

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
133	Pollution Prevention and Mitigation	5%		5%	
135	Aquatic and Terrestrial Wildlife	5%		5%	
136	Conservation of Biological Diversity	20%		20%	
301	Reproductive Performance of Animals	10%		10%	
302	Nutrient Utilization in Animals	10%		10%	
307	Animal Management Systems	20%		20%	
308	Improved Animal Products (Before Harvest)	10%		10%	
315	Animal Welfare/Well-Being and Protection	10%		10%	
511	New and Improved Non-Food Products and Processes	5%		5%	
608	Community Resource Planning and Development	5%		5%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

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

Year: 2010	Extension		Research	
	1862	1890	1862	1890
Plan	9.0	0.0	5.0	0.0
Actual	4.0	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
96871	0	92903	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
14373	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: Larval rearing trials on rabbit fish and mangrove crabs were conducted at the newly opened multi-species hatchery and thousands of fingerlings of these species were produced. Some fingerlings were given to local fish farmers for grow-out in cages while thousands more were released into the wild. Preliminary trial runs on the seed production of mangrove crabs yielded some crablets. A total of 30 milkfish (*Chanos chanos*) broodstock with body weight ranging between 3 to 4 kilos were collected from local milkfish farms and were stocked in 80-ton capacity tank for gonad maturation and spawning. Lectures on fish biology and aquaculture were provided to students in schools and during field trips to visit and observe actual hatchery operations. Local clients were assisted in their plan to put up hatchery for rabbit fish operations. Posters and aquarium exhibits were presented in various local and national events.

CMI: Several spawning runs took place which produced millions of oyster spats, which were distributed. The ROC-Taiwan government handed over its fish hatchery facility after they trained local staffs. There is a growing interest in the sea cucumber industry, but now there are no standard procedures for harvesting and there is a strong possibility that this resource might be depleted soon.

COM-FSM: Black pearl extension work continued on training of local farmhands to maintain the farms and the pearl hatchery. The sea cucumber project continued on the hatchery technology transfer and on developing restocking methods. Two restocking sites were designated on a high-value commercial species, the sandfish (*Holothuria scabra*). A long-term high-density holding tank system was developed for both broodstock and juveniles.

2. Brief description of the target audience

PCC: People in the community, government officials, local and foreign tourists, students and individuals who are interested and engaged in aquaculture activities are considered the target audience.

COM-FSM: In Pohnpei, the pearl project targeted three atoll communities including one NGO, one local government and several private land owners for implementing commercial farming. The sea

cucumber project targeted local and state governments to develop collaborations in wild stock surveys and restocking programs.

CMI: Two local governments that have existing pearl oyster farms and invitations have been sent out to potential local farmers.

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	475	2500	325	3000
Actual	479	10000	1695	10000

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

Patent Applications Submitted

Year: 2010
 Plan: 0
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2010	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
2010	6	13

Output #2

Output Measure

- Number of publications for lay use.

Year	Target	Actual
2010	4	1

Output #3

Output Measure

- Number of conference paper and publication/presentation.

Year	Target	Actual
2010	5	2

Output #4

Output Measure

- Expected Professional Journal publications.

Year	Target	Actual
2010	6	1

Output #5

Output Measure

- Expected Gray Literatures.

Year	Target	Actual
2010	6	3

Output #6

Output Measure

- Expected publications for lay use.

Year	Target	Actual
2010	5	1

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
2010	250	2174

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

PCC: Some people are not aware of recent aquaculture development in the country. Individuals with limited know how are interested to start an aquaculture project.

CMI: The status of the hatchery is the critical component for the pearl farming industry. The people should look at this as something that will be greatly beneficial.

COM-FSM: Some people are unaware that aquaculture will provide sources of income from new productions and add values to existing commodities.

What has been done

PCC: Facilitated posters and aquarium displays, walk-in and pre-arranged visits, technical assistance about aquaculture. Presented lectures about biology of fishes and aquaculture in schools.

CMI: Several spawns were conducted to determine the status and also to revive the pearl project that is aiming to obtain more reliable farm communities.

COM-FSM: Facilitated public displays of products from the projects, hands-on training, on-site visits and broadcasted information via local radio stations.

Results

PCC: People have realized the importance and contribution of aquaculture for the country's food security and economic development. The Multi-species Hatchery is essential in making

aquaculture sustainable. Fish farmers gained knowledge and availed of technical assistance on operation of aquaculture projects. Students learned the basic concepts of aquaculture.

CMI: The hatchery program was able to raise 14,000 spats for future distribution to community farms and increased participants? knowledge.

COM-FSM: The pearl and sea cucumber projects received immediate attentions from domestic and overseas stakeholders and international journals on high quality products and skill training methodologies.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
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
608	Community Resource Planning and Development

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
2010	50	47

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

PCC: Survival of rabbit fish and natural spawning of mangrove crab at Bureau of Marine Resources Hatchery was unsuccessful. Mangrove crab farmers depend on wild caught crabs for seed stock.

CMI: The government-operated pearl hatchery was unable to provide spats and the industry has been on hold for several years with an undetermined future.

COM-FSM: People need to adopt techniques to add value to existing products and materials to generate and increase income.

What has been done

PCC: Larval rearing and grow-out trials of rabbit fish using broodstock feeds in the hatchery, ponds and cages were done. Seed production of mangrove crabs was conducted.

CMI: Plans have been developed and other agencies involved in pearl industry have shown great interest in its revival and the hatchery was able to produce spawn.

COM-FSM: The project provided pearl farm training and monitoring activities for pilot farms and demonstrated value-added products, sea cucumber spawning and grow-out methods.

Results

PCC: Natural spawning, high survival rate and production of natural food for two species of rabbit fish at the hatchery were improved. Seed production of mangrove crabs was successful. Farmers obtained improved growth performance of rabbit fish in ponds and cages using the developed feeds.

CMI: Now the hatchery is fully equipped and can handle large numbers of runs to produce spats efficiently on mass scale through joint efforts with local agencies.

COM-FSM: Pearl project staff continued hatchery productions of pearls and sea cucumbers, pilot farm maintenance and made sample value-added products. This enhanced local awareness in pearl farming business investment and conservation. Long-term high density sea cucumber holding system was developed for high-valued sandfish (*H. scabra*).

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
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
608	Community Resource Planning and Development

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
2010	8	44

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

PCC: Inconsistent supply of hatchery produced rabbitfish fingerlings and mangrove crabs discourages farmers to grow them in ponds and cages.

CMI: Limitation in supply of oyster spats is the major bottleneck in commercial production.

COM-FSM: State governments and communities lack fisheries management plans and capacity building.

What has been done

PCC: Larval rearing of two species of rabbit fish produced fingerlings stocked in two fish farms using suitable feeds. Seed production of mangrove crabs was done .

CMI: Oyster spats were produced on mass scale and distributed.

COM-FSM: Youths in three communities were trained in nucleus implantation. Tagging trials of sea cucumber (*Holothuria scabra*) were conducted for restocking purposes.

Results

PCC: Growing rabbit fish with high protein feed in ponds and fish cages is feasible and encourages more farmers to go into aquaculture activities. Two aquaculture operations regularly harvested and market cage-grown fish.

CMI: More than 500,000 oyster spats were cultured and distributed to two farms.

COM-FSM: Training of half-pearl nucleus implantation and line culture skills were conducted at three outer island communities using 10,000 hatchery-produced pearl oysters. A quarter of million spat were produced from the hatchery selective breeding program for pearl farm commercialization process. A long term tank culture system was for broodstock and juveniles of the sandfish (*H. scabra*) and several thousand juveniles were produced from the hatchery.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
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
608	Community Resource Planning and Development

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.)

Brief Explanation

Frequent occurrence of natural disasters such as typhoons, rapid increase in the population and unexpected change in government policies will greatly influence the outcome of programs.

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

1. Evaluation Studies Planned

- Retrospective (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 the past people have been dependent on fish caught from the wild. With the success in producing fingerlings of rabbit fish in hatchery, people become aware of the potentials in growing these important fish species in ponds and cages. Establishment of the multi-species hatchery promoted development of aquaculture by providing consistent supply of rabbit fish fingerlings. There was an increase in number of fish and mangrove crabs in ponds and cages. More people are becoming interested in growing fish for commercial purpose.

CMI: Two atolls have been dedicated in maintaining the pearl industry by expanding their farm operations and looking at creating more jobs for the atoll communities.

COM-FSM: Nine youths from three local communities learned half-pearl nucleus implantation and pearl-shell accessory making as well as farm maintenance work by technicians of the pearl project. The sea cucumber hatchery technology was transferred and improved to the Micronesian technicians for the high valued species such as the sandfish which has been over fished to a level of near extinction in Pohnpei. The hatchery technology and a long term land-based holding system developed have potential to contribute to the enhancement of resources and provide additional source income.

Key Items of Evaluation

PCC: A practical method in larval rearing of two rabbit fish species has been documented with success in natural spawning of captive breeders. A nursery and grow-out of rabbit fish in cages has been verified and better feeding protocol was developed. Success of producing high valued aquaculture species such as grouper, which gave an opportunity to fish farmers to experience growing them in ponds or cages. Through series of lectures in schools and poster and aquarium displays in national events, students became more interested in learning fish biology and aquaculture. The development of techniques in seed production of mangrove crabs also encouraged more farmers to grow this high valued aquaculture species in ponds and cages.

CMI: The two existing pearl companies are preparing for their upcoming harvest and sell in December 2010. The hatchery staff is working closely with these companies' personnel to schedule a date to visit the two farms and distribute 150,000 oyster spats each. The two hatcheries at the college are for fish and oyster productions. The family of a

deceased farmer who had an existing oyster farm, expressed interest in starting up the family business.

COM-FSM: Half-pearls and pearl shell accessories by adding value to pearl shells are getting more attention among local and international stakeholders in Japan and USA. A display and sale of sample products from COM's pearl project was conducted in Pohnpei, resulting in positive responses from domestic and overseas stakeholders. Cross-breeding work produced a high rate of unique blue colored pearls and other rare colors such as light-green peacock and enquiries have been received from overseas for using these pearls for joint sales promotions of the Micronesian brand pearls. The sea cucumber (*H. scabra*) species has been consumed as a favorite seafood unlike other places in the world where people catch and process for export. Although the COM project revealed that this species was not near extinction in Pohnpei lagoon, it could be depleted rapidly in spite of the Pohnpei State government's export ban if restocking program is not implemented. The COM's hatchery-based aquaculture project shows a feasible tool to enhance resources and to re-vitalize local economy in Pohnpei.