Measure**

- Number of demonstration farms established.

Year	Target	Actual
2009	6	8

Output #2**Output Measure**

- Number of publications for lay use.

Year	Target	Actual
2009	4	4

Output #3**Output Measure**

- Number of conference paper and publication/presentation.

Year	Target	Actual
2009	5	2

Output #4**Output Measure**

- Expected Professional Journal publications.

Year	Target	Actual
2009	6	1

Output #5**Output Measure**

- Expected Gray Literatures.

Year	Target	Actual
2009	6	3

Output #6

Output Measure

- Expected publications for lay use.

Year	Target	Actual
2009	5	5

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
2009	80	1295

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

Fish farmers and entrepreneurs have limited knowledge on current aquaculture technologies and selection of appropriate sites for farming. People have realized that aquaculture farming will provide for food security and enabled income generation. Pearl culture, sea cucumber, and other marine species can be raised successfully with appropriate infrastructure and resources.

What has been done

Posters of hatchery-produced rabbit fish and grouper fingerlings were displayed at national events and lectures on aquaculture were conducted in different communities and schools. Hands-on training in hatchery and farming were provided and staff participated in aquaculture workshops and conferences. On-site visits were facilitated to students and others at hatchery facilities and aquaculture information were aired via local radio stations.

Results

PCC: People have realized the importance of aquaculture for food security and economic development. They were able to understand the life history of rabbit fish, groupers and mangrove crabs. Students learned the basic concepts in aquaculture and have shown interest by participating in discussions and lectures. Aquaculture personnel, both in the private and government institutions, learned latest technologies that can be adopted and learned basic things to consider when selecting aquaculture farming sites.

CMI: Government officials seek advises from aquaculture staff. Also, assistance from staff to help develop proposals still continues.

COM-FSM: The pearl project received immediate attentions from domestic and overseas stakeholders and international journals on high quality products of the round and half-pearls. The sea cucumber project developed its own grow-out technique by a land-based method, which caught international attentions in the sea cucumber aquaculture research.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife

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

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
2009	20	43

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Local communities are realizing the importance of aquaculture farming as a means for food security and improving quality of life. Disease and parasitic organisms are affecting fish stock. Fish farmers have limited knowledge of proper feeding management of cultured fish and appropriate sites to set up farms.

What has been done

Aquaculture staffs continued farm work and monitoring existing pearl oyster and sea cucumber farms. Grouper stock was examined for presence of bacterial and parasite infections using formalin bath, with frequent changing of nets and food. Correct feeding management and use of commercially available pelletized fish feeds were evaluated. Another species of rabbit fish, *Siganus lineatus*, was introduced for grow-out in ponds and cages and staffs provided assistance in assessing suitable sites for fish cage farming.

Results

PCC: Clients learned to solve disease problems and other issues affecting grouper and rabbit fish aquaculture farming. Giving the right amount of feed and regular sampling enables farmers to monitor the growth performance of rabbit fish in ponds and cages. Fish farmers were able to identify appropriate sites for aquaculture farming.

CMI: One of the farms shut down after the sudden death of its manager. The other five are still in operation.

COM-FSM: Pearl project staff began farm design, set up and maintenance, as well as hatchery juvenile production. This reflected local awareness in immediate pearl farming business investment and conservation activities like in Pakin Atoll in Pohnpei. Wild stock survey in Pohnpei lagoon revealed a higher-resource of the

high-value sandfish (*H. scabra*) than those estimated earlier, which is encouraging for re-stocking purpose.

4. Associated Knowledge Areas

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

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
2009	5	12

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

PCC: Hatchery -bred fingerlings of rabbit fish and grouper can be successfully grown to marketable size in fish ponds and cages using appropriate feeding management and disease prevention technologies. Appropriate technologies on feeding management and disease prevention and cure should be available to aquaculture farmers.

CMI: The community is beginning to realize the importance of aquaculture farming as a means for food security and income generating.

COM-FSM: Communities in Pohnpei still lack a fisheries management plan and capacity building for residents must be strengthen.

What has been done

PCC: Hatchery - bred rabbit fish fingerlings were delivered to a farm and grouper fingerlings were released to cages. Proper feeding management, stock manipulation and monitoring of stock were taught. Staffs conducted on-site assessments and recommended disease treatment to solve parasite and bacterial infections of grouper and

milkfish stock.

CMI: Aquaculture staff continued working and monitoring of existing oyster farms in the outer islands.

COM-FSM: Pearl farm training was offered to youths in three communities in preparation for upcoming commercial activities. The sea cucumber hatchery produced thousands of juveniles for restocking purposes.

Results

PCC: The fish farm growing rabbit fish in cages was able to harvest marketable size rabbit fish after 6 to 8 months of culture. Grouper farmers were able to harvest marketable size groupers in cages although problems of parasite infection were encountered. They learned practical methods to control parasites and bacteria that adversely affect their stock.

CMI: One of the farms shut down after the sudden death of its manager. The other five are still operational.

COM-FSM: Pakin atoll community commenced its own farm maintenance work with 10,000 2-year-old pearl oysters which were donated by the COM pearl project. Other two outer island communities deployed line culture systems for commercial operations. The sea cucumber project repeated hatchery spawning-runs which produced several thousands juveniles. Wild stock surveys also involved local people to locate commercially high-value sandfish specie (H. scabra).

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

PCC: Poor survival of mangrove crab larvae was influenced by limitations such as power interruptions, poor water quality, and fluctuation of water temperature due to poor hatchery ventilation. Seed production of mangrove crab will be improved once the larval rearing activities are conducted in the new PCC Multi-Species Hatchery."

CMI: The death of one of the farm managers caused for his farm to shut down operations. The mechanical problem that the domestic aircraft experienced caused a delay in the monitoring of farms.

COM-FSM: As has been exhibited by one of the outer islands in Pohnpei i.e. Nukuoro Atoll, who used to have pearl farm business based on collecting wild pearl oysters in its lagoon, over-expectations about pearls at retail outlet overseas lured a community-owned Nukuoro pearl management without going through strict product quality control by pearl grading and pricing, appropriate farm skill training, business planning and marketing/sale development. Pearls and pearl-related products are regarded as export commodity and therefore national, states and local governments needed to develop coordinated efforts on international marketing strategy and financial and vocational planning in a sustainable economic development. COM pearl project involved a qualified pearl grader (US Gemological Institute of America) as well as a master technician of pearl nucleus implantation to support quality control during the pearl quality improvement research and sales and branding promotion. One of the weakest points of the remote islands in developing internationally competitive export business is disunity or disorganized activities. Each atoll pearl farmers need to be supported to develop a state-wide pearl farmer's association or cooperatives, which could be provided technical advices by the US Rural Development through COM Land Grant Program research and extension services. Regarding the sea cucumber resource enhancement project, the Pohnpei State Government Division of Fisheries and Aquaculture should take more active roles in fisheries management policy review processes and strategic planning. Current sea cucumber fishing total ban on all species should be reviewed based on a comprehensive wild stock assessment work and by introducing species-specific restriction, size (wet weight) limit and/or fishing ground protection. This is because that a monitoring program has not been seen and that illegal fishing for export of small quantity of *H. scabra* has been carried out for more than a decade even though the State Government has imposed ban and some areas of *H. scabra* habitat indicated higher resource than it was expected as near-extinct status.

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

1. Evaluation Studies Planned

- After Only (post program)
- Before-After (before and after program)
- During (during program)
- Time series (multiple points 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

PCC: In previous years, people in Palau were dependent on the fish caught from the wild. With the success in producing fingerlings of rabbit fish and grouper in the hatchery, the public are now aware of the potentials in growing these important fish species in ponds and cages. More and more people are interested in growing fish for commercial purpose. Fish farmers encountering problems of mortalities in their ponds and cages now know how to identify the cause of mortalities and treat the fish. More students are now eager to learn more about the biology and culture of fish since they participate more actively in discussions during lectures and study tours. There is an increase in number of ponds and cages for grow-out of milkfish, rabbit fish, grouper and mangrove crabs in Palau .

CMI: Two farms have already had their oysters seeded. They both have already informed the other three farm owners that they are ready to buy to their oysters if they are not planning to have them seeded. An off island Seeder was contracted to seed the oysters at a rate of \$1 per oyster. A local person needs to be trained in this skill of seeding oysters.

COM-FSM: The communities have been positive in taking actions by establishing community-owned pearl

farms. Following several years of skill training and demonstrations by the COM pearl project, Pakin Community Association was organized. Leading youths were nominated to continue skill training for their own people and a number of participants increased. The sea cucumber hatchery technology was transferred successfully for the high valued species (*H. scabra*), a commodity of high potential to contribute to additional source of income. The project's hatchery-based aquaculture work enabled the Pohnpei State Government to collaborate closer to review and improve management planning.

Key Items of Evaluation

PCC: A practical method in larval rearing of two rabbit fish species has been documented with the success in natural spawning of the captive breeders. A nursery and grow-out of rabbit fish in cages has been verified and better feeding protocol was developed. PCC-CRE has succeeded in producing high - valued aquaculture species such as grouper which gave an opportunity to fish farmers experience growing the locally hatchery - bred grouper in their facility. Staffs continuously demonstrated to their clients basic developments and the potentials of aquaculture in Palau. A technique for seed production of mangrove crabs in Palau is being developed. Basic considerations and requirements in selecting appropriate sites for fish ponds and cages has been recommended to interested individuals and government agencies.

CMI: Need to conduct training on seeding oysters for local citizens. Marketing and Pearl grading skills are important and therefore need to organize future trainings for current farmers and interested citizens.

COM-FSM: Pearls and pearl-related value-added products (e.g. half-pearls) are getting more attentions among local and international stakeholders such as in Japan and USA. Some sample products have been sold overseas for developing marketing and branding strategies i.e. the Micronesian Pearls. Unique and valuable colorations of pearls from the project's cross-breeding programs has created positive responses and enquiries have already been received from overseas for investment opportunities in establishing joint venture pearl farms and joint sales promotions. In the case of the sea cucumber (*H. scabra*), the project's wild stock survey revealed higher abundances in the Pohnpei lagoon, twice as many sandfish found at night (4.3 sandfish/staff-hr.) compared to the daytime survey (2.2) by the CPUE (Catch Per Unit Effort) method. For estimating the resource per hectare (10,000 square meter), LT (Line Transact) method showed 122.2 sandfish at daytime and 88.9 at night. Both results by CPUE and LT methods gave surprisingly higher figures compared to those reported in the past stock studies in Pohnpei during 1996 - 1998 by the Japanese OFCF (Overseas Fishery Cooperation Foundation and Pohnpei State Marine Development) and in 2004 by the College of Micronesia - FSM, who concluded that the sandfish had been depleted to near extinct or nil in Pohnpei lagoon. This suggested a need to revise survey methodologies of the past published by others in FSM as well as overseas, who only conducted daytime surveys. The sea cucumber aquaculture project has a potential to re-vitalize local economy in Pohnpei.

V(A). Planned Program (Summary)**Program # 2****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	5%		5%	
111	Conservation and Efficient Use of Water	5%		5%	
112	Watershed Protection and Management	5%		5%	
123	Management and Sustainability of Forest Resources	10%		5%	
125	Agroforestry	5%		5%	
133	Pollution Prevention and Mitigation	5%		5%	
136	Conservation of Biological Diversity	5%		10%	
202	Plant Genetic Resources	5%		10%	
204	Plant Product Quality and Utility (Preharvest)	5%		5%	
205	Plant Management Systems	10%		10%	
212	Pathogens and Nematodes Affecting Plants	5%		10%	
216	Integrated Pest Management Systems	20%		10%	
315	Animal Welfare/Well-Being and Protection	5%		5%	
601	Economics of Agricultural Production and Farm Management	10%		10%	
	Total	100%		100%	

V(C). Planned Program (Inputs)**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	19.8	0.0	7.0	0.0
Actual	31.7	0.0	8.8	0.0

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

Extension		Research	
Smith-Lever 3b & 3c 463840	1890 Extension 0	Hatch 557126	Evans-Allen 0
1862 Matching 97370	1890 Matching 0	1862 Matching 31808	1890 Matching 0
1862 All Other 0	1890 All Other 0	1862 All Other 0	1890 All Other 0

V(D). Planned Program (Activity)

1. Brief description of the Activity

PCC: Conservation of genetic resources continued to make planting materials available for farmers. Mass propagation of tissue cultured taro varieties ensured steady supply of planting materials. New taro hybrids from SPC had adapted well and sensory evaluation found they were acceptable to Palauan taste. Banana research farms showed that regular application of fertilizers is essential for high yield. A manual on banana production was distributed. Culture of *Aphidius colemani*, the parasite of melon aphid and predatory mites of cassava was done. Biocontrol agents were released in taro and cassava infested with spider mites and taro leaf hopper. Scab - resistant sweet potato varieties cultured in the lab were distributed to farmers. Eggs and larvae of the arctiid moth, *Pareuchaetes pseudoinculata* for biocontrol of Siam weed were cultured and larvae and adult moths were released, however the insect did not established on the Siam weed. Two training on IPM and PAT were conducted to farmers and research and extension staffs. Fruit trees of different varieties were maintained regularly. Workshops were conducted on maintenance of rainwater catchments systems. The dry litter system was demonstrated to community members and students and was introduced to one underserved communities.

CMI: A workshop on food security and sufficiency was conducted to farmers. The main objective of workshop was to teach how to cultivate sweet potato and soft taro plants. The participants learned composting techniques. Two water quality workshops were conducted and residents' drinking waters were tested. Of the 100 samples, 88 were positive for total coliforms only and 55 were positive for both total coliforms and *E.coli*. Staff visited homes of 88 owners to provide technical assistance on how to treat their water. Translated brochures on water treatment were provided and demonstrations of the first flush concept provided information on hands-on activities. While a staff member was installing this first flush diverter, another staff videotaped it for future reference. Two first-flush diverters were installed on campus to monitor their effectiveness.

COM-FSM: Small commercial farms had become a major activity and one farm has gone from zero production to \$2000 per month in sales. Most atolls were severely affected by tidal surges and extension agents assisted in assessing crop damages. Research in salt tolerant root crops is needed to prepare for expected climate change and programs promoted bio-diversity and food security to buffer climate change. Livestock farmers benefited from programs promoting use of local feeds, training in feed nutrient balancing, and use of local medicinal plants as pharmaceuticals. Staffs promoted elite varieties of banana, taro, sweet potato and disease resistant planting materials of limes and other citrus. A strong niche market has emerged for noni and farmers receiving selected lines of quality plant stocks. External funding from FAO enabled the exchange of planting materials among farmers and staffs were involved in distributing these materials. Entrepreneurship trainings were provided to youths and it was observed that there is a need to provide such support for farmers transitioning from subsistence to semi-commercial status.

2. Brief description of the target audience

PCC: Target audience included farmers, elementary, high school, and college students, parents, teachers, government officials and private individuals.

COM-FSM: Target audiences were a wide spectrum of stakeholders. Food security programs were targeted at families on outer islands affected by climatic factors while families on the main islands benefited from programs to improve health and eating

habits. Programs were provided across all age groups and genders to encourage better agriculture, food security and improved diets.

CMI: Target audience included community members and students in the outer islands.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	600	3000	300	600
Actual	2200	1503	800	1000

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

Patent Applications Submitted

Year: 2009

Plan: 0

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	0	
Actual	1	1	2

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Expected Professional Journal Publications.

Year	Target	Actual
2009	3	1

Output #2

Output Measure

- Expected Gray Literatures

Year	Target	Actual
2009	3	2

Output #3**Output Measure**

- Expected publications for lay use.

Year	Target	Actual
2009	3	5

Output #4**Output Measure**

- Conference presentations

Year	Target	Actual
2009	3	6

Output #5**Output Measure**

- Conference publications

Year	Target	Actual
2009	3	1

Output #6**Output Measure**

- Number of publications for lay use.

Year	Target	Actual
2009	6	6

Output #7**Output Measure**

- Number of conference paper publication/presentations.

Year	Target	Actual
2009	3	7

Output #8**Output Measure**

- Number of demonstration farms established.

Year	Target	Actual
2009	12	15

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
2009	2400	3000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

PCC: Community members must be aware of current best management practices in crop production, animal waste, and water quality.

CMI: Low-lying coral atolls are the most vulnerable to the effects of climate change. Food security has been a major concern.

COM-FSM: Farming is primarily subsistence with traditional crops and systems. There is a developing market for agricultural produce and farmers started small businesses.

What has been done

PCC: Clients were informed about the importance of root crops germplasm conservation, use of tissue culture technique for mass propagation, pest and disease control using biological control agents, and dry litter waste management. Trainings were conducted on banana production and pesticide application to extension workers and farmers. A manual on banana production was developed and clients were trained on maintenance of rainwater catchments systems.

CMI: A food security and sufficiency workshop was conducted and awareness programs were provided to people on how to treat their water and practice proper personal hygiene and sanitation.

COM-FSM: Staffs provided basic agricultural techniques and demonstrations on crop production. Research focused on simple and sustainable production systems for traditional crops, commercial niche crops and food security issues through searches for salt tolerant or disease resistant crops.

Results

PCC: Clients are more knowledgeable about the importance of root crops germplasm conservation, use of biocontrol agents to control pests of crops, and current best management techniques to ensure successful crop production. They gained knowledge of water contaminants and maintenance of rainwater catchments. Farmers have shown interest the dry litter model.

CMI: Participants of the food security and sufficiency workshop increased knowledge from techniques learned to increase food production. In addition, a sweet potato and a taro farm were developed. People cleaned their roof gutters and catchments. Copies of water quality brochures were printed and distributed.

COM-FSM: Clients received new information and planting materials to address concerns about food security or nutritional distress. Over 1500 pieces of breadfruit plants of various varieties were given to families. More students enrolled in agriculture programs and more families started farming. One producer has gone commercial with sales of over \$2000 per month.

4. Associated Knowledge Areas

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

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
2009	1200	310

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

PCC: Farm productivity and yield can be enhanced from adoption of best management practices. Prevention of contaminated water sources is important to preserve the pristine environment and promote healthy communities. Water related diseases and animal waste contaminants are harmful to the health of the people.

CMI: Increase food production in the face of climate change is necessary to maintain the livelihood of islanders. The outbreak of swine flu was alarming and worrisome to their health.

FSM: Most Micronesians rely on imported food as they are less expensive and easier to store and prepare. Traditional knowledge and skills in agriculture have been lost and more than 30% of middle age Micronesians have diet related health conditions and over 80% of the middle age group is obese or overweight.

What has been done

PCC: Farmers were given disease-free and high-yielding planting materials of root crops and biocontrol agents were released on taro and cassava plants infested with pests. Farmers and extension agents were trained on safe effective and safe usage of pesticides and ways to clean and decontaminate rainwater catchments. The dry litter waste management project has served as a model for pig farmers to promote water conservation and prevent environmental pollution.

CMI: Water quality awareness workshops were conducted and installation of the first flush diverter was demonstrated. A workshop on food security and sufficiency was also conducted.

COM-FSM: Mass multiplication and distribution of staple food crops was done to reduce dependency on imported foods. Farmers received training and materials to develop better gardens or semi-commercial farms. Entrepreneur training and recruitment of youth into college agriculture programs has been successful.

Results

PCC: Farmers are now growing disease-free and high-yielding planting materials of root crops and using biocontrol agents to control pests of crops. Their harvests have improved and there was increase in production. Clients are now being referred to us for training on safe and effective pesticide usage and adoption of the dry litter system. Several clients are building their own dry litter piggery. Rainwater catchments are now maintained.

CMI: All 88 homeowners cleaned their gutters, added bleach into their drinking water catchments. One participant installed a diverter to his water catchment after attending the workshop.

COM-FSM: Ninety-six gardens were established and one new farmer started from scratch and after a year had employed 3 people and made more than \$2000 per month of vegetable sales. Impacts for farmers included usage of local herbs as alternative medicine for animal diseases and usage of compost to improve soil conditions. Total enrollment in agriculture programs at COM-FSM reached 72 students.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
125	Agroforestry
133	Pollution Prevention and Mitigation
136	Conservation of Biological Diversity
202	Plant Genetic Resources
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems

212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems
315	Animal Welfare/Well-Being and Protection
601	Economics of Agricultural Production and Farm Management

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
2009	18	127

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

PCC: Adopting proper cultural management technologies will result in increased production and quality of banana and adopting the dry litter system and maintaining rainwater catchments will improve sanitation and ensure clean environment and improve water quality.

CMI: Food security and sufficiency continued to be a problem for small islands and atolls. With the outbreak of swine flu, people were encouraged to practice proper hygiene.

COM-FSM: Many clientele are not aware of the opportunities in agriculture whether as farmers or professionals. Career training and entrepreneur training are needed to encourage new-comers into the farming arena. Understanding of the limitations of tropical soils is critical.

What has been done

PCC: Banana demonstration farms in 3 states have consistently used proper cultural management practices and adequate fertilization, which are key elements for successful banana production. Collaboration between health, environment and water agencies to promote and protect water resources and the environment is ongoing.

CMI: A food security and sufficiency workshop was conducted to farmers and community people. Water quality workshops were conducted and installation of the first flush diverters and treating drinking water were demonstrated.

COM-FSM: Students were recruited into agro-forestry and sustainable agriculture program. Basic skills and knowledge on agriculture were provided as well as seedlings and planting materials. Extension publications were developed and distributed to farmers.

Results

PCC: Adequate fertilization is essential for high yield production of banana. Planting materials were distributed to farmers who were trained on best management practices. Collaborative efforts continued on conservation and protection of the natural resources.

CMI: One sweet potato and one taro farm were developed as a result of the workshop. All 88 homeowners cleaned their gutters and added bleach into their drinking water catchments. One participant installed a diverter to his water catchment after attending the workshop.

COM-FSM: Total of 97 gardens and three agroforestry nurseries were established. One very successful farmer reached sales of \$2000 per month by the end of the year. Other farmers planted leguminous trees as hedgerows to provide mulch and compost to improve soil condition.

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

PCC: Economic considerations affect the number of farmers who can adopt the Dry Litter system. SPC was still unable to provide the biocontrol agent for Mikania and this is causing a delay in the implementation of the project.

CMI: When the government or college experience cash flow problems, it is a hindrance to the

implementation of the programs' proposed activities.

COM-FSM: The weather has contributed to the effect of the outcome, especially with cucurbits and is a strong limiting factor in the production of tomatoes. Duplication of efforts through the Department of Resources and Economic Affairs and local and international NGOs in programs which are similar to the backyard garden program create misunderstandings with farmers. The tidal surges of December emphasize the need for food security initiatives, management for atoll food systems as sea levels rise and salt tolerant crops and/or rapid generating crops for post-disaster relief. Other factors affecting production are the number of working age Micronesians who are emigrating each year. Local statistics indicate close to 2800 emigrants per year.

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

1. Evaluation Studies Planned

- Before-After (before and after program)
- Time series (multiple points before and after program)
- Case Study
- Comparisons between program participants (individuals, group, organizations) and non-participants

Evaluation Results

PCC: There have been constant requests for tissue cultured planting materials of high yielding varieties of taro and banana which are essential components to increase productivity. Biocontrol agents have effectively controlled pests of taro and cassava. Dry litter is an effective system for the water conservation and prevention of piggery waste contamination of water sources and environment. Clients gained knowledge and skills on the importance of proper maintenance of rainwater catchments and protection of the environment through the dry litter waste management system.

CMI: More than 50% of the water samples tested was positive for E. coli and total coliforms. This means that the source of collecting water (roof and gutters) needs to be cleaned at least once a month. Because people were scared of the swine flu outbreak, they immediately followed the recommendations that were provided to them by the water quality personnel. Hand sanitizers are highly used by the community. They are highly in demand.

COM-FSM: Families that participated in the program produced their own vegetables and continued to maintain their gardens. Municipalities that participated in the program displayed more vegetables during their agriculture fairs. Farmers in Yap produced enough noni to require external markets. More yellow varieties of bananas and other crops are available in markets. More farmers are treating animal diseases using local medicines and requested less services from extension staff. Farmers are utilizing agro-forestry techniques for soil improvement. Experiments are showing positive results. High efficiency protocols and nursery techniques have been developed for mass-multiplication of different varieties of banana, taro and sweet potato. Initial grafting experiments on citrus are showing positive results. Ultimately the projects have developed positive attitudes, zeal for learning techniques and farming aspects, and have changed the behavior of the participants.

Key Items of Evaluation

PCC: The tissue culture technique has been successful in providing a continuous supply of taro and banana planting materials to farmer clients. Biocontrol agents have been successful in controlling pests of root crops and invasive weeds in Palau. The Dry Litter Waste Management System is effective in water conservation and preventing animal waste contaminants from polluting water resources and environment.

CMI: More people use hand sanitizers. They also boil their drinking water and clean out their gutter at least once a month or once every quarter.

COM-FSM: There are an increase number of students with interest in farming for profit and increase number of commercial farms. Research is effective in small programs if targeted efficiently such as developing high efficiency protocols for rapid multiplication of different varieties of banana, sweet potato and taro, and in vivo and in vitro grafting experiments in lime showed positive results and sour orange rootstock accepted Mexican lime and Mexican lime thornless budwood. There is a definite need to develop strategic plans in food security and in response to climatic change including identifying or developing salt tolerant root crops and skills in sustainable agriculture systems. Stakeholders are in need of marketing guidance and processing techniques to add value and lengthen shelf-life of local foods.

V(A). Planned Program (Summary)**Program # 3****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	15%		0%	
801	Individual and Family Resource Management	10%		0%	
802	Human Development and Family Well-Being	15%		0%	
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures	10%		0%	
806	Youth Development	50%		0%	
	Total	100%		0%	

V(C). Planned Program (Inputs)**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	12.4	0.0	0.0	0.0
Actual	8.5	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
124374	0	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
48785	0	0	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)**1. Brief description of the Activity**

PCC: After school science program, summer program for Upward Bound, school outreach and presentations, and science fairs were conducted in the schools and communities to promote and provide awareness on major environmental and water issues. Students were involved in short classroom lectures, hands on activities, science projects contests, mini fairs, field trips and summer programs.

CMI: No activities reported for this planned program due to staff turnover.

COM-FSM: This program was offered at four sites and at one site, it was through a CYFAR grant for entrepreneurship training for youth. A volunteer food technologist collaborated with the extension service to promote new value added food products. Programs were also conducted to reintroduce troublesome children back to school. There is a strong effort in small scale entrepreneurship through the teaching of sewing, food processing and handicraft. Other sites were focusing on communities and youth programs. Training programs were conducted on food processing, entrepreneurship, sewing, handicraft and culinary arts at all four program sites.

2. Brief description of the target audience

PCC: Target audiences included students in elementary, high school and college level, teachers, school administrators, school cooks, parents and community.

COM-FSM: Programs have reached and trained different groups of people in the communities such as unemployed women, school children, vocational staff, youth and families at-risk, community women groups, local food producers and care-takers. Target audience included youths, homemakers, students, employees, unemployed and other interested individuals and groups like churches. Youth in the ages of 9-25 were included.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	900	2700	1200	3600
Actual	592	2000	3000	3590

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

Patent Applications Submitted

Year: 2009

Plan: 0

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	0	
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of training conducted targeting youths.

Year	Target	Actual
2009	12	6

Output #2

Output Measure

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

Year	Target	Actual
2009	6	12

Output #3

Output Measure

- Total number of youth clubs organized.

Year	Target	Actual
2009	3	3

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
2009	900	2020

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

PCC: Youths and families should be more knowledgeable about environmental and marine science issues. More youths will have positive perspective toward science and not considering it as boring and a subject for intelligent kids only. There is also a real threat from climate change and invasive species, pollution,

COM-FSM: Youths are disenfranchised and at risk due to family and cultural breakdown.

What has been done

PCC: After-school programs, science fairs, summer programs, fieldtrips and hands on activities were conducted in schools and communities to educate youths and parents on threats to the environment and marine areas.

COM-FSM: Entrepreneurship training was provided to youth and handicraft development training were provided in collaboration with Development Bank personnel. Kids received carving, weaving, food processing, sewing and entrepreneurial counseling. Selected drop-outs were re-introduced to the school system to continue their education.

Results

PCC: Students, teachers, parents, school cooks and school administrators who participated in programs are much more knowledgeable in environmental and marine issues. More importance and emphasis was put on science as a subject in school.

COM-FSM: Youths sought business development, participated in village fairs selling products and carving. Women attended sewing and culinary programs and most can now sew their own family needs and sell sewing and culinary products for additional family income.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development

- 801 Individual and Family Resource Management
- 802 Human Development and Family Well-Being
- 804 Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures
- 806 Youth Development

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
2009	300	900

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

PCC : Protection and conservation of natural resources is important for the sustenance of livelihood in small island communities.

COM-FSM: Life skills translated to economic development is the ultimate goal of programs.

What has been done

PCC: After-school programs, Earth Day clean up, science fairs and field trips were conducted in collaboration with other programs to protect and conserve the island's natural resources.

COM-FSM: Entrepreneurial training along with sewing and food processing were provided to youths and families in collaboration with the Kosrae Small Business Development Center. Other youth programs were gardening, sports, art and craft, and beautification.

Results

PCC: Students are more involved in community clean up, recycling, science contest, and science clubs. Students are now sharing information to their siblings and their parents regarding environmental issues. More students were pursuing their degrees in agriculture and environmental and marine science in the local college and abroad.

COM-FSM: Clients were able to sew their own clothes and save money and some are considered as tailors as they are making an income. There are more responsible youngsters respecting not only their parents, but their peers as well and taking leadership in supervising younger club members in youth activities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures
806	Youth 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
2009	300	500

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

PCC: Science is now considered as an interesting and important subject in school. Teachers and school administrators are exerting more effort and committing more resources in improving science instruction to their students. Youths, teachers and school administrators do not consider science as important subject that affect their future.

COM-FSM: Living condition is not suitable and inflation makes purchasing difficult. Families prefer to preserve and possibly market some of their produce rather than buy. All clients experienced the same issue that they all need to learn to preserve or sew in order to generate income for themselves and for their kids.

What has been done

PCC: After school science programs, science fair, visit to R & D Station and other agencies have been conducted to encourage students to be more interested in science and see its application in daily life. Students' involvement in the science clubs and other science projects illustrates the shift of mentality and stereo typing toward science.

COM-FSM: Counseling toward standard of life, behavior, attitudes, and being responsible for life has been integrated into the entrepreneurial training. Sewing and food processing trainings were conducted to program participants.

Results

PCC: Youths are now showing interest in science and view science as a field of study. Schools have improved their science programs and the environment and water resources are cleaner because of the student's and community involvement.

COM-FSM: Immediate results indicated that at least a few of the participants have attempted to establish their own small businesses. At least one youth returned to school and most families indicated they are saving money by producing their own clothing and preserving food.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

PCC: All schools in Palau have their own academic calendar which has to be followed and staffs found it difficult to do youth programs in the schools. There should be coordination among government and non-government agencies who are conducting science programs in schools to avoid duplication.

COM-FSM: Priorities on projects are focusing on larger scale and not directed on youth. Poor economy of the states caused lesser attention on youth programs that can develop youth entrepreneurship and contribute to economic development. There is a lack of funding to start businesses. Even though the clients learn all the techniques of sewing, they can not start their business without funding. Most selection for those who will be funded goes only for those who have money to pay back the loan. National statistics showed that a high number of youth and young adults 15-40 years of age leave the country each year for employment abroad.

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

1. Evaluation Studies Planned

- After Only (post program)
- Retrospective (post program)
- Before-After (before and after program)
- During (during program)
- Comparisons between program participants (individuals, group, organizations) and non-participants

Evaluation Results

PCC: Evaluation results showed that youth, teachers and school administrators are not familiar or aware of science and water issues. Content in science text books are focused on foreign situations and are not applicable to conditions in Palau. Students and adults have limited or no knowledge at all about environmental and water issues.

COM-FSM: Observation of participants revealed improved self-esteem, responsible citizens, participate in community activities and seek assistance to develop their own business. Individuals interviewed also stated that 100% of participants are willing to explore more traditional and other skills which will lead to entrepreneurship. Some participants were able to sell their products during the community fairs. Knowledge and skills learned from extension programs has helped program families reduced expenses on clothing and dollar spend on family needs. Participants learned and shared culinary, handicraft and sewing to their families, friends and communities. Youth-at risk participants learned to be responsible children to their parents, good students and good law abiding citizens.

Key Items of Evaluation

PCC : The youth program helped address the low level of awareness and knowledge of students, teachers and schools administrators with regards to environment and marine science issues. The program help the schools to change the mentality of students toward science subject by providing techniques or activities that will motivate the students and help them understand difficult problems in science.

COM-FSM: Micronesians are enthused by programs which offer the chance to be more self-sufficient. There is a robust entrepreneurial spirit here that needs to be cultivated and stimulated with available support. Youth are disillusioned by what they see as their future. Emigration is appealing for many youth therefore programs should be developed to prepare them for that future.

V(A). Planned Program (Summary)**Program # 4****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	15%		25%	
502	New and Improved Food Products	15%		25%	
701	Nutrient Composition of Food	10%		10%	
702	Requirements and Function of Nutrients and Other Food Components	15%		0%	
703	Nutrition Education and Behavior	10%		10%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	10%		10%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	10%		10%	
724	Healthy Lifestyle	15%		10%	
	Total	100%		100%	

V(C). Planned Program (Inputs)**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	10.0	0.0	0.0	0.0
Actual	7.2	0.0	0.8	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
109741	0	47699	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
46098	0	0	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

PCC: Two research projects were implemented and ninety products from taro, cassava, and sweet potato were produced and tested for their production and economic feasibilities. All 5 new varieties of sweet potato from germplasm collection were acceptable to the sensory evaluators. A book on "Taro as Food in Palau" was prepared and product development utilizing local ingredients resulted in the production of new and improved processed food products, which are being studied for their storage properties. Adult and youth food tasters evaluated food products. Adult and youth EFNEP programs were conducted to parents of young children and high school students. Both programs provided information on proper nutrition and food safety with hands-on activities.

CMI: EFNEP workshops were conducted to clients comprised of housewives, young mothers, and college staff senate members. These workshops covered EFNEP lessons and cooking demonstrations. The EFNEP extension agent and the college nurse organized events to talk about diabetes.

COM-FSM: EFNEP lessons and workshops, school enrichment, local food campaign and a Child Find survey were carried out. Adults, including young mothers, and youths attended food and nutrition workshops, which provided EFNEP lessons, local recipes, and planting materials. Government departments and agencies and NGOs, such as the Island Food Community of Pohnpei, have been collaborating to disseminate information to promote healthy foods and healthy lifestyle. EFNEP staff also collaborated to conduct a Child-Find survey to identify disabilities that can be found on children ages 0-5 yrs. The 24- hour food recall on program participants provided baseline for counseling parents and caretakers nutrition requirements for children and for different age groups.

2. Brief description of the target audience

PCC: The target audiences were homemakers, food processors, food establishments, entrepreneurs, and others.

CMI: Target audiences were young mothers, students, government employees, and food processors.

COM-FSM: Target audience consisted of young mothers with children aged 0-5, young mothers with children (EFNEP clients, school children, youth, and others).

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	600	3000	300	1500
Actual	2700	6000	750	1300

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

Patent Applications Submitted

Year: 2009

Plan: 0

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	0	
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of community workshops conducted.

Year	Target	Actual
2009	12	19

Output #2

Output Measure

- Number of coalitions strengthened.

Year	Target	Actual
2009	6	39

Output #3

Output Measure

- Number of intervention conducted to individuals or small groups.

Year	Target	Actual
2009	134	415

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
2009	900	3366

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

PCC: There is an increasing demand by visitors on locally processed foods while young people preferred imported processed food over local foods. Relying on imported food created a trade imbalance. Chronic diseases and food-borne illnesses are negatively impacting the lives of low income families and individuals.

CMI: Diabetes is still a major health problem in many communities due to changing lifestyle and diabetic patients are the most vulnerable and susceptible to the swine flu.

COM-FSM: Over half of children surveyed have sub-clinical Vitamin A deficiency. Chronic diseases, such as cancer, heart, and diabetes have become serious problems among adults and youths and these are problems associated with the dietary shift and changes in lifestyles.

What has been done

PCC: Processed food products were subjected to sensory evaluation conducted by several groups during civic events. Food technology trainings and were offered and participants had hands-on experience on local food processing, safe storage and proper handling. Presentations to increase knowledge in health related topics were also conducted to both adult and youth groups.

CMI: The extension agent collaborated with public health in visiting diabetic patients for counseling on healthy eating and physical exercise. Workshops were conducted and recipes were provided during cooking demonstrations.

COM-FSM: Community workshops were conducted, EFNEP lessons, nutrition workshops and nutrition counseling were provided to parents. School enrichment programs and promotions of local foods were also conducted in the communities.

Results

PCC: One thousand clients tasted processed food products. Four students were trained in food technology. Kayangel State residents learned to prepare processed foods from locally available food sources. These activities have created awareness to the food tasters, trainees, and community that locally processed foods can

be prepared.

CMI: Workshop participants received their certificate of participation after completing the sessions. New clients were recruited for future workshops.

COM-FSM: Of those completing the EFNEP course, 100% increased knowledge in nutrition based on the 2nd food recall and food behavior checklist data. People are more aware of the importance of having a well balance diet. Former trainees, especially those in government agencies and NGOs have returned as volunteers in training programs and as community emissaries. Local market surveys indicated a demand and delivery of more high Vitamin A varieties of crops.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
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 Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
724	Healthy Lifestyle

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
2009	600	660

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

PCC: Food processing business is developing due to the growing demand for locally processed foods and as an income to others. Chronic diseases and food-borne illnesses can be reduced by improving the diets of low-income families.

CMI: Diabetes is still the main killer disease due to lack of exercise and unhealthy eating habits. With the outbreak of swine flu, diabetic patients were the most vulnerable and susceptible.

COM-FSM: There are about 27% children aged birth through five who are not in the correct weight categories as reported by the state divisions of Public Health. Therefore, more awareness programs need to be conducted to prevent further increase.

What has been done

PCC: Staff responded by conducting trainings on food processing and nutrition education. Trainees in food technology were encouraged to process food for the market and students at an underserved community were trained on food processing.

CMI: Collaborations were made with public health staffs in visiting diabetic patients and provided counseling on healthy lifestyle. Workshops were conducted and recipes were included in cooking demonstrations.

COM-FSM: Conducted community workshops, interviews, nutrition counseling to young mothers. Inter-agency efforts provided public awareness, local food campaigns, and cooking demonstrations on healthy recipes.

Results

PCC: Trainees can now prepare locally processed food products for the local markets. The student trainees have been inspired to pursue further studies in food science. More than 90% EFNEP program participants have improved their practices in all areas of nutrition and food safety.

CMI: Workshop participants received their certificate of participation after completing the sessions. New clients were recruited for future workshops.

COM-FSM: Homemakers started shopping for nutritious foods and cultivated their own local foods to supplement the family diet and sometimes for the local and export markets. President of the FSM included the "Go Local" motto in his State of the Nation message to encourage better diets.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
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 Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
724	Healthy Lifestyle

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
2009	6	64

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

PCC: There is a trade imbalance from large food importation and domestic food production. There is also a growing preference for imported processed foods over the local foods.

CMI: Diabetes is still a major disease due to unhealthy lifestyle. With the outbreak of swine flu, the diabetic patients were the most vulnerable.

COM-FSM: Unhealthy food choices and cultural pressures have led to a serious diet related increase in NCDs such as diabetes, hyper-tension and vitamin deficiencies.

What has been done

PCC: Food technology and EFNEP classes were conducted to community groups, schools children, and entrepreneurs to provide skills in preparing healthy and new food products.

CMI: The extension staff collaborated with the public health staff in providing counseling on healthy lifestyle. Workshops were conducted and recipes were demonstrated.

COM-FSM: Promotion on healthy eating conducted in the schools and the communities. The "Let's Go Local" campaign was conducted in the communities with display of local foods, recipes and cooking demonstrations.

Results

PCC: Food products are now available in the market as a result of trainings conducted in food technology and nutrition. Parents and youth are now practicing skills learned for preparing nutritious meals at home.

CMI: Workshop participants received certificate of participation after completing the sessions. New clients are recruited for future workshops.

COM-FSM: More people started consuming more local foods and preparing meals with local ingredients.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
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 Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
724	Healthy Lifestyle

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Populations changes (immigration, new cultural groupings, etc.)
- Other (Brain-drain)

Brief Explanation

PCC: Participants of food technology classes could not immediately go into business because of strict government regulations on food preparation and expensive permits to operate.

COM-FSM: Increase importation and demand for imported foods is due to the high cost of local produce. Imported food also is more appealing to children and young adults and it is more convenient to store and cook. Statistics indicated a high rate of emigration which removes many of the best educated and most productive citizens from the region. Lifestyle changes have increased the use of imported processed foods. An ongoing campaign is putting strong emphasis on cultivation and utilization of local food.

CMI: Because of customary obligations, some clients did not finish the workshops. The swine flu outbreak hindered some of the program's proposed activities, especially with patients in the hospital. Visitors were not allowed in the hospital wards unless you are a doctor or nurse.

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

1. Evaluation Studies Planned

- After Only (post program)
- Retrospective (post program)
- Before-After (before and after program)
- During (during program)
- Comparisons between program participants (individuals, group, organizations) and non-participants
- Comparison between locales where the program operates and sites without program intervention

Evaluation Results

PCC: Participants of food technology classes found the program acceptable since they benefited not only from food on their tables, but also for business. The skills that they obtained are long-lasting. Food tasters have accepted the products very well. Student trainees rated the program very helpful for their future endeavors. Check-lists, 24-hour Food Recalls, pre and post tests were used at the beginning and after each

adult and youth program. There was a significant improvement in all areas of nutrition

CMI: Participants enjoyed preparing the "vegetarian" dishes and eating them. Several on island restaurants offer the "Wellness" dishes in their menu. More locals are seen to be eating the wellness diet.

COM-FSM: More people are selective in what they're buying, eating and planting, the yellow fruits/vegetables over the other varieties. More people are using the yellow banana (karat and Taiwan) for baby foods and for home consumption. Local markets report an increased demand and delivery of Vitamin A rich varieties of local bananas and taro. More people are interested in preservation techniques of local foods. Former trainees of nutrition programs often volunteer to help future efforts in their communities. Anecdotal observations indicates that more stores are displaying out-of-date food items prominently signed for use as animal feeds only.

Key Items of Evaluation

PCC: New food products from locally available food resources were developed and adopted by participants for home consumption and business. EFNEP participants adopted recommended nutrition and food safety practices.

COM-FSM: There was knowledge gained and application of relationship of non-communicable diseases such as hypertension and diabetes to good diet, especially foods to avoid such as high salt, high saturated fats and high refined carbohydrates to prevent NCD and monitoring of NCD incidences and cost to the public health system over extended years is needed. There is a continuing need for regular physical fitness such as walking and gardening is being accepted and should be encouraged. Food safety handling of local foods prior to and at market needs monitoring. Superiority of local foods over imported and junk foods in healthy and nutritious diets are becoming internationally known and market demand may lead to export possibilities.

CMI: People are beginning to eat healthy and exercise daily. Walkathon is a very popular exercise that is conducted for every major event on island.