

# June 2010

**Creating rural livelihoods in Solomon Islands  
through environmentally-friendly aquaculture  
and trade of marine ornamentals**

## **PHASE II FINAL REPORT**

Submitted to NZAID

By The WorldFish Center



**WWF** *for a living planet*



**WorldFish**  
C E N T E R

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## Summary

This is the final report of the NZAID-funded project that aimed to establish a viable commercial enterprise for the culture of marine ornamentals for the aquarium trade as a livelihood option in the Western Province, Solomon Islands. This report describes the outcomes of phase II (2009-2010) of this two phase project which began in 2005. It also provides an overall assessment of the effectiveness of the full project in providing farmers with the capacity to become involved in a small-scale environmentally sustainable business activity as well as assessing the long-term sustainability of the marine ornamental trade.

Two key goals for phase II were to establish and optimize the privately operated Maraqaata depot and to strengthen the Nusa Aquarium Farmers Association (NAFA) to work towards industry sustainability at the end of the project.

Stock, sales and expense management systems have been established at the Maraqaata depot, as has a strategy for the collection of products from farmers. The strategy involves the self transport of products by the farmers (using local transport networks), with a resultant increase in the price that the farmer receives owing to reduced fuel expenditure by the depot. This strategy is in its infancy, with mixed feedback from the farmers to date. Maraqaata depot is currently operating as an independent (albeit with continued access to the start-up capital and equipment provided through the NZAID funded project and managed through an MOU with WorldFish) and economically viable small business. Profit margins remain small (~\$2000 SBD/year) yet this is sufficient to maintain the depot operator's enthusiasm.

Strengthening of NAFA has resulted in an association that is currently committed to continuing and with the knowledge and capacity to continue into the future. Small business training has been an integral component of this strengthening and was not only important for farmers to be able to improve their business and manage their farms more efficiently, but also as a means to understand the operational capacity of the depot and the marine aquarium trade industry. The recently elected NAFA executive has taken the initiative to become a registered association and have shown an interest to apply for external funding to help support new farmers. However given the distant location of the farmers, combined with the limited funding and resources available, the future of the association is expected to ultimately be determined by a series of 'champions' within each of the communities. Should there be a demise of the association it is expected that there would be limited impacts on the individual farmers, however it would make it more difficult for the future growth of the marine aquarium trade in the Western Province without the association's support to train and develop new farmers. This role would likely fall to the depot if it was in their business interest to encourage more farmers.

A major limiting factor for profitability of the marine aquarium trade in the Solomon Islands is the low price received for product, due in part to an absence of competition amongst exporters. The existence of only one exporting company is otherwise not currently a major limiting factor for existing farmers, with orders for clams continuing to increase over the past 4

years. In addition the demand for corals is not currently being met by the existing farmers with the low number of coral farmers (8 individuals) not being sufficient to maintain a regular supply.

In order to maintain a consistent supply of juvenile clams to farmers, the WorldFish Center has made an organizational commitment in the foreseeable future to provide juvenile clams to Western Province farmers on a cost neutral basis. It is anticipated that in the future clam production be managed by the National or Provincial Government or the private sector. In order to facilitate this transfer, a lower technology, extensive, method of clam spawning has been established as an option to the hatchery process. Three species of giant clams have now been successfully spawned and maintained through to settlement stage using this option, with four cohorts in grow-out phase in the land-based tanks at Nusa Tupe.

This NZAID funded project has attracted the interest of other donors and as a result the WorldFish Center has received funds from the Coral Reef Initiatives of the South Pacific (through French Global Environment Funding) to further strengthen the marine aquarium trade in the Solomon Island through improved marketing. This will involve the completion of a website; an informal eco-label for sustainably produced products and support for the further development and expansion of marine aquarium products, with a particular focus on corals.

At the end of five years this industry has not absorbed all the lessons that there are to be learned nor has it yet made all the ongoing adaptations that will need to be made. However a strong, trained base with committed practitioners (farmer and depot operators) has been established. If better prices can be obtained and marketing continues to be improved we expect that the industry will remain viable and be able to grow as needed to meet the market. Project monitoring and evaluation suggests that there has been significant progress made toward the targeted overall outcome of this 5-year project of *“enhanced well being of village communities within the Solomon Islands, through the provision of new revenue sources based on the sustainable cultivation and sale of marine organisms”*. Farmers and their families reported that the overriding benefit of this project had been the provision of a cash income. With the sale of sustainably cultured marine products providing families with SBD \$500 (NZ\$95) - SBD \$2600 (NZ\$500) per year farmers reported an increased standard of living, improved children’s education and increased knowledge of, and care for , the marine environment by individuals, families and communities.

## Introduction

The *Creating Rural Livelihoods in Solomon Islands through Environmentally-Friendly Aquaculture and Trade of Marine Ornamentals* project was designed to facilitate the development of a small-scale ornamental trade industry in Solomon Islands, using sustainable methods. The project was initially designed to run for five years, and in two phases. Continuation of the project beyond the first three years (Phase I: 2005 – 2009) was dependent on review at the end of phase I. The outcomes of phase I, and subsequent bridging arrangements while the review was completed and phase II finalized, were detailed in the report *Creating Rural Livelihoods in Solomon Islands through Environmentally-Friendly Aquaculture and Trade of Marine Ornamentals: Final Progress Report: June 2008*, and this was supplemented by three progress reports: *October 2008; December 2008 and February-March 2009*. In summary, by the time phase II of the project began in May 2009 a network of clam and coral farmers had been established in the Western Province of Solomon Islands together with a locally-run central depot that acted as the interface between the farmers and the exporter. A farmers association (Nusa Aquarium Farmers Association) was also operating. Products produced by the project, in decreasing order of importance, were giant clams, hard corals and soft corals. There was no success with fish, although a small degree of shrimp and lobster farming did occur, based on the capture and culture of post-larvae. During this initial phase the project subsidized the farmers through materials and by financing the product pick-up service.

The continuation of the project into Phase II was subject to the outcomes of a review that was completed in April 2008. Following recommendations from the review, Phase II of the project was funded from May 2009 – June 2010. Phase II was focused on exiting from the project with the goal to *establish a viable commercial enterprise with a realistic chance of sustaining future contribution by a range of Western Province farmers that can meet NAFA requirements to provide environment-friendly aquarium products to the international marine ornamental market*.

This is the final project report and describes the overall outcomes of this second phase in the context of the planned objectives. This report also provides an overall assessment of the effectiveness of the project in providing farmers with the capacity to become involved in a small-scale environmentally sustainable business activity as well as the long-term sustainability of the marine ornamental trade for Western Province Nusa Aquarium Farmers. We assess the original outcome that the project was designed to achieve by the end of a five-year period *“enhanced well being of village communities within the Solomon Islands, through provision of new revenue sources based on the sustainable cultivation and sale of marine organisms”*.



## ***Project objectives and outcomes***

Phase II of this project was focused around five related objectives; depot optimization, hatchery viability, product expansion, long-term industry sustainability and project assessment.

### **Objective 1 Depot Optimization**

*Work with the depot operators and farmers to; optimize the operations of the depot to ensure that the depot acts as an effective mediator between the exporter and farmers to ensure quality and reliability of supply under fluctuating demand and ensure that both depot and farmers receive sufficient reward for effort to make them willing to continue their operations.*

Expected outcome: A rural depot servicing village farmers providing product to Honiara exporter is economically viable once donor support is withdrawn.

### **Objective 2 Hatchery Viability**

*To set up the hatchery to be economically viable source of seed giant clams for farmers for two or three species in demand by the aquarium industry.*

Outcome: Clam hatchery is operating in an economically viable way to support the marine ornamental trade industry and producing clams for grow-out.

### **Objective 3 Product Expansion**

*To explore and where feasible, implement options for expanding the aquarium product business, including at least enhancement of product range, reduction in production costs and marketing products as Solomon Eco-friendly.*

Outcome: Western Province depot is placed to take advantage of future benefits that may become available from eco-labelling.

### **Objective 4 Industry Sustainability**

*To ensure that at the termination of the project, structures are in place to ensure the sustainable governance of the marine ornamentals farming industry*

Outcome: Measures are in place to ensure sustainability beyond the life of the project

### **Objective 5 Assessing Effectiveness**

*To determine the effectiveness of the project in equipping farmers with the capacity to engage in the sustainable production of aquarium ornamentals as a supplementary livelihood.*

Outcome: Improvements in the welfare of women, children and families, through a family member's involvement in exporting products to the marine ornamental trade.

## ***Project Management***

The work undertaken as part of this project was implemented by the WorldFish Center and WWF-SI in partnership with the Maraqata Depot and the Nusa Aquarium Farmers Association (NAFA). WorldFish was responsible for the overall project management for the activities listed below and through an MOU with WWF-SI, their activities were focused towards strengthening the marine ornamental industry in the Western Province of the Solomon Islands through supporting NAFA and the depot.

On the basis of recommendations by the NZAID review of phase I a regional consultant (Mr Simon Ellis) was engaged in this project to provide advice on practical and achievable ways of making the marine aquarium trade business in the Solomon Islands more profitable. The visit and recommendations provided by the regional consultant have helped shape and develop the final activities undertaken as part of this project.

Within phase I the Marine Aquarium Council was a key partner in the project, however in 2007 their work in the Pacific came to a halt. It was agreed between WorldFish and NZAID that the funds held for MAC activities could be re-allocated to additional activities to further strengthen the depot and NAFA within phase II of the project. These were:

### Objective 1

- Have the Gizo based lawyer that was involved in the initial development of the NAFA constitution review NAFA constitution, provide continued advice and attend a farmers meeting to advise farmers by November 2009.
- SIBEC to run a small business planning course in Gizo for all farmers to follow on from the introductory financial management course.

### Objective 4

- Print additional promotional materials for sustainable aquarium products from Maraqata depot for distribution to exporters, international buyers and visitors.

These additional activities have been reported on within the appropriate objectives below.

NZAID (specifically Kirsty Burnett and Brenda Waleka) have remained closely involved with project planning and activities during phase II of the project, making visits to the project site, depot and farmers and providing input and feedback on the design of the monitoring and evaluation survey. The attendance of NZAID staff at a NAFA farmers meeting and NAFA executive meeting proved valuable to assist in giving farmers a broader understanding of the role and intent of the donor in supporting such livelihood projects in Solomon Islands.



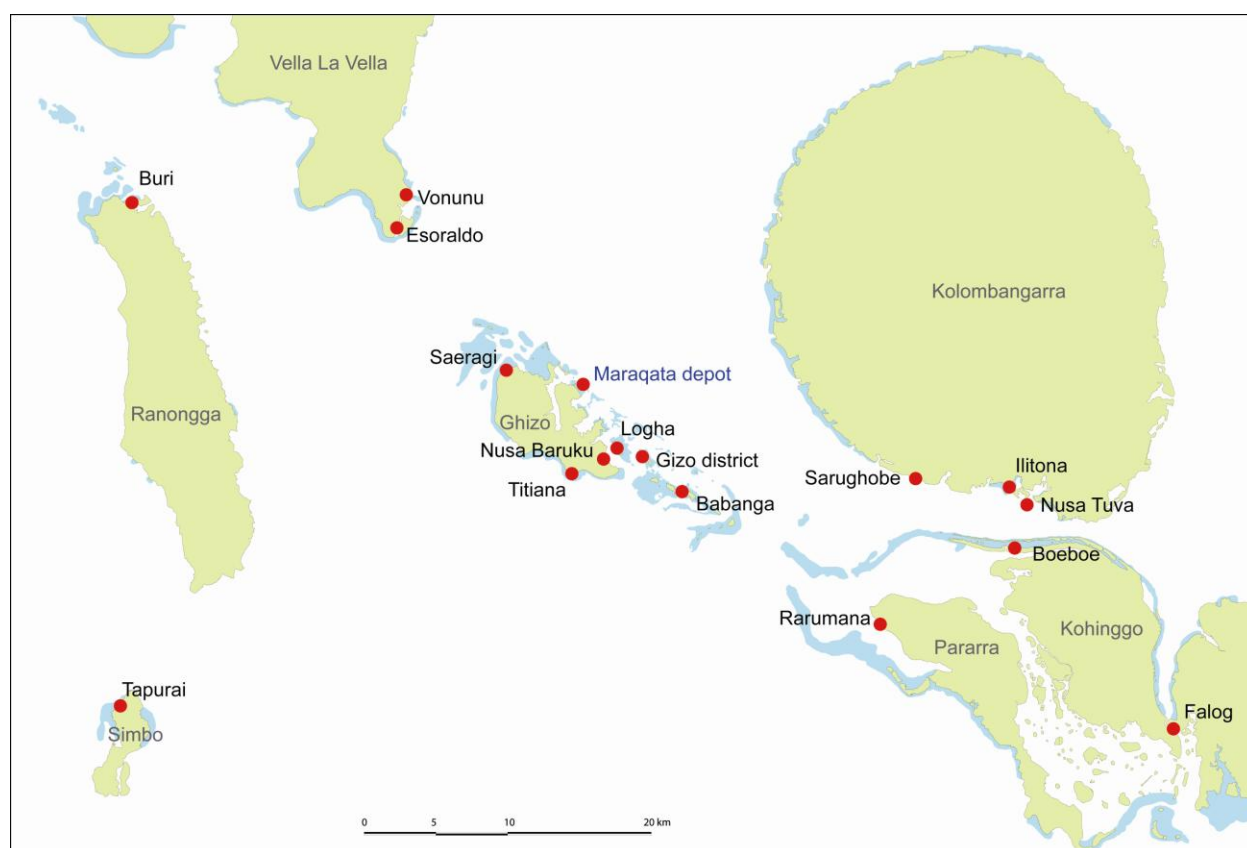
## Reporting on Objectives and Outcomes

The five objectives were each broken down into a series of activities and in this section we report on these individually.

### ***Objective 1 Depot Optimization***

***“A rural depot servicing village farmers providing product to Honiara exporter is economically viable once donor support is withdrawn.”***

The establishment and optimization of the depot has been one of the focal areas for phase II of this project. The depot (and in this case The Maraƣata depot, run by Patson and Naomi Baea) operates as an interface between the farmers and the exporter, and the collection point and distributor for products (and finances) grown by active NAFA farmers between Buri on Ranongga and Noro on New Georgia (Figure 1).



**Figure 1** Map of village locations of active NAFA farmers in the Western Province as well as the Maraƣata depot

The WorldFish Center and WWF-SI have been working regularly with the Maraƣata depot to develop their business and management skills. As part of this project the depot has received

small business training (through the Solomon Island Small Business Enterprise Centre (SBEC) as well as day to day specific training and information sharing specific to the aquarium trade. As it stands at the end of the project the depot is working with NAFA and the aquarium exporter in Honiara, independently of project support, to export sustainably cultured marine ornamentals from the Western Province. As discussed in detail below, although the Maraqata depot is not currently an overly profitable venture, it has dedicated time, resources and significant effort to ensure this business is viable once donor support is withdrawn. Specific activities as part of this objective were:

Interact regularly with the depot operator to assess sales, expenses and stock management.

Regular interactions occurred between WorldFish and the Maraqata depot to assist the depot to assess sales and expenses as well as stock management and overall depot management. WorldFish staff were involved on an as needs basis. The main areas of interaction with the depot were:

- *Warehouse establishment and maintenance:* During the initial stages of phase II depot assistance was focused on warehouse establishment and maintenance. Warehousing, rather than collecting from farmers to fill individual orders, was identified as a mechanism for reducing fuel costs. Although the depot was fully trained in aspects of clam husbandry, maintaining large numbers of stock (to reduce mortality) was a new aspect for the depot. Thus an initial focus on the management of stock was required with a high degree of input from WorldFish technical staff and the station manager.
- *Development of stock management database:* The project leader worked with the depot to establish a stock management database system. This was to keep track of the stock in the warehouse, stock purchased and sold from individual farmers and stock ordered and sent to Aquarium Arts. The database development was an adaptive process and evolved as the business progressed. In particular various approaches were trialed for the warehousing situation (see more information below).
- *Development of account keeping database:* The project leader and WorldFish accountant worked with the depot to establish the most effective mechanism to track product sales and record keeping processes with the farmers. This included basic training about the use of database systems as well as basic financial management. This supplemented knowledge previously gained through participation through the business training workshop and is now being applied to current day to day business operations.

In addition to the needs based visits with the depot, in December 2009 monthly meetings were established between Maraqata, WorldFish and WWF. These meetings were attended by Patson and Naomi Baea (Maraqata); Joelle Prange (Project Leader); Regon Warren (WorldFish Technical Assistant); Salome Topo (WWF Livelihoods Officer) and Andrew Bana (Provincial Fisheries Officer, under secondment at WorldFish). The purpose of these meetings was to maintain and facilitate communication between project partners and to create a mechanism to

address concerns and issues between the farmers, NAFA and the depot. Minutes from these meetings were circulated to NAFA executive members.

Completion of activity (%)	0%	25%	50%	75%	100%
Comments					

Assist the depot operator with day-to-day issues such as record keeping, sales analysis and trends

Using the database (described above) the depot has been able to better understand how the business can successfully operate. This has been an adaptive process and has resulted in the alteration of business activities (see discussion of warehousing of products below) to maintain profitability over time.

Figure 2 provides an analysis of total income and expenditure for the depot from May 2009 and April 2010. The income and expenditure fluctuates over time, primarily due to the irregularity of the aquarium trade, where orders change from week to week. The rolling profit (which is the overall income minus expenditure over time) shows that over the May 2009 – April 2010 period the Maraqaata depot made minimal profit of ~SBD \$2000. Subsequently the depot has assessed the way in which the business is operating to ensure long term sustainability, for example by rigorously minimizing expenses.

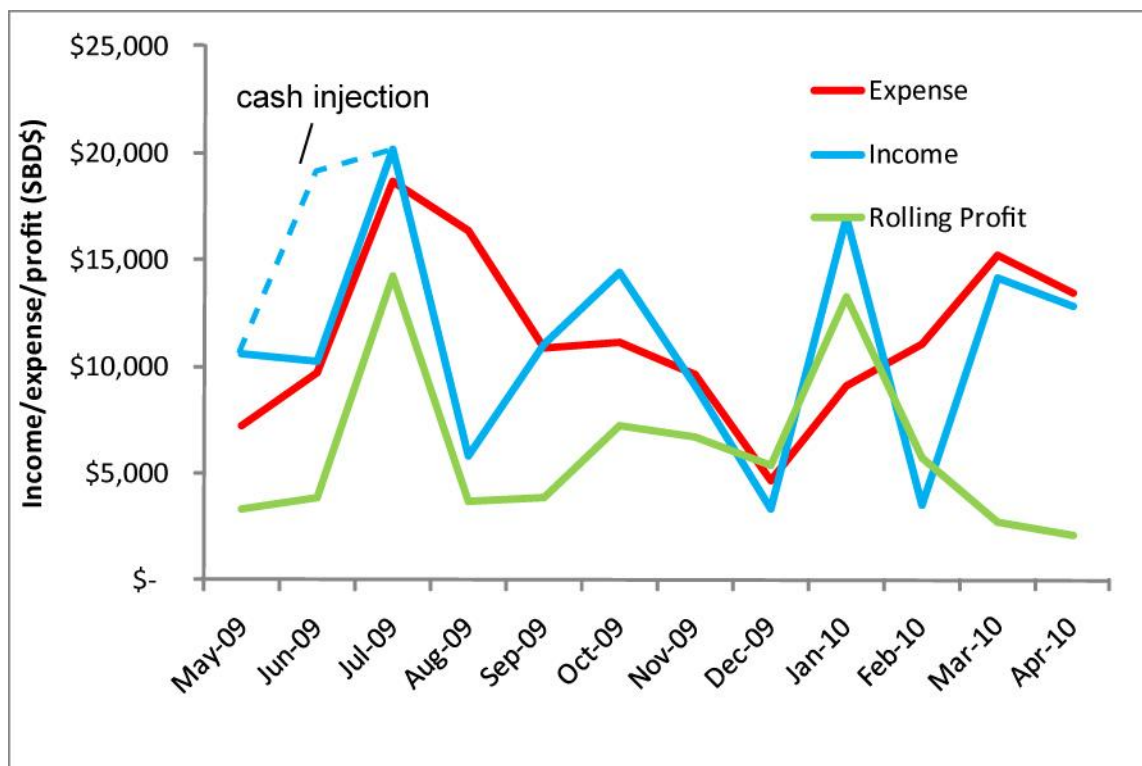


Figure 2 Analysis of Maraqaata income and expenditure (May 2009 - May 2010)

The mechanisms that the depot has identified and adopted to keep expenditure at a minimum include; the primary use of a 9.9hp four-stroke engine in preference to a 30hp two-stroke engine made available for use by the depot as part of an MOU with the WorldFish Center. Fuel, used mainly for pickups from farmers but also for delivery to the airport, is the major expense for this small business. Although the smaller engine uses substantially less fuel it does make travel time a lot slower.

Consistent with a recommendation in the depot feasibility study (*Business Plan and Risk Assessment Report: August 2008*) as part of the depot set-up and as part of MOU between the WorldFish Center and the Maraqata depot, a cash injection was made to the depot (from previous sales of clam and corals grown by WorldFish in the project development phase and from the depot support fee withheld from farmers payments (3% to July 2008 and 15% from 1 August 2008)) to support the set-up and development of their business, this was mainly to allow the depot to begin farmer pick-ups and warehousing. The total amount of money received by the depot was SBD \$17 800. Half of this money (\$8 900) was used to establish the warehouse (as shown in Figure ), with the remainder being kept in a separate savings account as contingency funds.

Record keeping has also allowed the depot to keep track of its ability to be able to supply orders that the exporters request (Figure 2). Tracking the products that were ordered by the exporter against the products that were able to be supplied provides information about what products are not available and aids the depot in communicating market needs to the NAFA farmers.

Completion of activity (%)	0%	25%	50%	75%	100%
Comments					

Assist the depot manager to identify, using an adaptive approach, the optimal strategy for collection and warehousing of products.

Adopting an optimal product collection and warehousing strategy was a fundamental component for the success of the Maraqata depot as there are significant risks involved with this process. As part of phase I it was established that it was economically viable for the depot to collect clams and corals from farmers in a bulk manner and to store or ‘warehouse’ these products at the depot for a short period until sold to exporters. As stated above an injection of cash was made to the depot to ‘kick-start’ this process as there is a substantial outlay of costs by the depot in the form of fuel costs and payments to farmers, with the depot only able to recover from these expenses once the products are sold. In July and August 2009 the depot undertook farm-gate purchasing of clam from all farmers. The initial purchase focused on collecting enough clams and corals to fill a ‘regular’ monthly order from the exporter in Honiara. A number of issues and challenges were faced during this process. Firstly due to unfavourable weather conditions, a significant number of corals collected were lost at the

depot (due to bleaching and subsequent death). Thus it was decided that corals should be excluded from farm gate purchasing due to the higher risk involved in maintaining a large number of corals. Secondly on some of trips to the farmers the quantities of product available for collection in some areas were insufficient, thus the cost of fuel involved in the collection far outweighed the cost that could be recovered on the products collected.

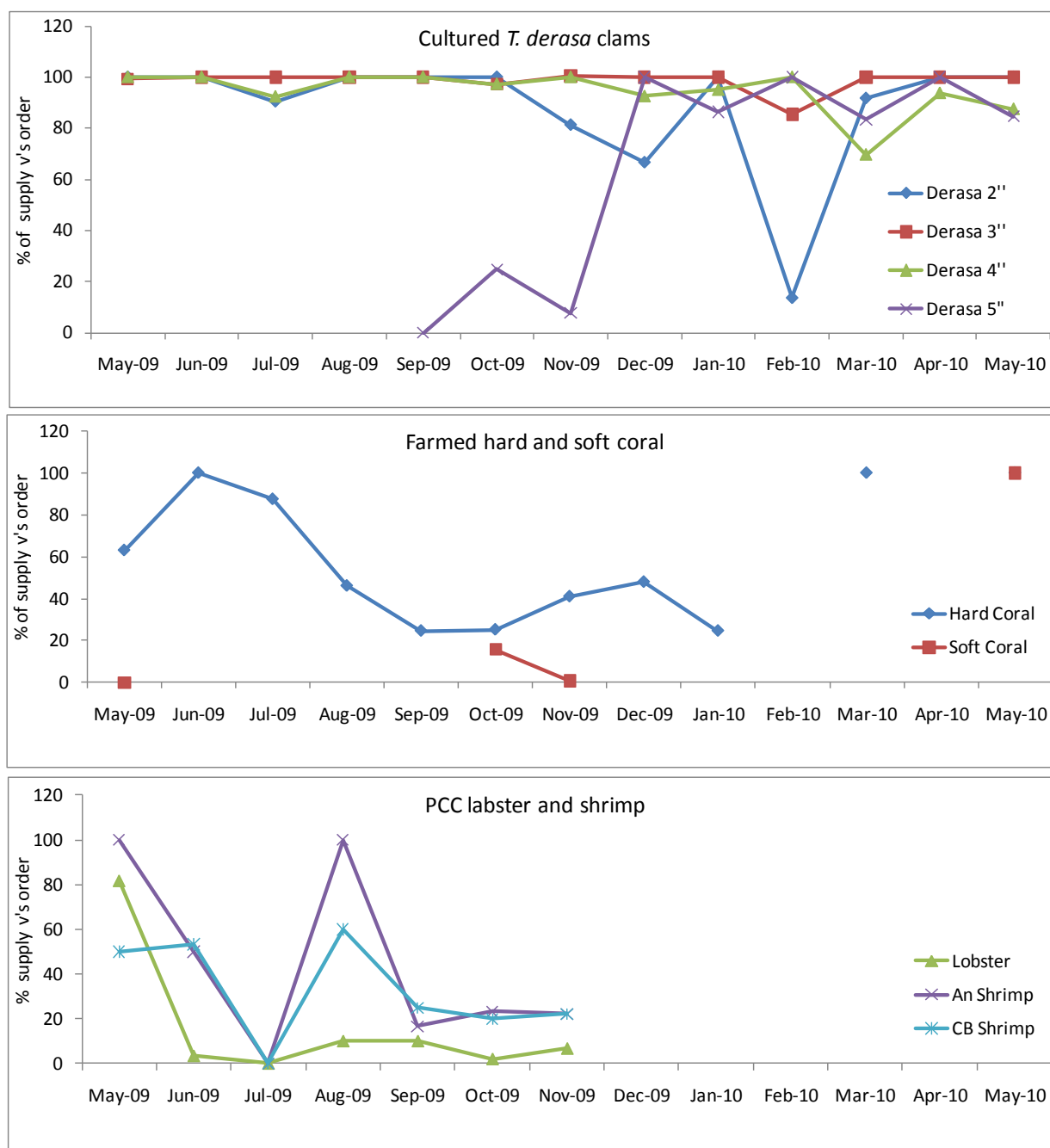


Figure 2 Percentage of product supplied by the depot vs the export order between May 2009 - May 2010

Thirdly, due to unforeseen and unmanageable circumstances the orders from the exporter in the months following product collection, were significantly lower than anticipated. This resulted in a higher number of clams in the warehouse than anticipated and thus an increased workload for the depot (in terms of clam husbandry and maintenance). In addition farmers began to transport their clams to the depot when they needed additional cash, subsequently this resulted in an over-stocked warehouse, which took the depot almost six months to clear.

Through discussions with the WorldFish Center and the regional consultant (Mr Simon Ellis) it was recommended that the depot cease the payments at the farmers gate and a new mechanism for the collection of clams and corals be developed (See appendix A for the full report from Mr Ellis).

In late 2009 a new mechanism for the transport of clams and corals was developed and proposed to farmers at the November farmers meeting. The new method of transport involved the farmers taking responsibility themselves to transport their clams to the depot using existing forms of transport such as regular village market and transport boats. This was to be based on a timetable approach prepared by the depot to allow all farmers equal opportunity to sell their products. Associated with the change in collection method was an increase in the price that the farmers received for the products (because the depot fee was able to be reduced) to encourage their involvement and to cover their transport costs. This method was trialed in early 2010, with the depot communicating with the appropriate farmers on a week to week basis.

Several difficulties have been faced with this method including:

- Communication difficulties between the farmer and the depot (i.e. difficult accessing farmers on the HF radio; problems with mobile phone connections; farmers forgetting their scheduled week)
- Transport difficulties with some villages having little space available on market boats
- Farmer concerns that the market/transport boats will not adequately protect their products
- Farmers needing to take the responsibility of grading their products to reduce rejections.

This method continues at the time of writing this report with ongoing assessment of problems. Already some modification have been agreed on or implemented: farmers have been provided with guidelines to assist them to grade their own products for export;- as part of the new MOU with the WorldFish Center the depot will be provided with a HF radio to allow them to maintain regular communication with farmers; farmers have been provided with Styrofoam boxes to transport their products to the depot to increase product survival.

<b>Completion of activity (%)</b>	0%	25%	50%	75%	100%
<b>Comments</b>	Activity completed by required continued monitoring by the depot over time				



## Set up reliable communication systems with the exporter and the farmers

Although the past few years has seen a rapid development in communication technology in the Solomon Islands, such as mobile phones and internet becoming available in urban centers, and in some cases rural outposts, communication remain one of the most difficult aspects when undertaking a small business venture in remote rural areas. The majority of farmers involved in this project remain outside the mobile network area and continue to rely on HF radio, letters and word of mouth as their primary mechanisms of communication.

Through the provision of office and internet access support from WWF (and WorldFish on an as-needs basis) the depot has established a regular email correspondence with the exporter in Honiara for placing orders, sending receipts and communicating about product sales and quality. This method of communication has been mostly successful, apart from times when email or internet is down. Under these circumstances the depot relies on mobile phone contact with the exporter to ensure product orders and deliveries are received.

In addition, due the location of the WWF-SI office in Gizo (the main urban center in the Western Province), the time the depot operators spend in Gizo provides an opportunity for face to face contact between the depot and the farmers (when farmers come to Gizo for other business). Otherwise the mode of contact between the depot and the farmers varies, depending on individuals and is usually via HF radio, mobile phone or public phone.

As part of the new transporting system described in the activity above, a regular communication mechanism has been established between the depot and the farmers, a member from each village has been designated as the primary contact point for the depot. In addition the NAFA executive and NAFA farmers meeting create a mechanism by which the depot and the farmers can communicate. The NAFA executive contains one member from each village and it is their responsibility as part of their position in the executive to communicate farmer updates and concerns, and subsequent feedback, between the village, the NAFA executive and the depot.

The expected imminent development of improved mobile phone networks and internet access in Solomon Islands will continue to ease the current difficulties face by the depot, exporter and NAFA farmers.

<b>Completion of activity (%)</b>	0%	25%	50%	75%	100%
<b>Comments</b>	It is anticipated that communication will become easier overtime with the development of technology				

Assist the depot operator to establish a rapport with the farmers and exporting agencies

The depot operator has been in the aquarium trade industry in various capacities for many years and thus had a previous long-term relationship both with the farmers and the exporting agencies. Despite criteria for selection being openly discussed with the farmers and transparently communicated to them following the depot feasibility study, there was (and remains) jealousy from the farmers that Naomi and Patson Baea were the successful candidates for the depot (an experience common to many small enterprises in Solomon Islands). Thus although the farmers knew the depot operators well, there was significant amount of mistrust and feeling that they were making a significant amount of money undertaking the depot operation.

The skepticism about the depot was further exacerbated by the fact that a lower price was received by the farmers for the products once the depot took over from WorldFish and implemented full cost recovery (due to the 30% deduction to cover depot costs). In addition in the early stages the depot did not regularly collect product from the farmers and keep track of their inventories, as was the case when WorldFish undertook collections of products under the initial development phase of the project.

The mechanism that was adopted to assist the depot to establish a good rapport with the farmers was to remain transparent in terms of income and expenses and with support from WorldFish and WWF to explain the reasons why the depot could not be operating in the same manner as a subsidized project. Small business training for all farmers also assisted them to better understand the costs associated with running a business. The transition between the development and commercialization phases of this project were very rapid and for any similar undertakings we recommend that this transition should be undertaken over a longer period to ensure understanding of all parties.

The depot has been able to establish their own rapport with the exporting agency in Honiara (Aquarium Arts). Some assistance was provided to the depot in achieving this, particularly with regards to the nomenclature of corals. There are many different coral species and during the initial orders the depot received from the exporter, corals were requested by their latin (scientific) names. At that stage the depot operators did not have sufficient knowledge of coral species and thus found it difficult to send the correct corals. To overcome this issue WorldFish worked with the exporter and the depot to develop a local system of coral names with pictures of the appropriate corals (Appendix B).

Completion of activity (%)	0%	25%	50%	75%	100%
Comments					

Ensure that the depot operator and NAFA are managing the farmers in a way that ensures retention of sustainable techniques and that they are responsive to market demands

NAFA farmers are bound by their constitution and one of the aims of NAFA is to provide sustainable and reliable harvesting processes and market outlets. In addition, to ensure the retention of sustainable techniques into the future NAFA requested the WorldFish Center to develop a new farmers manual that can be used as a training guide for new member. This manual has been completed as part of phase II of the project and outlines the sustainable techniques and processes required of farmers (Appendix C).

In order to ensure that farmers remain responsive to market demands the depot tries to keep track of farmers inventories to ensure products likely to be required by the exporter will be available when needed. For example farmers buy juvenile clams directly from the WorldFish hatchery. Towards the end of 2009 there was a decline in the availability and purchase of juvenile clams owing to a lag time between cohorts available from the WorldFish hatchery. Now as the clams are becoming available again at the hatchery, the depot continues to encourage farmers to buy new clams to ensure that there will be a supply of 2 inch clams in the coming months. The depot also offers to supply juvenile clams to the farmers and deduct the costs of these from the farmers sales as an incentive for them to continue to farm their products. This means that farmers do not need to supply cash up front to purchase replacement juvenile clams.

Ensuring farmers are responsive to market demand will continue to remain an issue for the depot and NAFA. Rural Solomon Islanders do not have the freedom to be able to undertake livelihood activities as a hobby and farmers are expected to shift between livelihood options, depending on what is providing them the best return on their investment of labour at any given time. Therefore to ensure long-term sustainability of the industry it is essential that the market for sustainable ornamentals from the Solomon Islands is expanded to ensure that this particular option provides enough return for effort to remain a desirable option.

<b>Completion of activity (%)</b>	0%	25%	50%	75%	100%
<b>Comments</b>	Longer term responses to markets and retention of sustainable techniques will be dependent upon future market and accounting of sustainability				

Ensure that NAFA is fully aware of its role in ensuring that sustainable, fair and equitable practices are in place throughout the industry.

The strengthening of the Nusa Aquarium Farmers Association has been a fundamental role for WWF-SI during Phase II of this project. Through a series of four executive and two farmers meetings and a small business training workshop, NAFA and in particular the NAFA executive have been able to understand their role in the industry and they take their role in the aquarium

trade in the Western Province very seriously. In late May 2010 the secretary of NAFA traveled to Honiara (NAFA funded) to undertake the registration processes to make NAFA a legal entity.

While they understand that they need to be independently financially viable, as an organization they wish also to be able to have the opportunity to obtain funding from community small grants project for example, to be able to continue to support their farmers and to ensure the sustainability of the aquarium industry in the Western Province of the Solomon Islands. Full details of the NAFA meetings are available in the final report of activities submitted by WWF-SI (Appendix D).

Completion of activity (%)	0%	25%	50%	75%	100%
Comments					

Ensure that NAFA can effectively process new farmers into the system.

During phase II of the project NAFA made the decision not to involve new members into the system for a 12 month period, to ensure the industry and NAFA have enough time to establish themselves and to establish a process for brining in new farmers. During NAFA executive meetings it was established that new members would be trained by existing (selected) NAFA members and to ensure that sustainable techniques and processes are followed, the farmers manual is to be used as a guide.

WorldFish and WWF-SI are committed to continuing to support NAFA through being ready to provide advice (technical or otherwise) through their continued presence at Nusa Tupe and Gizo. In addition a Western Province fisheries officer (under secondment to WorldFish) will be available to help support and strengthen NAFA where funds permit. This fisheries officer has received full training on the marine ornamental trade through the WorldFish Center and has been involved in NAFA meetings over the past year of the project. This capacity building processes through provincial infrastructure will help support the industry in the longer term.

Completion of activity (%)	0%	25%	50%	75%	100%
Comments					

Have the Gizo based lawyer that was involved in the initial development of the NAFA constitution review NAFA constitution, provide continued advice and attend a farmers meeting to advise farmers by November 2009.

A Gizo based lawyer was utilized to provide support and assistance to NAFA, in particular for the review of the NAFA constitution. Unfortunately the lawyer was unable to attend a farmers meeting, however through WWF-SI, the lawyer was able to provide advise to the NAFA executive with regards to reviews required on for the NAFA constitution as well as the process

and provision of application forms and advice on the registration of the association. The most current version of the NAFA constitution is provided in Appendix E.

<b>Completion of activity (%)</b>	0%	25%	50%	75%	100%
<b>Comments</b>	The lawyer was unable to attend a farmers meeting				

SIBEC to run a small business planning course in Gizo for all farmers to follow on from the introductory financial management course.

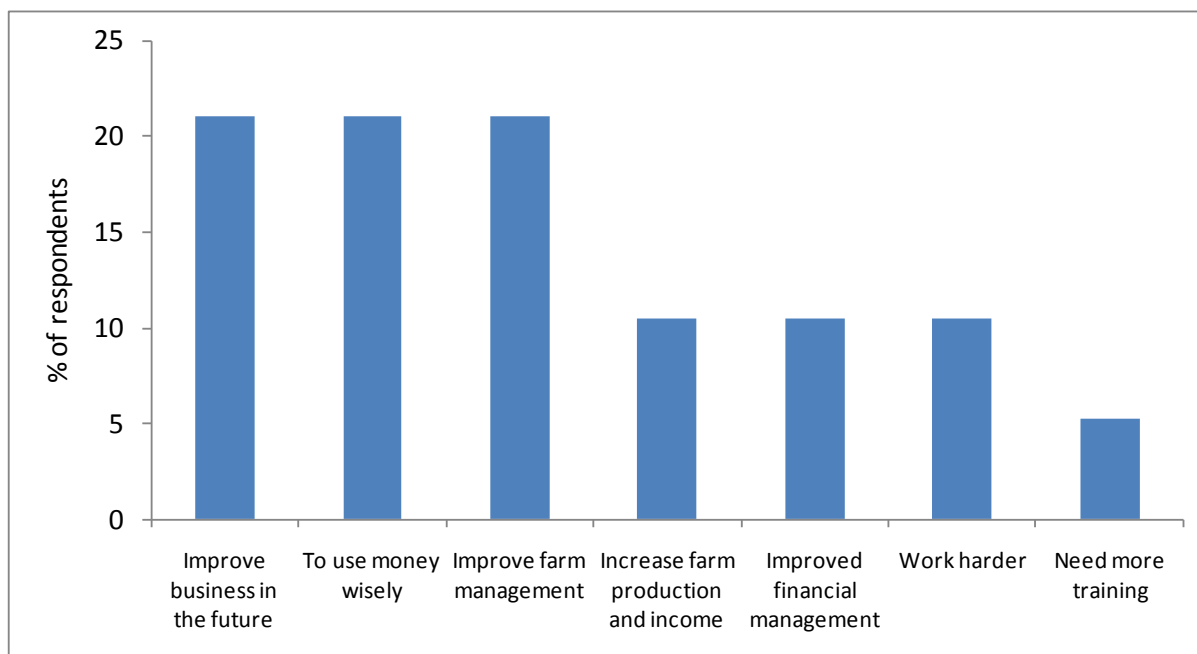
A second small business training workshop was held with NAFA farmers at Nusa Tupe on September 29<sup>th</sup> and 30<sup>th</sup> 2009. This business training was a continuation on from the initial introductory financial management course run by Solomon Island Business Enterprise Center (SBEC) during phase I. The second small business training was focused towards record keeping and in total 27 farmers attended the training (5 women and 22 men).

SBEC undertook a specific monitoring and evaluation exercise after the business workshop. Although the monitoring and evaluation undertaken by SBEC was primarily for their own purposes, the responses in these surveys were similar in that the majority of people that attended the course (70%) stated that what they learned during the course was relevant to their marine aquarium business activity and they would apply what they have learnt to their own business into the future. The full report from SBEC is provided in Appendix F.

Key recommendations from SBEC were:

- SBEC must collect detailed information and have time to tailor the training
- SBEC to come up with a standard cash book training for two days which will include the financial statements.
- SBEC trainer to use projector when conducting training at urban centers. This will add flavor to the training.
- Participants with little education should send a family member who has some good education to attend bookkeeping training as the training involves a lot of calculations.
- World Fish to considering seeking financial assistance for a full course on SIYB to be conducted for the farmers

At the end of the small business training workshop an additional short survey was undertaken by WorldFish to look at the perceived benefits of the training exercise (on the part of the farmers), specifically in terms of the project outcomes. All farmers that attended the workshop stated that the business training was important for them to be able to improve their farming activities into the future. The business training would be able to help them primarily by; improving their business, using money wisely and improving their farm management (Figure 3).



**Figure 3 Ways in which the farmers stated the business training could assist them.**

In addition, as part of the monitoring and evaluation component undertaken towards the end of this project (see relevant section below), farmers were asked to rate their satisfaction with different components of this project (1 = not satisfied, 5 = very satisfied). Of the 27 farmers interviewed, the average rating for the business training was 4.4, which was similar to the rating for the clam, coral and PCC training that were undertaken during phase I.

<b>Completion of activity (%)</b>	0%	25%	50%	75%	100%
<b>Comments</b>					

Measures of Success	Achieved
The depot manager has identified the optimal strategy for collection and warehousing of products	√
The depot operator is competently keeping records of sales and is able to analyse trends	√
NAFA accepts the depot annual report	√
Farmers utilize sustainable techniques and are responsive to market demands	mostly
There is an increase in percent orders filled for the exporter at the end of phase II	×
Exporters continue to purchase products to May 2010	√
Depot realizes a sufficient profit by May 2010 to motivate the operators to continue	√



## Objective 2 Hatchery Viability

**“An operational and economically viable clam hatchery to support the marine ornamental trade industry”**

In many parts of the Pacific, including the Solomon Islands, giant clams have historically been harvested for food, their shell, and for the aquarium market. In many cases commercial exploitation has resulted in unsustainable harvesting practices. Since the late 1980's the WorldFish Center (previously ICLARM) has been researching the hatchery cultivation of giant clams, initially this research was conducted at the ICLARM facility near Honiara and following the destruction of this facility during the ethnic tensions a giant clam hatchery was re-built at the Nusa Tupe WorldFish Research Station in 2005 and the hatchery was completed as part of phase I of this project.

There are six species of giant clams found in the Solomon Islands, these are *T. gigas*, *T. derasa*, *T. maxima*, *T. squamosa*, *T. crocea* and *H. hippopus* (Figure 4). All of these species are valuable for the marine ornamental trade, however some species have higher market value such as *T. maxima* and *T. crocea* (due to the demand for their bright colours). These species are however more difficult to raise in the hatchery, have slower growth rate and are less robust to being transported than species such as *T. derasa*.



Figure 4 Six giant clam species of the Solomon Islands

In phase I of the project the giant clam species *T. derasa* was selected for farmers to grow out and sale for the aquarium trade. The main reasons for this selection were: there was a good supply of broodstock available at the WorldFish facility at Nusa Tupe; its known robust qualities and the fact that it was also known to be a relatively popular species in the aquarium trade.

External reviews at the end of phase I of the project recommended that other species be spawned at the Nusa Tupe hatchery in order to meet a known demand for these in the international market.

### Activities

Ensure that all efforts are made to produce seed clams of the *T. maxima* and *T. crocea* species and that existing production of *T. derasa* is formalized in a sustainable way so that WorldFish can be the supplier of seed clams into the foreseeable future.

During the bridging phase of the project prior to phase II being implemented, broodstock of *T. maxima* and *T. crocea* were obtained from stocks at Nusa Tuva, Makuti Island, Heron Island, Naru Island, Nusa Tupe and Saeragi. Additional collections of *T. crocea* were made at Sepo Island in mid-2009, to try and improve the status of the broodstock.

An initial successful spawning of *T. maxima* and *T. crocea* in March 2009 did not result in successful grow-out of clam seeds. During March 2009 – June 2010 broodstock of *T. maxima* and *T. crocea* were kept in the spawning tanks with supplemental feeding to assist with the growth of reproductive organs and health of these clams to cope with the stressful process of spawning. During May 2009 and June 2010 there were four attempts of spawning *T. maxima* and *T. crocea*, of these attempts only one spawning and fertilization of *T. maxima* was successful. There has been no successful spawning yet for *T. crocea*. The *T. maxima* are currently in grow-out phase in land tanks at Nusa Tupe. Once ready for sale (> 18 mm) these juvenile clams will be used to trial with some experienced farmers for grow-out and export to the aquarium trade.

WorldFish has made an organisational commitment to continue to provide seed clams to Western Province farmers on a cost recovery basis into the foreseeable future. However in the longer term WorldFish would like to see this activity adopted by either the Solomon Islands government (National or Provincial Fisheries staff) or a private operator. In order to facilitate this transition, a new spawning method (extensive culture) is being trialed at Nusa Tupe. This method reduces the need for a full hatchery and reduces costs involved in hatchery labour, feeding, fuel (for pump) and chemical costs. The 'extensive' spawning technique means that the intensive hatchery processes currently managed by the Nusa Tupe hatchery manager can be simplified for ease of passing knowledge and skills to a wider range of people.

In order to increase the economic viability of the clam hatchery (and as a recommendation from the regional consultant – see regional consultant report for details) funds from Phase II of the project were allocated (in agreement with NZAID) to enable hatchery manager (Mr Cletus Oengpepa) to attend a “look and learn” training exercise for the culture of giant clams using extensive methods at the Marine and Environmental Research Institute of Pohnpei (MERIP). On his return Mr Oengpepa held a training workshop on the extensive spawning method for five NAFA representatives, MFMR provincial and national staff as well as the staff at Nusa Tupe. A manual has also been produced (see Appendix G) and is available for MFMR and provincial fisheries staff as well as interested farmers.

In 2010 there were 12 attempts to spawn giant clams using the extensive method, of these attempts there were four successful spawnings (two *T. derasa*, one *H. hippopus* and one *T. maxima*); these clams are currently in the grow-out phase in land tanks at the Nusa Tupe research station. In total during the period May 2009 to May 2010 eight successful cohorts were produced and reared in the land-based nursery.

One of the tasks for this activity was to conduct a cost benefit analysis for *T. derasa* vs other species. At this stage this is not possible owing to the low success rate for spawning of the other species. As identified at the start of the project species other than *T. derasa* are more difficult to raise in the hatchery and have slower growth rates. Until it can be shown that a sufficiently higher price can be obtained for these species to account for the increased production rates a cost-benefit analysis is not possible.

Two major constraints have been encountered in the giant clam juvenile productions (regardless of species); the availability of mature broodstock and the long retention time in the landbase (it generally takes 6 to 8 months for juvenile clams to be ready for sale). In particular it has been identified that although there are lower costs involved, the extensive method has a longer nursery cycle than hatchery raised clams and typically raises fewer clams per spawning.

In order to track and record future production costs and income from the sale of juvenile clams produced at WorldFish, an account has been established at WorldFish HQ whereby hatchery related costs (pump fuel, labour costs, hatchery maintenance costs) as well as income are tracked. The intent is to retain a cost-neutral accounting system for the sustainable production of giant clams beyond the life of the NZAID funded project.

To further reduce the hatchery costs a system is currently being established whereby a gravity based feeder tank is used to pump water through the tank system, this will decrease the time required to run the diesel pump that circulates water through the land-based tank system.

Although only the extensive method is appropriate for transfer to organizations or individuals outside of WorldFish at this stage, owing to available skills and infrastructure, WorldFish will conduct an internal cost-benefit analysis for the two methods of clam production once the

extensive method has been fully established. This will ensure that we utilize the most effective method to be able to provide clams into the foreseeable future.

**Table 1 Giant clam spawning activities at Nusa Tupe from May 2009 - June 2010**

Clam species	Date	# gametes	Spawning		Method	Current status/comments
			Success	Fail		
<i>T. maxima</i>	27 <sup>th</sup> Aug 2009	Sperm only		√	hatchery	unsuccessful
<i>T. derasa</i>	28 <sup>th</sup> Aug 2009	157 million	√		hatchery	unsuccessful in grow-out
<i>T. derasa</i>	15 <sup>th</sup> Sept 2009	18 million		√	hatchery	unsuccessful
<i>T. derasa</i>	18 <sup>th</sup> Sept 2009	10 million	√		hatchery	unsuccessful in grow-out
<i>T. derasa</i>	26 <sup>th</sup> Oct 2009	63 million	√		both	Ready for farmer purchase
<i>T. crocea</i>	25 <sup>th</sup> Feb 2010	Sperm only		√		unsuccessful
<i>T. maxima</i>	26 <sup>th</sup> Feb 2010	Sperm only		√		unsuccessful
<i>T. gigas</i>	16 <sup>th</sup> Mar 2010	Sperm only		√		unsuccessful
<i>T. squamosa</i>	26 <sup>th</sup> Mar 2010	10 million	√		hatchery	Grow out in tanks
<i>T. crocea</i>		Sperm only		√		unsuccessful
<i>T. gigas</i>	29 <sup>th</sup> March 2010	Sperm only		√		unsuccessful
<i>H. hippopus</i>	13 <sup>th</sup> April 2010	8 million	√		extensive	Grow out in tanks
<i>T. derasa</i>		6million	√		extensive	Grow out in tanks
<i>T. maxima</i>		Sperm only		√		unsuccessful
<i>T. crocea</i>		Sperm only		√		unsuccessful
<i>T. maxima</i>	28 <sup>th</sup> May 2010	10 million	√		extensive	Grow out in tanks
<i>T. derasa</i>		8 million	√		extensive	Grow out in tanks
<i>T. crocea</i>		Sperm only		√		unsuccessful
<b>TOTAL</b>			<b>8</b>	<b>10</b>		

<b>Completion of activity (%)</b>	0%	25%	50%	75%	100%
<b>Comments</b>					

Measures of Success	Achieved
At least two cohorts of clam seed are being produced a year under a cost recovery basis	√
At least one additional species of giant clam is available as clam seed for sale from WorldFish	Cohorts in tanks
Cost benefit analysis report of <i>T. derasa</i> v's other clam species is available	Not yet possible
WorldFish has an acceptable cost neutral system within the organisations accounting system from tracking hatchery expenditure and income that ensures the organisation can sustain production beyond the life of the project	√

### ***Objective 3 Product Expansion***

#### **“Creating future benefits for the Western Province depot from eco-labelling.”**

This component of the project was designed to identify possible mechanisms and activities that could enhance the monetary return to farmers and depot from the sale of marine ornamentals, including mechanisms to increase the number of organisms sold and, the price obtained and to reduce production costs. The mechanisms proposed to investigate were:

- Expand the product range by increasing species of clams
- Take measures to remove the Central government 10% withholding tax
- Linking to eco-tourism
- Investigate information eco-labeling opportunities.

At the time of the start of phase II the Coral Reef Initiative for the South Pacific (CRISP), through French GEF funding were developing a programme to support the development of eco-certified trading networks for the ornamental trade market in the Pacific. The implementers had a strong interest in the Western Province marine ornamental trade being undertaken through the NZAID project and it was intended that they would link to and supplement attempts at eco-labeling thereby also providing a more regional focus.

The CRISP programme was delayed from the anticipated mid-2009 start, thus the focus on eco-labeling as part of this project was also delayed. Nevertheless, the WorldFish Center was successful in receiving a small quantity of funds from the CRISP – French GEF project and from May 2010 – April 2009 there will be a project in the Solomon Islands focusing on the expansion of the aquarium trade through the development on an informal eco-label and a website for advertising products. While waiting for the anticipated link to the CRISP initiative, this objective focused on expanding the product range and linking to eco-tourism.

#### **Activities**

##### Expand WorldFish product range to include other species of clams

The new clam species described above will be included as part of the new product range in a step-wise process, initially through the trial of selling juveniles to experienced farmers. These farmers will be able to identify any issues or concerns with the farming of these new species. Once issues and concerns are addressed, these species will be made available for other clam farmers as part of NAFA. Ongoing support for the development phase will be provided beyond the life of the NZAID project through the CRISP project in the first instance.

Concurrently there has been a diversification in the range of coral species being farmed. Through an iterative process between the Maraqata Depot and Aquarium Arts (the exporter based in Honiara) locally available hard and soft coral species in demand internationally, were included as part of the product range. To ensure a maximum coverage of different species

across the coral farmers, farmers were provided with specific coral species to grow (see appendix B for full list of coral species being targeted by NAFA farmers).

Completion of activity (%)	0%	25%	50%	75%	100%
Comments					

Take measures through MFMR to reduce central government taxes imposed on exports of cultured marine products from the current 10%.

In June 2009 a letter was submitted to the MFMR Aquaculture group to request the exemption of the central government’s 10% withholding tax for rural farmers of sustainably produced aquarium products. MFMR agreed that they supported this initiative and have made a submission to the Ministry of Finance. There is yet to be a response.

Completion of activity (%)	0%	25%	50%	75%	100%
Comments	No response yet from Ministry of Finance				

Produce promotional material to support a future Solomon eco-labeled brand

This activity was focused towards expanding the aquarium trade industry in the Solomon Islands by focusing efforts on the eco-tourism industry. The initial activity ‘Adopt-A-Clam’ was established with Uepi Resort in Marovo Lagoon in late 2009. The resort buys 5 inch clams from the depot (at the same price as the Honiara exporter) and they on-sell these to tourists to plant on the reef. This provides an additional market outlet for Solomon Island sustainable products and also assists in the natural re-stocking of giant clams on Solomon Island reefs. The second activity ‘Adopt-A-Coral’ was established with Fat Boys Resort in Gizo. Fat Boys resort buys farmers’ corals via the depot that are either over-grown (too big to export) or the wrong species of coral to be exported for the aquarium trade. Tourists then buy these corals to plant them on the resort’s reef. This provides a mechanism for farmers to be able to sell products that are not viable for the aquarium trade, at the same time restocking the natural population of corals. The promotional material developed as part of these activities is shown in Figure 5Figure 5.

Completion of activity (%)	0%	25%	50%	75%	100%
Comments					

**Measures of Success**

Informal eco-labeling of the products accompanies shipments and NAFA is included in any regional initiatives to develop eco-labeling

**Achieved**

× (future development)





Over the past few decades giant clams throughout the Solomon Islands have been reduced to critically low levels due to overharvesting for their meat, shell and the aquarium trade.

Now thanks to a sustainable culture and farming program, we can offer guests the opportunity to help wild populations recover by adopting a clam and replanting it yourself on the reef.

These clams have been cultured by the WorldFish Center and cared for by local village farmers until they reach a size ready to go back to the reef.



For less than a few drinks you can single-handedly help this endangered species, while supporting a sustainable income for local villages.

These clams have been cultured as part of a NZAID funded project "Creating Rural Livelihoods in Solomon Islands through Environmentally-Friendly Aquaculture and Trade of Marine Ornamentals".



In April 2007 an earthquake and tsunami destroyed a number of villages and coral reefs in the Western Province of the Solomon Islands. Two years later, there are still many reefs where corals have not regrown, these corals provide important habitat and food source for many marine species.

Now, thanks to a sustainable culture and farming program, we can offer guests the opportunity to help wild populations recover by adopting a coral and replanting it yourself on the reef.

These corals have been sustainably cultured and cared for by local village farmers until they reach a size ready to go back to the reef.



For less than the cost of a few drinks you can single-handedly help the reefs recover, while supporting a sustainable income for local villages.

These corals have been cultured as part of a NZAID funded project "Creating Rural Livelihoods in Solomon Islands through Environmentally-Friendly Aquaculture and Trade of Marine Ornamentals".



Figure 5 Adopt-A-Clam (left) and Adopt-A-Coral (right) posters that were provided to the resorts to support the eco-tourism activities as part of this project

## **Objective 4 Industry Sustainability**

### **“Ensuring industry and farmer sustainability beyond the life of the project”**

The primary goal of this project was to *establish a viable commercial enterprise with a realistic chance of sustaining future contribution by a range of Western Province farmers that can meet NAFA requirements to provide environment-friendly aquarium products to the international marine ornamental market.* At the end of this project all that will remain are the farmers and the depot, with NAFA as the main supporting mechanism linking them. In order to ensure industry and farmer sustainability beyond the life of the project, there has been an active focus towards training, awareness and education, particularly through NAFA and the depot (linked also to objectives 1 and 3 above). However industry sustainability is also intrinsically linked to the market and trade potential. A better understanding of, and increased government and donor emphasis on, how to improve marketing and trade routes from remote communities is required to ensure the wider sustainability of enterprises specializing in marine products in general.

### **Activities**

#### Provide training, advice and awareness to farmers and to the NAFA executive on management of small enterprises in general, economics and on the specific attributes of the marine ornamental trade.

The small business training has been the most effective mechanism through which farmers have gained awareness of small business management practices. Throughout phase II farmer and the NAFA executive have been kept abreast of specific aspects of the marine ornamental trade, primarily through the newsletters that were produced as part of this project. Feedback from the exporter about product quality, as well as the aquarium industry are regularly circulated via the depot and back to the farmers. The newsletters produced as part of this activity are available in Appendix H.

Completion of activity (%)	0%	25%	50%	75%	100%
Comments					

#### Ensuring that all understand the implications of eco-labelling in the future and the importance of maintaining standards

Although an eco-label was not specifically developed as part of this project, maintaining standards for the sustainable techniques and standards developed as part of this project are fundamental to ensure the long-term sustainability of marine resources in the Solomon Islands. Through training, meetings and workshops the farmers and the depot are fully aware of the implications for maintaining standards and to this day, farmers continue to maintain

broodstock and follow protocols as per training. The farmers manual (Appendix C) will ensure that new farmers are also aware of the protocols. Improving the long-term maintenance of sustainable technologies is an issue that will be further explored through the previously mentioned CRISP funding received by the WorldFish Center

Completion of activity (%)	0%	25%	50%	75%	100%
Comments					

To allow an opportunity for all farmers to continue to provide inputs to the management of the industry after donor exit in June 2010

Through the NAFA executive and farmers meeting, NAFA and in particular the NAFA executive have been able to understand their role in the industry and they take their role in the aquarium trade in the Western Province very seriously. As part of the final (project funded) NAFA meeting it was decided by the NAFA executive that farmers meetings and regular farmer communication will now occur at a regional level (three regions centered on the depot), with NAFA executive members (of which there is one from each region) to report back to the depot and executive. This will provide a possible mechanism for providing continued input into the industry. In this regard it is promising that the current NAFA executive are represented primarily by motivated, long-term farmers with a keen ambition to succeed.

Completion of activity (%)	0%	25%	50%	75%	100%
Comments					

Print additional promotional materials for sustainable aquarium products from Maraqata depot for distribution to exporters, international buyers and visitors by March 2010.

Materials promoting sustainable aquarium products from the Solomon Islands produced as part of this activity include: pamphlets about Western Province cultured products, Solomon Island giant clams, NAFA farmed corals, the Maraqata depot and NAFA (Appendix I). These pamphlets have been printed and distributed to exporters and visitors. In particular the exporter (Aquarium Arts) has found the coral pamphlet beneficial and further distribution from Aquarium Arts to other buyers has occurred, which has resulted in increased requests for specific coral species. In addition to printing these materials, WorldFish has been working with a website developer who has scoped and begun to design a website to promote the products supplied by NAFA and the depot. The CRISP funded project will ensure the completion and launching of the website and will enable the inclusion of a wider range of promotional material.

The website will be used to advertise and increase the market for Solomon Island sustainable marine aquarium products.

<b>Completion of activity (%)</b>	0%	25%	50%	75%	100%
<b>Comments</b>					

Measures of Success	Achieved
NAFA is recognized by farmers, the exporter, MFMR, WorldFish and other NGO's as the primary governing organization for the Western Province	√
Income is sufficient to encourage farmers to remain involved	mostly
The executive and members of NAFA are fully aware of all the issues relating to the sustainability of the project, including quality, quantity and variety of products	√

## Objective 5 Assessing Effectiveness

**“Improving the welfare of women, children and families, through a family member’s involvement in exporting products to the marine ornamental trade”**

Rather than one final project exit workshop, two approaches were used to evaluate the impact of the project and to assess whether this project has achieved its original overarching goal of *providing effective supplementary livelihood opportunities that benefited rural communities*, through achieving the expected outcome of *enhanced well being of village communities within the Solomon Islands, through the provision of new revenue sources based on the sustainable cultivation and sale of marine organisms*.

During the final farmers meeting in May 2010 focus group discussions were held to elicit responses from farmers to key topics. Subsequently, household questionnaires were conducted within the villages where farmers are currently active, or have been active at some stage over the life of the project.

### Activities

Conduct household surveys of NAFA members, community members and project drop-outs to attempt to identify socioeconomic indicators for better targeting of rural communities and families

Outcomes from the two activities undertaken as part of this project are outlined in the monitoring and evaluation report, which follows below.

Completion of activity (%)	0%	25%	50%	75%	100%
Comments					

An exit meeting of all stakeholders to determine what has worked well, what has not, and what have been the benefits to the participants.

Completion of activity (%)	0%	25%	50%	75%	100%
Comments					

### Measures of Success

Achieved

There have been improvements in the welfare of women, children and families through a family member’s involvement in exporting products to the MOT

√



## Assessment on meeting project goals and objectives

An overall assessment on whether the project goals and objectives of phase II of this project have been met has been undertaken through the analysis of the completion level of the individual activities for each of the project objectives (Table 2) as well as an assessment of the project ‘measures of success’.

Overall 100% of activities were completed for 3 out of 5 objectives, of the remaining objectives three activities were 75% completed, with the final completion of the activity being reliant on other parties and future responses from the aquarium trade market.

Of the specific project “measures of success” that were identified in the project document 80% were fully or mostly achieved, of the remaining “measures of success” two were not possible to be completed by the end of the project and only one was not achieved.

**Table 2 Overall assessment of the level of completion of each of the activities undertaken as part of phase II**

Activity	Completion level	Comments
<b>Objective 1 Depot Optimization:</b> Work with the depot operators and farmers to; optimize the operations of the depot to ensure that the depot acts as an effective mediator between the exporter and farmers to ensure quality and reliability of supply under fluctuating demand and ensure that both depot and farmers receive sufficient reward for effort to make them willing to continue their operations		
Interact regularly with the depot operator to assess sales, expenses and stock management.	100 %	
Assist the depot operator with day-to-day issues such as record keeping, sales analysis and trends	100 %	
Assist the depot manager to identify, using an adaptive approach, the optimal strategy for collection and warehousing of products.	100 %	
Set up reliable communication systems with the exporter and the farmers	100 %	
Assist the depot operator to establish a rapport with the farmers and exporting agencies	100 %	
Ensure that the depot operator and NAFA are managing the farmers in a way that ensures retention of sustainable techniques and that they are responsive to market demands	75 %	Long term responses to markets and retention of sustainable techniques will be dependent upon future market and accounting of sustainability
Ensure that NAFA is fully aware of its role in ensuring that sustainable, fair and equitable practices are in place throughout the industry	100 %	
Ensure that NAFA can effectively process new farmers into the system.	100 %	
Have the Gizo based lawyer that was involved in the initial development of the NAFA constitution review NAFA constitution, provide continued advice and attend a farmers meeting to advise farmers by November 2009	75 %	Lawyer was unable to attend farmers meeting
SIBEC to run a small business planning course in Gizo for all farmers to follow on from the introductory financial management	100 %	

Activity	Completion level	Comments
<b>Objective 2 Hatchery Viability:</b> <i>To set up the hatchery to be economically viable source of seed giant clams for farmers for two or three species in demand by the aquarium industry</i>		
Ensure that all efforts are made to produce seed clams of the <i>T. maxima</i> and <i>T. crocea</i> species and that existing production of <i>T. derasa</i> is formalized in a sustainable way so that WorldFish can be the supplier of seed clams into the foreseeable future	100%	
<b>Objective 3 Product Expansion:</b> <i>To explore and where feasible, implement options for expanding the aquarium product business, including at least enhancement of product range, reduction in production costs and marketing products as Solomon Eco-friendly</i>		
Expand WorldFish product range of product range to include other species of clams	100 %	
Take measures through MFMR to reduce central government taxes imposed on exports of cultured marine products from the current 10%.	75 %	Further action now depends on MFMR and Ministry of Finance.
Produce promotional material to support a future Solomon Eco labeled brand	100 %	
<b>Objective 4 Industry Sustainability:</b> <i>To ensure that at the termination of the project, structures are in place to ensure the sustainable governance of the marine ornamentals farming industry</i>		
Provide training, advice and awareness to farmers and to the NAFA executive on management of small enterprises in general, economics and on the specific attributes of the marine ornamental trade	100 %	
Ensuring that all understand the implications of eco-labelling in the future and the importance of maintaining standards	100 %	
To allow an opportunity for all farmers to continue to provide inputs to the management of the industry after donor exit in June 2010	100 %	
Print additional promotional materials for sustainable aquarium products from Maraqata depot for distribution to exporters, international buyers and visitors by March 2010	100 %	
<b>Objective 5 Assessing Effectiveness:</b> <i>To determine the effectiveness of the project in equipping farmers with the capacity to engage in the sustainable production of aquarium ornamentals as a supplementary livelihood</i>		
Conduct household surveys of NAFA members, community members and project drop-outs to attempt to identify socioeconomic indicators for better targeting of rural communities and families	100 %	
An exit meeting of all stakeholders to determine what has worked well, what has not, and what have been the benefits to the participants	100 %	
<b>Overall level of activity completion</b>	<b>96%</b>	<b>Average activity completion (%)</b>



**Table 3 Overall assessment of the achievement of the project 'measures of success'**

Measures of Success	Achieved
<b>Objective 1 Depot Optimization</b>	
The depot manager has identified the optimal strategy for collection and warehousing of products	√
The depot operator is competently keeping records of sales and is able to analyse trends	√
NAFA accepts the depot annual report	√
Farmers utilize sustainable techniques and are responsive to market demands	mostly
There is an increase in percent orders filled for the exporter at the end of phase II	×
Exporters continue to purchase products to May 2010	√
Depot realizes a sufficient profit by May 2010 to motivate the operators to continue	√
<b>Objective 2 Hatchery Viability</b>	
At least two cohorts of clam seed are being produced a year under a cost recovery basis	√
At least one additional species of giant clam is available as clam seed for sale from WorldFish	Cohorts in tanks
Cost benefit analysis report of <i>T. derasa</i> v's other clam species is available	Not yet possible
WorldFish has an acceptable cost neutral system within the organisations accounting system from tracking hatchery expenditure and income that ensures the organisation can sustain production beyond the life of the project	√
<b>Objective 3 Product Expansion</b>	
Informal eco-labeling of the products accompanies shipments and NAFA is included in any regional initiatives to develop eco-labeling	× (future development)
<b>Objective 4 Industry Sustainability</b>	
NAFA is recognized by farmers, the exporter, MFMR, WorldFish and other NGO's as the primary governing organization for the Western Province	√
Income is sufficient to encourage farmers to remain involved	mostly
The executive and members of NAFA are fully aware of all the issues relating to the sustainability of the project, including quality, quantity and variety of products	√
<b>Objective 5 Assessing Effectiveness</b>	
There have been improvements in the welfare of women, children and families through a family member's involvement in exporting products to the MOT	√

## Solomon Island Marine Ornamental Industry Situation Analysis

### *Monitoring and Evaluation Synthesis*

Twenty-seven individuals were interviewed (22 men, 5 women) the majority of these (88%) being active farmers. The farmers were distributed across the Western Province sites (Figure 1) and at least two farmers from each representative village were included in the monitoring and evaluation surveys.

### Farmers baseline information

#### Retention of farmers

A total of 90 individuals (75 men, 15 women) and 3 community groups have been trained in clam, coral and post-larval capture and culture (PCC) techniques. In June 2010, 39 individuals (36 men, 3 women) and 2 community groups remained as active farmers. The retention of farmers across the three main aquarium products was highest for clam farmers (80%) followed by 35% of coral farmers and 5% of PCC (lobster and shrimp) farmers (Figure 6). The majority of PCC farmers never implemented the training that they received, primarily due to the effort required for regular feeding of lobster and shrimps during the grow-out phase, combined with the low price that farmers received for these products from the exporter. Those farmers that did begin this activity after training were concentrated on eth island of Gizo and did not re-establish their activities after the 2007 tsunami due to other commitments and/or relocating away from the coast.

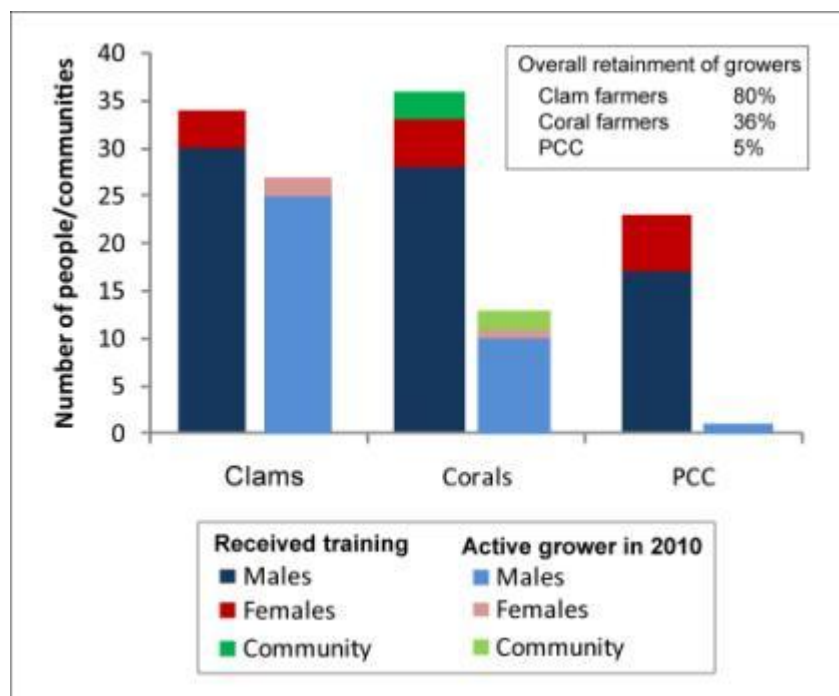


Figure 6 Retention of clam, coral and PCC farmers in 2010 compared to those originally trained

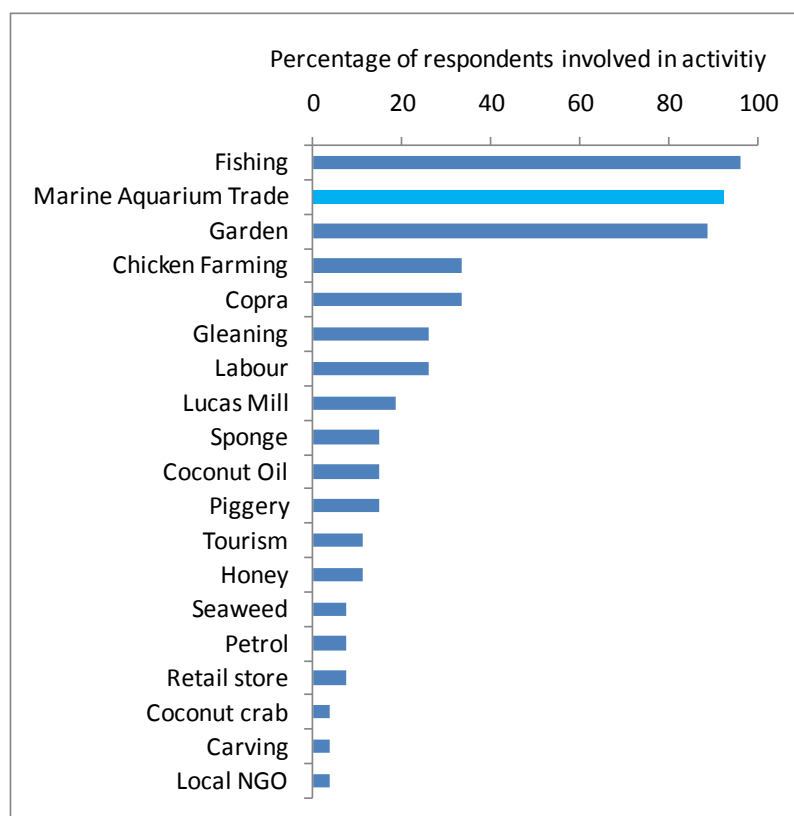
### Farmer and farmer household statistics

The average age of the farmers from the one-on-one interviews ranged from 23 to 79 years old (average 43 years). The majority of farmers were of the United Church (40%) or Seventh Day Adventist (40%) denominations, there were also farmers that were Catholic, South Sea Evangelical Church, Anglican or Methodist. Typically for Solomon Island households, the average household size was relatively high ranging from 1 to 16 people, with an average household size of 6.2 people (3 adults and 3.2 children).

### Livelihood activities

Previous research has shown that rural households generally engage in diverse occupations and that the ability to diversify activities is a key factor in the resilience of communities to external threats (Allison and Ellis, 2001). Diversification is seen as a method to reduce the reliance on one particular activity which, if it fails, places the participant in a vulnerable position.

On average the individual respondents were involved in 5.6 different livelihood activities (ranging from 2 – 10). Aside from farming aquarium products the main livelihood activities for the majority of respondents was fishing and gardening (Figure 7). This reflects the mainly subsistence livelihoods of rural Solomon Islanders. Other common livelihood activities included chicken farming, copra, labour, gleaning and building.



**Figure 7 Livelihood activities of individual farmers (% of farmers involved in each activity)**

## **Farming activities**

### Investment of time

One of the initial designs behind this project design was the idea that in order to support rural livelihoods, the activity should complement existing daily activities. In this regard it is important that the time required for investment in clam/coral and PCC farming should not be overly extensive so as to remove people from their daily livelihood activities. Farmers were asked how much time was spent per week on their primary livelihood activities. The time farmers spent on activities in their marine aquarium farm ranged from 2 hours/week to 3 days/week (average 1.3 days/week). In comparison to other main activities (fishing and gardening), the average time that farmers invest in farming their aquarium products (1.3 days/week) is approximately half of the time that is spent either fishing (3.2 days per week) or gardening (3 days per week).

The farmers were asked whether the work for the different activities associated with their marine aquarium business were undertaken by themselves, their families, their tribe or the community. The majority of respondents (81%) said that the business was undertaken by the family, 11% were part of a community run project and 7% were undertaken entirely by individuals.

### Involvement of women and youth

The majority of aquarium farmers (84%) trained as part of this project were men. One of the objectives of the monitoring and evaluation survey was to evaluate the roles of women and youth in the farming activities.

The respondents were asked to list the specific activities undertaken by the women (wives and other family members) and youth (male and female children). Overall women were engaged in a variety of activities for both the clam and coral farming with the highest number of women being involved in the husbandry of clams (cleaning clams and cages) as well as the planting and husbandry of corals. Youth were also primarily involved in clam husbandry, coral planting; coral husbandry as well as making cement bases to attached the corals (Figure 8).

This is a significant finding in terms of the spread of benefits and knowledge throughout the family and community. Training exercises were undertaken only by one identified farmer per family and during subsequent workshops and external reviews there has been little mention of the activities undertaken by other family members.

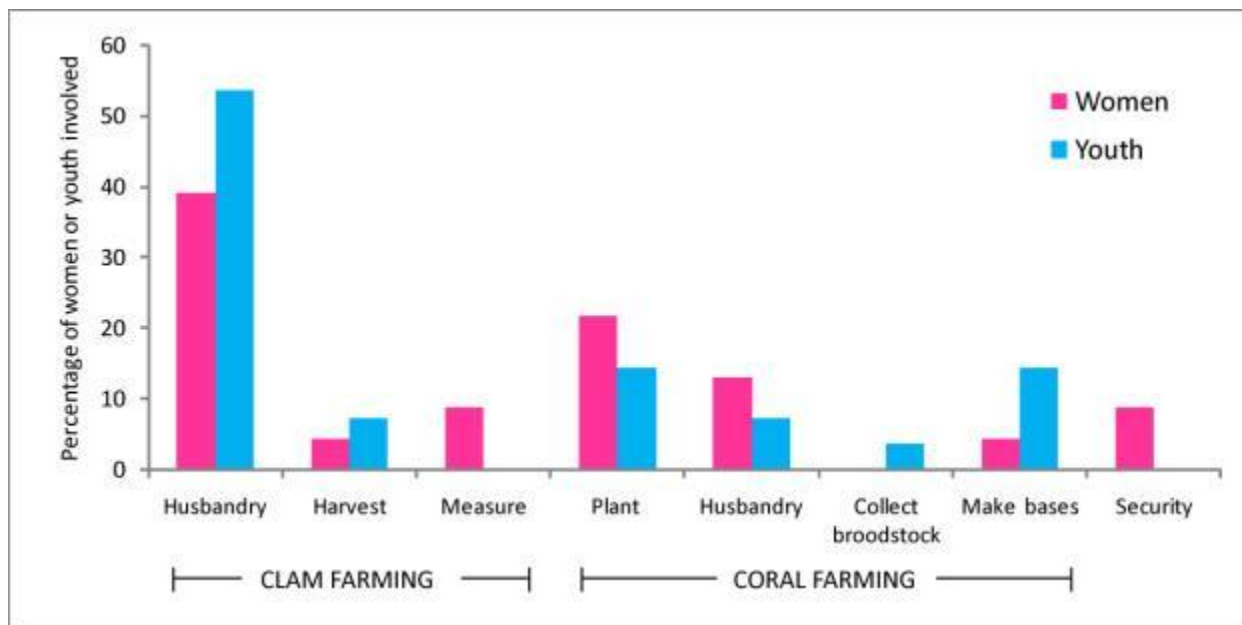


Figure 8 Clam and coral farming activities undertaken by women and youth

## Income and expenditure

### Income from sale of products

The average income for the sale of clams, corals and PCC shrimp/lobster was calculated for both 2009 and 2010 (note: 2010 data based only on the sales from Jan – May 2010). Overall the average income was similar over the two years, although the farmers income from the sale of clams was slightly higher in 2010 and the income from the sale of corals was lower in 2010 compared to 2009. On average clam farmers have earned approximately SBD \$2600 (NZ\$500), coral farmers SBD \$500 (NZ\$95) and PCC farmers \$500 (NZ\$95) per year (Figure 9). It should be noted that some farmers are more active and may have earned double this amount.

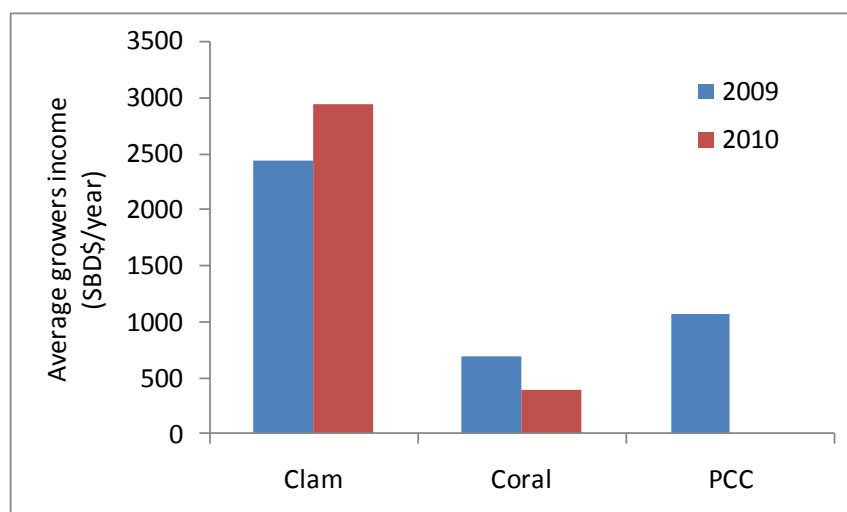


Figure 9 Average farmers income (SBD\$) from the sale of clams, corals and PCC

An average income of SBD \$500 - \$2600 seems like a relatively low amount of money from an outside perspective, however more than 95% of active farmers interviewed stated that their marine aquarium business was very important for their families, primarily as a source of cash (Figure 10). The cash income generated from this business contributes more than 40% of the farmers income for more than 70% of active farmers.

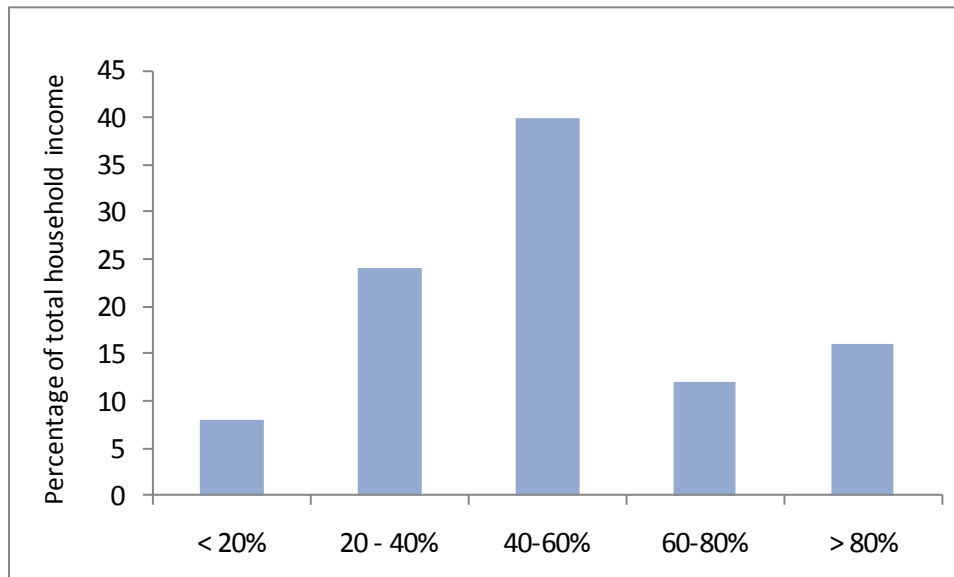


Figure 10 Current income from marine aquarium products (as a % of total income)

### Income expenditure

The decision about the expenditure of the income earned from farming corals, clams and shrimp/lobster was mostly made as a joint household decision, although in some households the decision was made either only by the men, or only by the women (Figure 12).

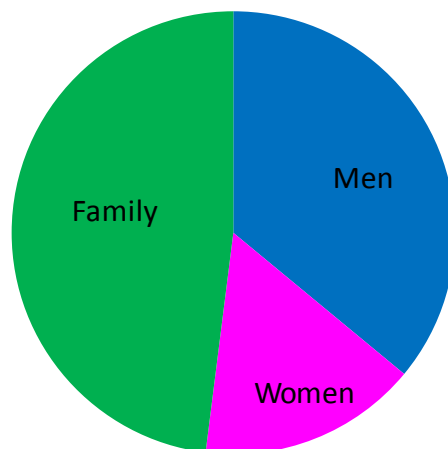


Figure 11 Response to the question "Who makes the decision about how the money earned from your farm is spent?"



The cash earned by the farmers for selling their clams and corals is used to pay for basic household expenses, primarily school fees and education costs followed by household food expenses and contributions to the church (Figure 12). More than 40% of respondents also used cash from the sale of clams to further expand their business. The use of funds from the sale of clams to expand and develop the farmers existing business was one of the key messages from the business training workshop undertaken by SIBEC, thus it is encouraging to see business expansion as one of the top five uses of income expenditure and highlights the benefits of associating business training exercises with livelihood development activities.

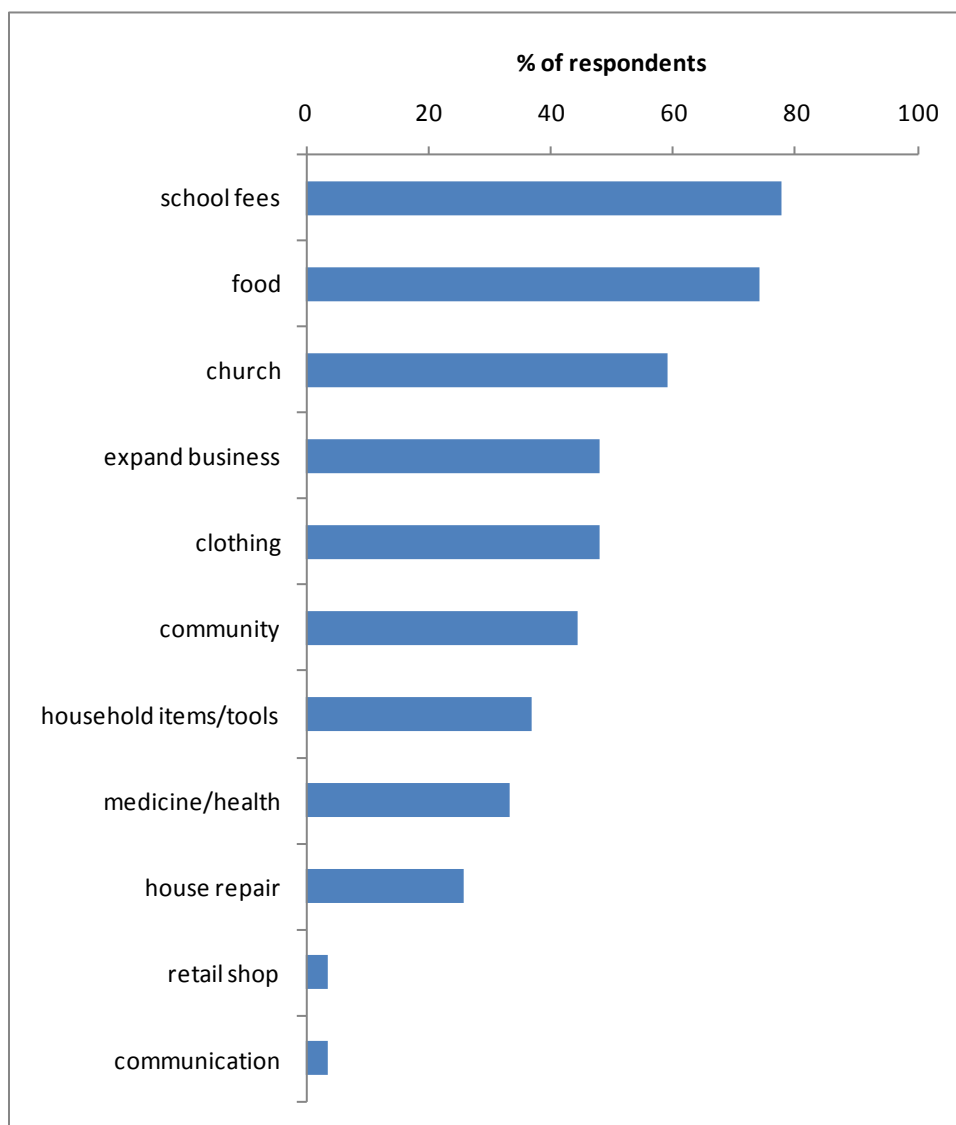


Figure 12 Main areas of income expenditure by the famers (for cash earned from sales)

## Project Benefits

### Family Benefits

Aside from financial assistance farmers recognized a number of other benefits that this project provided for their families. These benefits included; improved standard of living, increased knowledge of marine resources, improved children education, supporting family needs, having the basic resources to start up another business and the provision of materials that assisted them to start this business (Figure 13). A number of farmers mentioned that the training that they received through this project, was able to pass onto their children and other family members and this has improved their knowledge of marine resources as well as the need to protect these resources for the future.

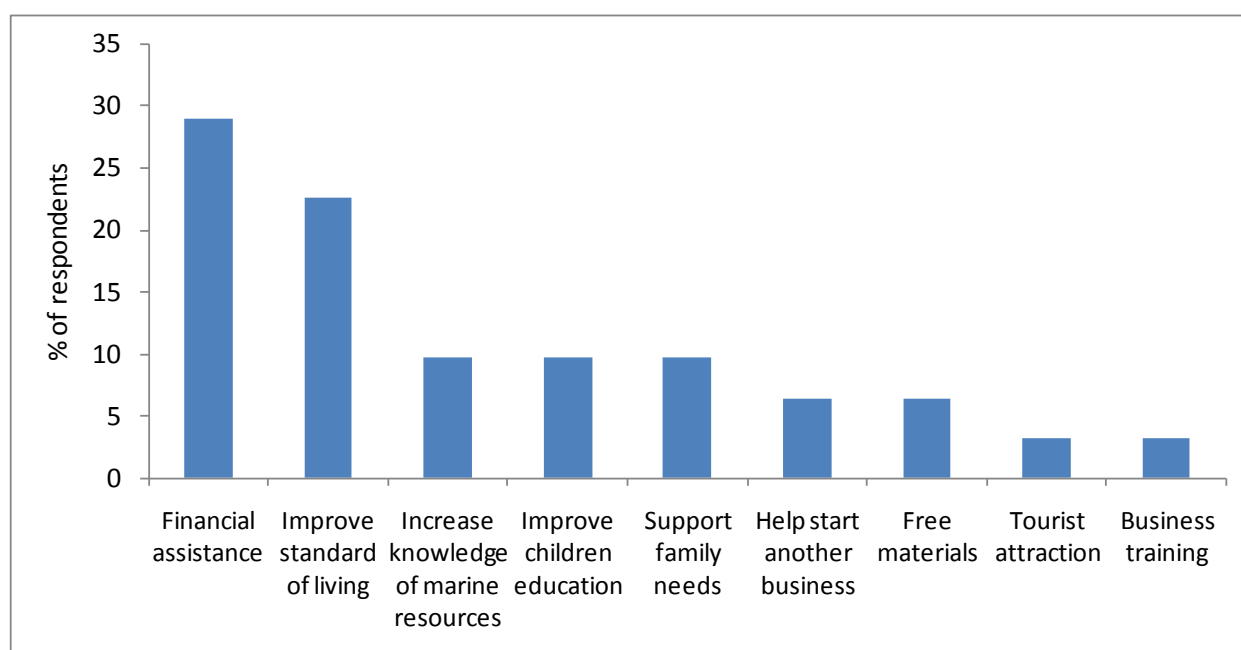


Figure 13 Main benefits mentioned of this project for farmers families

### Community Benefits

There were notably less benefits at the community level in comparison to the family level benefits, which is not surprising given that in the majority of circumstances this project operated at the level of individuals. There were however some community level benefits that were an outcome of this project including; financial support from individuals to the community and church as well as increased education and knowledge about the importance of marine resources and increased community participation (Figure 14) Figure 14 Main benefits of this project for the community. In particular it was interesting to note that several farmers stated that through them farming clams and/or corals the community began to recognize that clams and corals can have a monetary value therefore it is important to conserve and look after them.

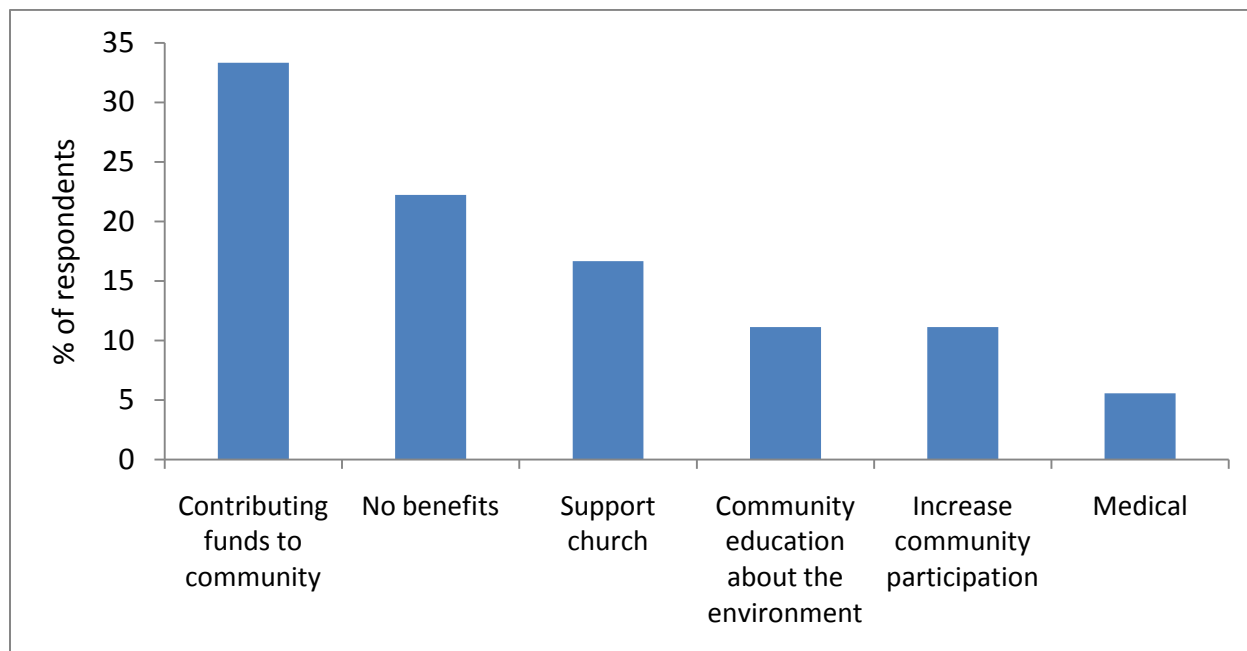


Figure 14 Main benefits of this project for the community

## Farmers satisfaction

During the monitoring and evaluation exercise farmers were asked to rate their satisfaction with different project components and activities during phase I and II. Farmers satisfaction was rated from 1 (very unsatisfied) to 5 (very satisfied).

Overall the farmers interviewed stated that on average they were satisfied to very satisfied with the over project both during phase I (4.6) and phase II (4.3). In general the farmers satisfaction was greater during the initial phase of the project in comparison to phase II, however the majority of farmers were satisfied with most components of the project during both phases (Figure 15). The areas of greatest satisfaction by the farmers were the clam, coral and business training activities which gave the farmers the opportunity to learn about a new livelihood opportunity and gain knowledge and information about marine resources in general. The only components where the farmers were less than satisfied were the transport of products and the engagement of the depot with the farmers during phase II and the price that they received for their products.

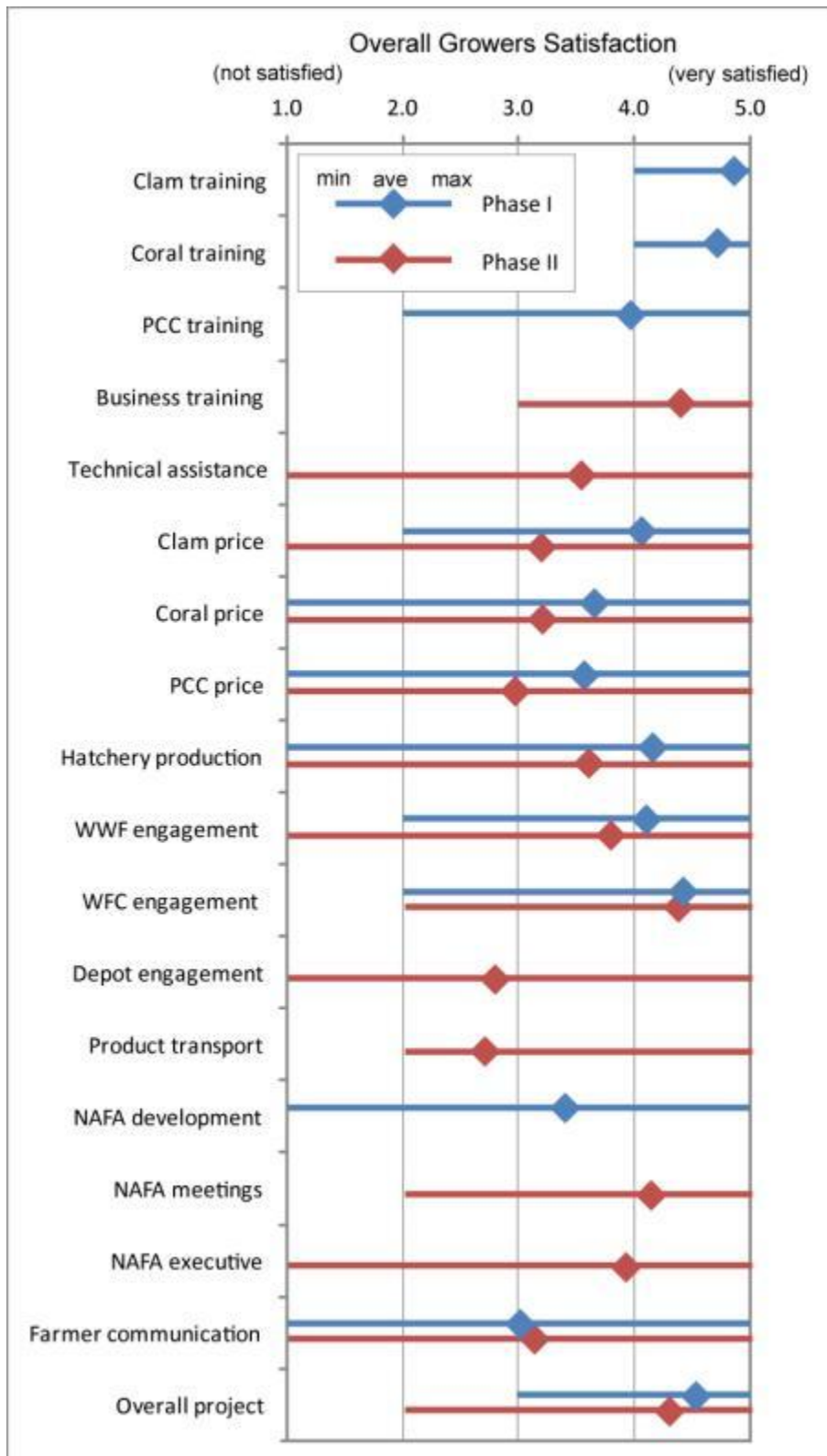


Figure 15 Overall satisfaction of the farmers with aspects of phase I and phase II of this project (figure show lowest (min), average (ave) and highest (max) ratings)

## **Business challenges for farmers**

NAFA members are currently facing the phase-out of donor support with the completion of the NZAID funded project. The farmers have undertaken extensive training and support during the project, however there remain a number of challenges that they must overcome to be able to continue this livelihood activity. The challenges listed by the farmers themselves can be categorized into five main areas; external shocks, export/market, product transport, commitment to activity and funding (Figure 16).

Over the past four years farmers have faced numerous external shocks that have impacted on their activities from natural disasters to clam and coral predator attacks, and poaching. In 2007 an earthquake/tsunami affected a number of areas in the Western Province of the Solomon Islands, impacts on farmers included uplift of reef areas (this caused severe environmental changes that hindered farming activities in particular on Ranongga Island (Buri farmers), Parara Island (Rarumana farmers) and areas around Gizo where farmers lost areas that were successful PCC grounds prior to the earthquake. More recently several farmers have experienced increased problems with clam and coral predators (boring sponges, snails and fish), which may be related to decreased effort and husbandry at the farm level. Poaching, primarily for the equipment and larger clams is a problem in some areas and farmers have needed to increase security for their clams – or move them to another area where they are safer.

Limitation in the export/market of their products was the second greatest concern for NAFA farmers. There is currently only one exporter for marine aquarium products in the Solomon Islands, thus the price for products and the quantity sold on a weekly basis is controlled by this exporter.

During phase II there was, of necessity, a change in the arrangements of transport for getting products from the farmers to the depot. Initially, this activities was a project subsidized activity undertaken by WorldFish. To ensure the longevity and sustainability of the marine ornamental trade in the Western Province it was necessary to change the model and request farmers to transport products to Gizo themselves using locally available transport options. Many farmers expressed that this can be a very difficult process, with market boats being full and other options unviable.

Other challenges for farmers included the inability for farmers to commit to the activities as often more viable and lucrative options for earning an income arise to which farmers will preferentially invest time into (although these are often short term). Some farmers were also concerned that the lack of funding (to help provide equipment and resources required) will also hinder their business activities in the future.

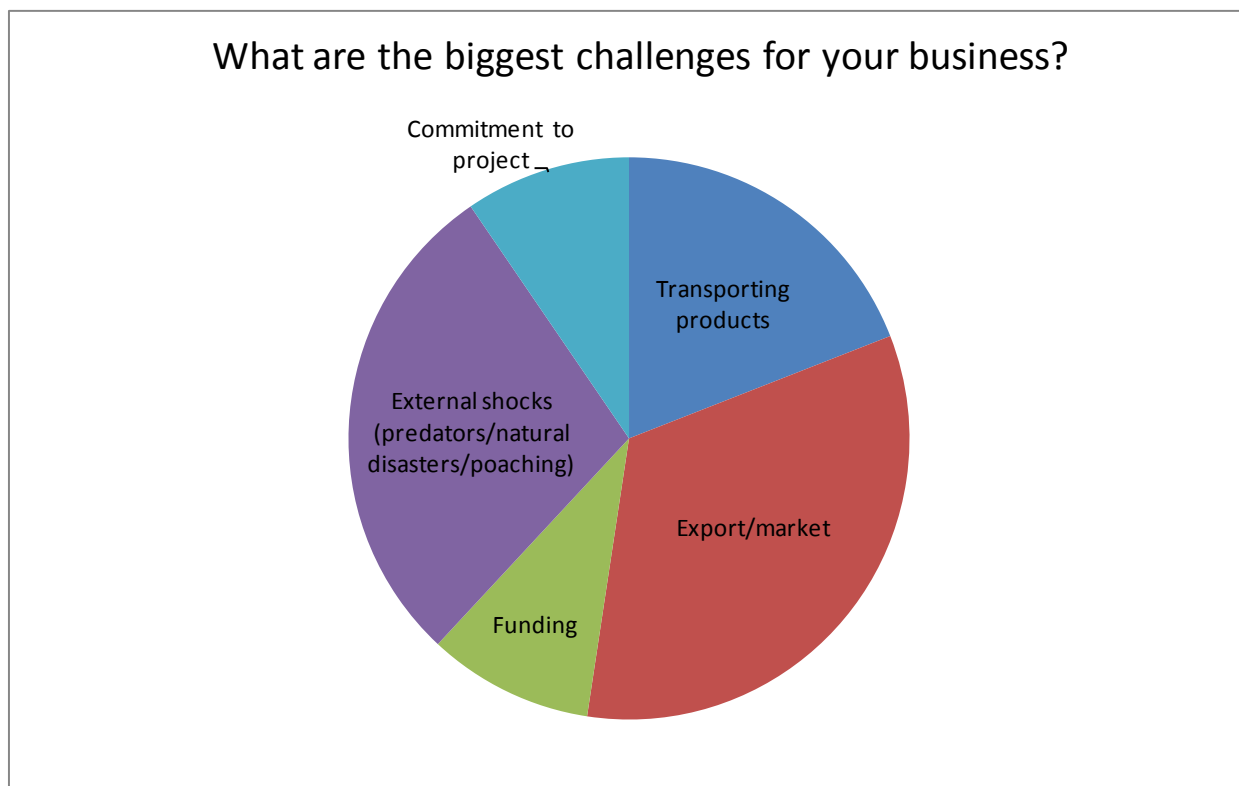
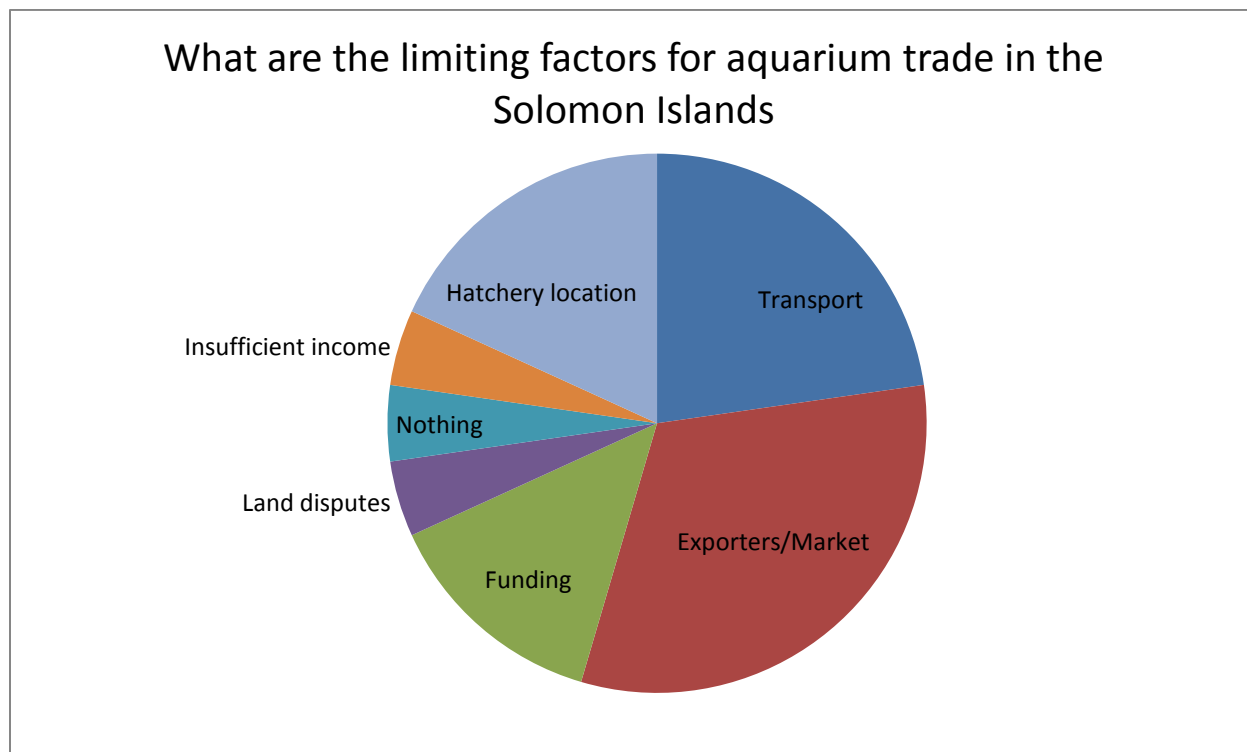


Figure 16 Challenges faced by farmers for the marine aquarium business

### Challenges for the marine aquarium trade

During the life of this project, farmers have developed a deep understanding of the marine ornamental trade in the Solomon Islands. Farmers were asked to list the challenges that they saw not only for the ornamental trade for NAFA famers, but also for the trade in general in the Solomon Islands. The main areas or challenges for the industry that the respondents identified during the interviews were export and markets; transport; hatchery location and funding opportunities (**Error! Reference source not found.**), which are in fact the limiting factors that ave been identified for the wider expansion of the marine aquarium trade in Solomon Islands.





**Figure 17** Limiting factors for the marine aquarium trade in the Solomon Islands

As mentioned above, any future expansion of the export of marine aquarium products is limited (for various reasons) by the current availability of only one exporter. In particular this currently limits the price that farmers receive for their products. In terms of stock volume, at this stage of industry development, the limit in the export market is not a major impediment to the current industry as there are only ~ 30 active farmers. However to allow further expansion throughout the rest of the country there will be a need to increase the volume of products exported. There are opportunities to increase this volume with the existing exporter and assisting with this goal is a key objective of the WorldFish Center funded CRISP project.

Transport will remain one of the key challenges for the marine aquarium trade in the Solomon Islands due to limited transport options available to and from remote rural areas as well as the need to transport live animals quickly. These factors must be taken into account when considering investment in new communities to become involved in this activity in the future. They must be one of the basic criteria for the involvement of new farmers.

Currently there is only one clam hatchery operating in the Solomon Islands (based at the WorldFish Nusa Tupe field station). If this industry was to expand throughout Solomon Islands either additional 'depot like' operations would need to be established or consideration for an additional hatchery in a suitable location elsewhere.

Funding opportunities for training new farmers was mentioned by the farmers as a small but potential limiting factor for the marine aquarium trade. There are however existing projects undertaken by other environmental NGO's in Solomon Islands that are looking for livelihood opportunities to offer the communities in which they work and these may have some potential as long as the limitations and criteria for successful establishment that have been identified through this project are strictly adhered to. There is little room (financially) for cutting corners. In addition, before significant further expansion occurs emphasis needs to be placed on removing identified export and marketing barriers.

## **Monitoring and Evaluation Summary**

During phase I the farmers were supported almost 100% through the project with equipment, and training being fully subsidized through the project funds. Product transport was recovered by the WorldFish operated depot at a nominal fee of 3% as sales began and this was increased to 15% in August 2008 (announced in newsletter 2, July 2008). During the time of the operation of the depot by WorldFish with support from the project, there were fewer delayed payments than in phase II (due to delays in payments from the exporter), nor did farmers need to transport their products themselves or think about budgeting for additional equipment, for example when their equipment was damaged in the earthquake/tsunami.

This resulted in high expectations from the farmers particularly in terms of financial support. With the bridging phases (September 2008 – March 2009) and phase II (May 2009- June 2010) of the project focusing on the development of a long-term sustainable small-scale business through the development of the Maraqata depot (run by Patson and Naomi Baea) there was a concurrent withdrawal of financial support and incentives. As a result there was understandably a reduction in farmer motivation and generally a lack of understanding on how these changes would impact on their day-to-day transporting and payment operations.

Over the past year the majority of farmers have begun to understand the need for the changed operations undertaken as part of this "business activity", in particular the business training and regular farmers meetings help to alleviate farmers concerns. Yet there remains a low level of acceptance that these changes are required and farmers are still looking for opportunities to revert to the model adopted in phase I (in particular farmers main issue is the fact that their products are no longer collected from the farmers gate). Notwithstanding these concerns there remains an overall high regard and positive outlook for the future of the marine aquarium business for the existing farmers.

The outcomes from the monitoring and evaluation exercise highlight the benefits (both direct and indirect) that have occurred at the family and community level, with the greatest impact occurring at the family level. The overriding benefit from this project has been the provision of a cash income for the farmers and their families. This has been accompanied by a stated increase in standard of living, improved children's education and increased knowledge about, and care of, the marine environment by individuals, families and communities.

## The future of the marine aquarium trade in Solomon Islands

As highlighted by the farmers through the monitoring and evaluation surveys there are a number of challenges for the marine aquarium trade in Solomon Islands including a limited export market and transport issues. Nevertheless since clams became available for sale in 2007 the demand for giant clams (*T. derasa*) has steadily increased to the current export level of > 10 000 individuals per year (Figure 19). It is expected that increasing the variety of clam species available for sale will further increase export numbers, even under the limitation of one exporting company.

In order to maintain farmers enthusiasm and reduce transport issues, it would be advantageous to increase the current price the farmers receive for these products. There is a disproportionate change in payment for clams through the market chain, with the American importers making a 700 % – 1000% profit on Solomon Island clams (see regional consultants report for further details). There has not been an increase in the price that the farmers receive during the 5 year timeframe of the project, which has not helped encourage farmers. Initial discussions have been undertaken with the export company with indications of a positive response to the suggestion of a price review. WorldFish will continue these discussions in support of NAFA.

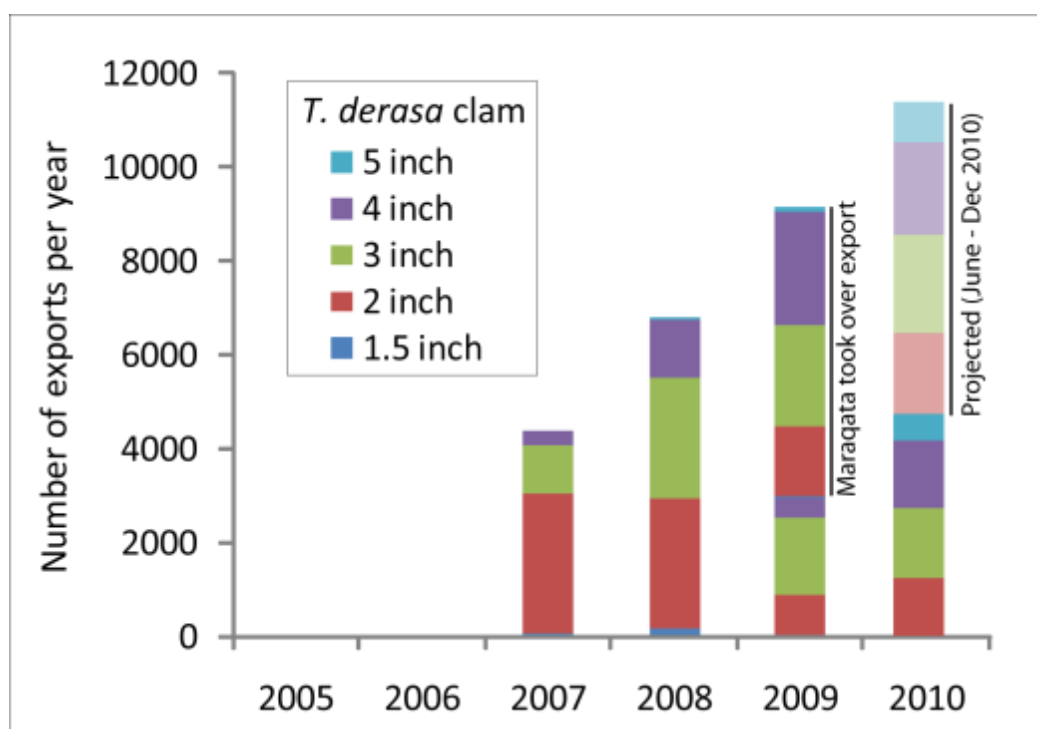
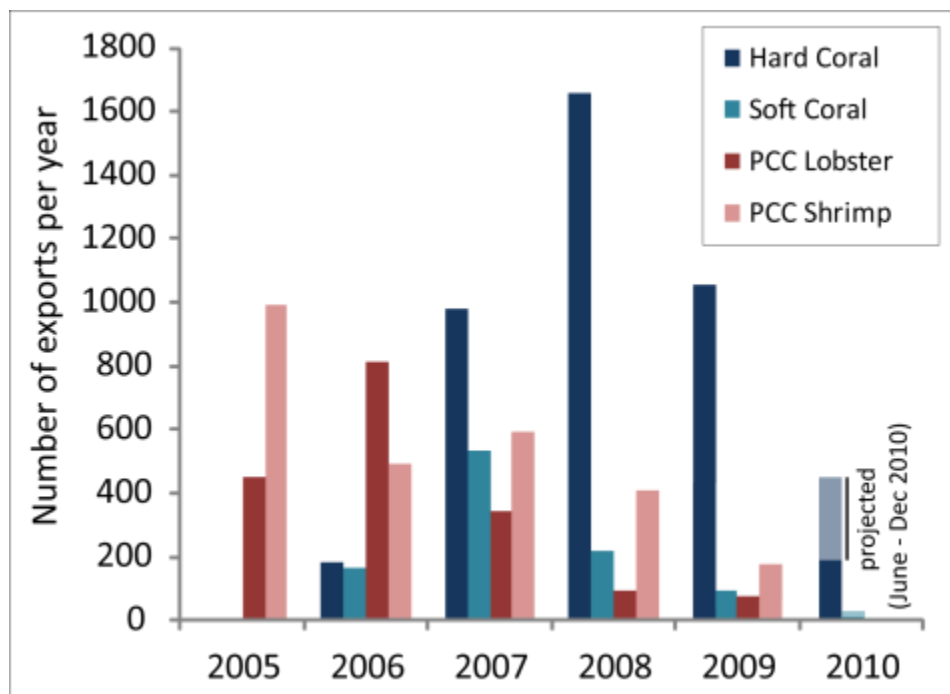


Figure 19 Number of giant clam (*T. derasa*) exports from NAFA farmers since 2007. Note: the predicted exports for June – December 2010 were calculated based on current monthly exports rates.

In contrast to the export of giant clams, there has been an overall decline in the export of corals as well as PCC shrimp and lobster. In 2007 there was approximately 1500 farmed corals (hard and soft corals) exported, peaking at more 1700 in 2008, and declining since to the current estimate of 400 corals for 2010 (Figure 20). This decline is not currently market driven as the exporter has expressed interest in purchasing between 100 – 500 farmed corals per week. The limiting factor has been the supply of corals from the farmers.



**Figure 20** Number of soft and hard coral, PCC lobster and shrimp exports from NAFA farmers since 2007. Note: the predicted exports for June – December 2010 were calculated based on current monthly exports rates.

In late 2009, there was only one farm that had stock available and none of the farmers have recently planted corals to supply the market in the longer term. Coral on average take 4 – 6 months to grow to market size, thus there is a need for planting to be undertaken on a regular basis. This is similar to giant clams, however the major difference between these two product areas is the number of farmers (there are currently 28 clam farmers and 8 coral farmers), thus it seems that the current number of coral farmers is below the threshold required to maintain a consistent supply of products for the market. A further limiting factor is, similar to the other products the low price received from the exporter. Recent discussions with the exporter indicate that there is not a high demand for PCC lobster and shrimp, and until alternative export and market options are available there is little motivation for farmers to pursue these ornamental products.

## Evaluation of the future of NAFA

In the report from the regional consultant it was stated that *“At the present time it seems that Salome Topo is doing much of the work for NAFA while being partially paid by the NZAID project as the livelihoods officer, essentially a subsidized organization. At best it seems that NAFA will act as the formal liaison between the farmers and the depot. At worst it will be burden on the farmers by imposing fees and fund raising obligations at a time when their income is already being cut by commercialization of the project.”*

As part of the monitoring and evaluation surveys, farmers stated that:

*“NAFA is a WorldFish/WWF association and that they are not fully independent yet...”*

*“Good it (NAFA) started, but not actions or outcomes have been seen yet”.*

This feedback does not suggest a promising future for the association, however following the visit from the regional consultant there has been a renewal in the NAFA executive and a strong focus by WWF-SI to strengthen NAFA to ensure they are as independent as possible prior to the end of the project. The new NAFA executive members have expressed a keen interest to ensure the long-term future of the association, although this will ultimately be determined by individuals and a likely need for a ‘champion’. The association has recently taken the initiative to become a registered association and they have shown an interest to apply for external funding to help support farmers into the future.

Only time will tell with regards to the future of NAFA, however should there be a demise of the association there would be limited impacts on the individual farmers as such, but it would make it more difficult for the future growth of the marine aquarium trade in the Western Province without further project support to train and develop new farmers. This role would likely fall to the depot if it was in their business interest to encourage more farmers.



Figure 21 NAFA members at a farmers meeting held at Nusa Tupe

## Evaluation of the future of the depot

Maraqata depot has dedicated time, resources and significant effort to ensure this business is viable once donor support is withdrawn. Although it is not currently an overly profitable venture, the business does provide an alternative source of income to their existing eco-tourism lodge and provides enough to keep the depot operational.

Throughout the past year they have gained an in-depth knowledge of the marine aquarium trade and are working together with NAFA, the exporter and WorldFish to ensure the future of the Western Province trade of sustainable marine aquarium products. There are farmer concerns however that will need to be addressed to ensure the longevity of their operations.

Mechanisms have been implemented to reduce costs and increase profitability, with an expected increase in profits over the coming years. Although the commercialization process has been rapid, the depot will still have access to the capital items and equipment provided through the project for as long as they are operating the depot. This will help alleviate the pressure on the depot operators in the short term and the arrangement is covered by an MOU with WorldFish on the understanding that the project capital equipment is available to whoever is the depot operator. The depot is required to pay for maintenance and upkeep of equipment.

In the longer term the availability of additional clam species (through the production at the hatchery) and further support for development and extension activities with coral farmers (through the CRISP project) will help support and strengthen the depots position.



Figure 22 Maraqata depot operators preparing to transport products to the airport to send to Honiara



## Appendices

### ***Appendix A      Regional consultant report***

Regional consultant report: *Practical Business and Marketing Consultancy for the Marine Ornamental Aquaculture Livelihoods Project at WorldFish Center*. Submitted to WorldFish Center by Mr Simon Ellis

### ***Appendix A1      WorldFish report on consultant recommendations***

Regional Opportunities for Solomon Island Ornamental Products - Report on the recommendations and proposed actions from the consultancy report on practical business and marketing options for the marine ornamental aquaculture livelihoods. Submitted to NZAID by WorldFish Center.

### ***Appendix A2      WWF narrative report on regional consultant visit***

Narrative report: Creating Rural Livelihoods in Solomon Islands through Environmentally-Friendly Aquaculture and Trade of Marine Ornamentals. Submitted to WorldFish Center by WWF-SI.

### ***Appendix B      Corals grown by NAFA farmers with local nomenclature***

Pictures and nomenclature of corals developed by WorldFish, the depot and the exporter.

### ***Appendix C      NAFA farmers manual***

### ***Appendix D      WWF-SI final report***

WWF Annual Narrative Progress Report: Creating Rural Livelihood in Solomon Islands Through Environmentally-Friendly Aquaculture and Trade of Marine Ornamentals. Submitted to WorldFish by WWF-SI

### ***Appendix E      NAFA Constitution***

### ***Appendix F      SBEC report on the small business workshop***

### ***Appendix G      Giant clam mariculture using extensive protocol***

### ***Appendix H      NAFA newsletters***

### ***Appendix I      Promotional material***