

Republic of Vanuatu

Vanuatu Fisheries Department

Republic of Vanuatu
The Project for Promotion of
Grace of the Sea in the Coastal
Villages (Phase 3)
Final Report

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Japan International Cooperation Agency (JICA)

IC Net Limited

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Project area(Phase 3)



Southern part of Santo Island
Araki, Tangoa,
Nakere, Wailapa



Emae Island
Sangaba, Tongamea, Marae



Tanna Island
Waisisi



Project area (Phase 2, Reference)



Amal-Crab Bay
Uripiv & Uri Island



Mangaliliu, Lelepa
Moso Island

Aneityum (Anelcauhat)
Mystery Island



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Exchange rates

Based on the foreign currency exchange rates in the contracts for the implementation and outsourcing of the work of the Japan International Cooperation Agency (https://www.jica.go.jp/Resource/announce/manual/form/consul_g/ku57pq00000kzv7m-att/rate_2021.pdf), the following currency exchange rates as of 16 December 2021 (at the time of signing the Project Agreement) apply.

1 Vanuatu vatu (VUV) = 0.008 US dollar (USD)

VUV 1.00 = 1.013 Japanese yen (JPY)

JPY 1.00 = VUV 0.987

JPY 1.00 = USD 0.008

JPY 1.00 = 0.012 Australian dollar (AUD)

USD 1.00 = VUV 123.375

USD 1.00 = JPY 113.60

AUD 1.00 = JPY 81.106

List of abbreviations

Abbreviation	Term in Full
ADB	Asia Development Bank
AUD	Australian dollar
CBCRM	Community-Based Coastal Resource Management
CBFM	Community-Based Fisheries Management
DBFFM	Deep-Bottom Fish Fishery Management
FAD	Fish Aggregating Device
FAO	Food and Agriculture Organisation of the United Nations
FCA	Fisheries Cooperative Association
FDO	Fisheries Development Officer
FRP	Fibre Reinforced Plastics
GIZ	<i>Deutsche Gesellschaft für Internationale Zusammenarbeit</i> (German Federal Enterprise for International Cooperation)
ICT	Information and Communication Technology
IUCN	International Union for the Conservation of Nature
JICA	Japan International Cooperation Agency
JOCV	Japan Overseas Cooperation Volunteer
JPY	Japanese yen
MALFFB	Ministry of Agriculture, Livestock, Forestry, Fisheries and Biosecurity
MBFM	Malampa Butchery and Fish Market
MM	man-month
MSG	Melanesian Spearhead Group
NCDs	non-communicable diseases
NFC	National Fisheries College
NGO	Non-Governmental Organisation
OFCF	Overseas Fishery Cooperation Foundation of Japan
PPP	Public Private Partnership
SDGs	Sustainable Development Goals
SNS	Social Networking Service
SPC	Pacific Community
USD	United States dollar
VCAP	Vanuatu Coastal Adaptation Project
VFD	Vanuatu Fisheries Department
VUV	Vanuatu vatu
WHO	World Health Organization

Chapter 1: Overview of project objectives and outcomes

1-1 Background and history of cooperation

In Oceania, people are heavily dependent on coastal resources for food and income. The Asian Development Bank (ADB) has noted a high rate of employment in the fishing industry in countries in the region and that a large share of the region's exports is comprised of fishery-related products. In the Republic of Vanuatu ('Vanuatu'), located in the south-eastern part of the Pacific, an agricultural census conducted in 2007 revealed that approximately 46% of households in rural areas are engaged in coastal fisheries, indicating that the importance of coastal resources in the socio-economy is extremely high.

The foreshore of Vanuatu's communities is home to highly persistent shellfish (e.g., Trochus, green snails, giant clams, and crustaceans) and sea cucumbers. However, in recent years, environmental destruction caused by development in coastal areas, overfishing, and climate change-induced ecosystem transitions have led to a deterioration in the state of coastal resources. This has had a detrimental effect, forcing fishers to expand their efforts further than ever before. The Vanuatu Government is therefore working towards the appropriate management of these resources by banning the capture of certain marine species, reducing fishing pressure by regulating catch sizes and fishing seasons, and by establishing a Ministry of Agriculture, Livestock, Forestry, Fisheries, and Biosecurity ('MALFFB'). The MALFFB coordinates exports through licencing.

From 2006 to 2009, building on the Vanuatu Government's efforts towards coastal resource management described above, the Japan International Cooperation Agency (JICA) implemented Phase 1 of The Project for Promotion of Grace of the Sea in the Coastal Villages. The aim was to improve the coastal resource management capacity of the MALFFB Fisheries Department, focusing on shellfish, a highly persistent resource, to increase aquaculture and create a community-based coastal resource management mechanism at the pilot site (Amal-Crab Bay, Uripiv, Uri Island, Mangaliliu, Lelepa, Moso Island, Aneityum (Anelcauhat), Mystery Island, as shown in Project area map). Subsequently, from 2011–2014, Phase 2 was implemented, which aimed to demonstrate the same approach as that trialled in Phase 1, in each community and strengthen the technical leadership capacity of the Fisheries Department in relation to community-based coastal resource management (CBCRM). The CB-CRM approach, which was continuously developed in Phases 1 and 2, is well received in Oceania, and its implementation is already being considered in the Solomon Islands and Tonga. However, no training programmes or manuals have been developed to systematically summarise the results of Phases 1 and 2, which would help to disseminate and expand the approach to other regions in response to the demands of these peripheral regions.

Dissemination activities for the CBCRM approach are promoted through a combination of tools tailored to the unique characteristics of each location, and no specific case can serve as a model. Therefore, it is necessary to develop a more comprehensive list of coastal resource management

options so that the CBCRM approach is applicable in a diverse range of geographic and socio-economic situations. Consequently, the Government of Vanuatu requested that Japan further strengthen the CBCRM approach by increasing the number of examples of initiatives and promoting its wide domestic application, while simultaneously providing technical cooperation for its dissemination throughout island states in the Oceania region that face common challenges.

In response, the Government of Japan adopted the technical cooperation project named the 'Project for Promotion of Grace of the Sea in the Coastal Villages Phase 3' ('Phase 3'), and JICA dispatched to Vanuatu a dedicated planning and research team in February 2015. An agreement was reached on the project outline and the agreement document (R/D) was signed by Vanuatu on 3 August 2016.

1-2 Project overview

(1) Project name

Project for Promotion of Grace of the Sea in the Coastal Villages (Phase 3)

(2) Overall Goal

(a) Integrated Community-based Coastal Resource Management (CBCRM) approaches are widely extended in Vanuatu as official standard approach for promoting coastal resource management.

(b) Integrated CBCRM approach is promoted in the Pacific region.

<Indicators>

(a) official adoption of the Integrated CBCRM approach is confirmed by the MALFFB.¹

(b) The Integrated CBCRM approach is adopted and introduced by other players (e.g. MSG, SPC and NGOs).

(3) Project Purpose

(a) Integrated CBCRM approach developed by the Project is practiced throughout the country as well as in neighbouring countries within the Melanesian region.

<Indicators>

(a) At least 12 communities outside of pilot sites initiate the integrated CBCRM approach after participating in related training.

(b) At least one community in one participating country of the technical exchange initiate the integrated CBCRM approach.

(4) Outputs and activities

Output 1 Applicability and practicability of integrated CBCRM approach are strengthened.

<Indicators>

(a) Positive effects of the integrated CBCRM approach are compiled as a synthesis report.

¹ At the beginning of the project, 'X environmental and resource indicators show positive changes'.

- (b) Record of revisions and modifications of the integrated CBCRM plans in the pilot sites of Phase 2 is made available for reference.
- (c) The integrated CBCRM plans are newly formulated in the Phase 3 sites.
- (d) Number of options for management tools and supporting tools increases from 5 to 14.
- (e) Lessons learned and experiences gained from the pilot sites are compiled as a synthesis report.
- (f) Rating of the communities' self-evaluation is improved in the pilot sites.

<Activities>

- (a) Conduct a special study on green snail resource assessment on Efate Island and compile a report.
- (b) Conduct a special study on impact of the cyclone Pam on coastal communities and compile a report.
- (c) Review current status of integrated CBCRM implementation at the three pilot sites of the Phase 2 and identify issues to address.
- (d) Based on the result of 1-1 to 1-3 above, implement necessary modifications/adjustments to the CBCRM-related activities (including amendments of the CBCRM plans) at those sites.
- (e) Conduct socioeconomic surveys at candidate sites of additional pilot activities and compile a report.
- (f) Develop an evaluation tool to monitor the achievement level of the fishery resource management activities.
- (g) Based on the results of 1-5, determine new pilot sites (maximum three sites) and identify pilot activities in close consultation with key stakeholders.
- (h) Implement pilot activities at additional pilot sites and periodically monitor/examine their effectiveness.
- (i) Evaluate the applicability and practicability of the integrated CBCRM.
- (j) Try to apply the experience and knowledge of the CBCRM approach developed through pilot activities to emergency support and recovery efforts in response to the effects of the spread of the new coronavirus infection (COVID-19) and damage from giant cyclones. This will verify the effectiveness of this approach in emergency response and reconstruction in the event of a major disaster.
- (k) Urgently assess the impact of the spread of the novel coronavirus (COVID-19) and super cyclone disasters on coastal communities, residents' responses, and recovery efforts to restore livelihoods.

Output 2: Knowledge and experience of integrated CBCRM approach are synthesised and standardized as national training programmes for its effective promotion.

<Indicators>

- (a) Guidelines on the CBCRM approach is elaborated.
- (b) National training programmes are elaborated (Separately for fisheries extension officers and for community leaders).

<Activities>

- (a) Review and standardize the integrated CBCRM approach.
- (b) Elaborate the guidelines of the integrated CB-RM approach by referring to the results of activities for Output 1.
- (c) Examine validity of the guidelines by testing them at the pilot sites and making necessary modifications.

- (d) Develop national training programmes for promoting the integrated CBCRM approach (including manuals and textbooks for training, and other training materials).
- (e) Review and validate the contents of training programmes with relevant authorities including Vanuatu Maritime College.

Output 3 Integrated CBCRM approach is introduced through national training programmes as well as technical exchanges with neighbouring countries within the Melanesian region.

<Indicator>

- (a) Fisheries extension officers in six provinces receive training on the integrated CBCRM approach.
- (b) Representatives of at least three communities in each of the six provinces receive training on the integrated CBCRM approach.
- (c) Discussion results in the regional seminar are compiled as the seminar proceedings.

<Activities>

- (a) Organise training courses on the integrated CBCRM approach for fishery extension officers.
- (b) Organise training courses on the integrated CBCRM approach for community extensionists and community leaders.
- (c) Organise seminars, workshops, and/or training courses to introduce the integrated CBCRM approach for government officers of participating countries in technical exchange.
- (d) Organize technical exchange visits for mutual learning.
- (e) Organise a regional seminar to examine the applicability of the integrated CBCRM approach with regional partners (e.g. SPC and/or MSG).
- (f) Conduct training for disaster-affected communities across the country regarding the activities mentioned in (a) above.
- (k) Develop methods for disseminating the CBCRM approach that involve a wider range of stakeholders (including other relevant ministries, state governments, youth and women's groups, and teachers).

1-3 Project implementation period

The project (Phase 3) was implemented from February 2017 to February 2024 (85 months), and the local operation period was from February 2017 to November 2023 (80 months).

1-4 Project target area

The project area includes the following three regions. (as shown in project area map(Phase 3)).

- 1) Emae islands: Sangaba, Tongamea, and Marae
- 2) Santo Island: Araki, Tangoa, Nakere, and Wailapa
- 3) Tanna Island: Waisisi

1-5 Input results

1-5-1 Inputs from the Japanese side

(1) Expert input

Nine Japanese experts were deployed during the project period, undertaking a total of 40 trips and 43.15 man-months (MM) (1,229 days) of fieldwork over a period of approximately two years and two months. The experts were in charge of: 1) Chief advisor, Coastal resource management 1; 2) Deputy chief adviser, Fishery extension 1; 3) Fishery extension 2; 4) Fishery extension 3, Support for socially vulnerable and Coastal resource management 3; 5) Coastal resource management 2; 6) Added value improvement, Training, supervision, and education, and Support for socially vulnerable 2; 7) Coordination, Quality control and hygiene management, and Nutrition improvement; 8) Inland aquaculture; and 9) Marketing. See Attachment 1 (Engagement Plan Performance Table) for more details.

(2) Equipment provision results

The equipment provisioned included fishing equipment (such as blue chart maps and handheld GPS), aquaculture equipment (such as FRP tanks and nets), research equipment (such as scuba diving sets, and electric reels), processing and distribution equipment (such as portable cooler boxes ['eskies'], and solar freezers), infrastructure (such as solar panels and cement), connectivity and audio-visual equipment (such as mobile Wi-Fi routers, portable screens), and other tools (such as chainsaws and generators). The Vanuatu Fisheries Department, which received the equipment grant, pledged in writing to continue making effective use of the equipment for the development of the project. For further details, see Attachment 2 (Certificate of Receipt).

(3) Workshops/training conducted

A total of 22 workshops and training sessions were conducted over the four-year period of the entire project, which includes approximately two years and two months of field activities. Several workshops and training sessions were conducted at the Vanuatu Fisheries Department ('VFD') headquarters in Port Vila and in the coastal villages identified as target areas for demonstrating the project. For more details, see Attachment 3 (Workshops and training).

(4) Local expenditure

Expenditures were made on training for Fisheries Development Officers (FDOs) and leaders, regional seminars, Vanuatu-Solomon Islands reciprocal visits, surveys and support in affected areas, organisation of the CBCRM Cup (football and volleyball tournament), various activities (giant clam resource survey, environmental education, and hygiene management), and several other expenses necessary for project implementation. The total local expenditure for the entire four-year project and

approximately two years and two months of fieldwork was estimated at 4,362,822 yen.²

1-5-2 Inputs from the Vanuatu side

(1) Counterpart (C/P) arrangement

Twenty-nine staff from the VFD were deployed as C/Ps for the project (see Attachment 4 for details). The VFD Director acted as project manager while staff from the Fisheries Development and Capture Division and Research and Aquaculture Division, and FDOs from the target states, were engaged in project activities as C/Ps. There was no formal C/P assignment from the Management and Policy Division; however, staffing assistance was provided as required. Additionally, no-take zone management committee members and youth leaders from the target communities assisted in the implementation of pilot project activities and the review and development of coastal resource management plans as community counterparts.

(2) Actual C/P expenditure

An estimated VUV 800,000 was spent on utilities for the project office, hatchery operations, and transport costs.

² Estimated as at the end of December 2023, based on the assumption that all contract amounts will be used up, as expenditure in year 4 has not been finalised.

Chapter 2: Overview of project activities

2-1 Socio-economic surveys

2-1-1 Objectives of the survey

One objective of Phase 3 was to increase the applicability of the CBCRM approach established in Phase 2 as an 'integrated' CBCRM approach. This required an approach that could be applied to different types of communities while accounting for their resource status and social, economic, and cultural aspects, as well as a variety of resource management and supporting measures that could be used as components of this approach. Therefore, the survey objective was to identify suitable target sites for testing new tools and obtain indicator data for measuring the effectiveness of these new tools in the future.

2-1-2 Survey areas and methods

To assist in identifying candidate pilot sites for this project, the VFD was consulted from three perspectives: 1) the significance of introducing CBCRM activities (e.g. declining trends in coastal resources), 2) the level of awareness of the population to the danger of declining trends in resources, and 3) the potential for developing new tools that would be important components of an integrated CBCRM approach. A pre-screening process was conducted to select potential and excluded sites for the detailed study. The following three sites were assessed as being unsuitable for the study: 1) the eastern part of Espiritu Santo Island, where co-operative support with other donors would make effective use of limited resources on both sides; 2) the western part of Tanna Island, where it is challenging to identify target organisms for resource management; and 3) Futuna Island, where access is very difficult.

The sites that were selected for the detailed study included: 1) Nakere, Wailapa (Espiritu Santo Island), Tangoa Island, and Araki Island in the southern part of Espiritu Santo (South Santo), where the introduction of CBCRM is highly significant and diverse activities related to the new tools are expected because fishing as an alternative livelihood option has been increasing due to the negative effects of drought on agricultural activities in recent years; 2) Marae, Tongamea, and Sangaba on Emae Island, which are suitable for setting examples that can be disseminated to the surrounding islands in terms of the development of island-wide management plans and joint management of offshore reefs with other islands by multiple communities, led by a resource management committee that oversees the whole island; and 3) Waisisi on Tanna Island, which has potential for introducing the use and management of bottom-fish resources caught on the surrounding islands and for developing new supporting tools such as value chain development with a fish collection and marketing centre at its core.

A literature review, interviews, workshops, and questionnaires were employed as survey methods.

2-1-3 Summary of survey results

(1) Southern Espiritu Santo Island (Wailapa and Nakere), Tangoa Island, and Araki Island

(i) In South Santo, the interview survey confirmed that there has been little experience in implementing community-led resource management activities, and the results of the questionnaire survey showed that there is an insufficient understanding of resource management. To introduce resource management activities at such sites, emphasis needs to be placed on raising awareness of the importance of resource management.

(ii) When compared to other candidate areas, South Santo has relatively weak governance within the community, including traditional tribal systems, chief systems, and area councils.

(iii) In recent years, owing to the negative impact of drought on crops on the main island side of South Santo, the importance of fisheries has increased in the concerned communities, which are mainly dependent on agricultural activities, and the importance of implementing coastal resource management has increased. On the other hand, in the four communities, with the exception of Araki Island, community initiative towards resource management is relatively low, such as not establishing taboo areas in the sea area.

(iv) In South Santo, despite its proximity to the large market in Luganville, Vanuatu's second-largest city, the catch is less distributed than that on the eastern side of Santo Island. Fish aggregating devices (FADs) have been deployed with the support of the VFD, and migratory pelagic fish such as yellowfin tuna, are now being caught but are not effectively used effectively since sale of the pelagic fish is not due to low demand.

(v) Although tilapia aquaculture has been in operation for eight years, a survey of consumers in the Luganville market revealed that few had heard of tilapia. The potential growth of tilapia aquaculture is unknown; however, if the introduction of aquaculture is expected to reduce pressure on coastal resources, it is necessary to make tilapia more accessible and attractive to consumers by lowering prices. However, GIZ (German Federal Enterprise for International Cooperation) experts already involved in the region have adopted the approach of intensive tilapia culture by providing high-quality seedlings and imported feed. This has resulted in tilapia being sold for prices of 500–600 batu/kg, which is the same or higher than that of sea-caught fish, and trends need to be closely monitored.

(2) Emae Island (Marae, Tongamea, and Sangaba)

(i) Off the island perimeter, the extent of no-take zones established in each community was assumed to be limited and not highly effective for resource management.

(ii) As the island's governance and traditional systems, such as the traditional tribal system, chief system, and area councils, were found to function well, it is desirable that they are fully utilised to provide a high degree of autonomy to the community.

(iii) Cook's Reef in the north-western part of Emae Island is a good fishing ground for island fishers. However, in recent years, fishers from the nearby islands of Buninga, Mataso, Tongariki, Tongoa, and Makira have also been operating there. Cook's Reef is recognised as belonging to Emae Island, and arrangements must be made for the future joint-use of this area with other island communities.

(iv) Alternative industries to agriculture and fisheries have not yet developed. Residents are looking

forward to tourism development around the wide, beautiful sandy beaches and offshore Cook's Reef. Support for tourism development could be a major incentive for residents to manage coastal resources.

(3) Tanna Island (Waisisi)

- (i) Owing to the impact of Cyclone Pam (2015) and other factors, there is an increased reliance on fishing as a source of self-consumption and cash income. This has increased the fishing pressure on in-reef coastal resources. Therefore, effective resource-management measures need to be identified.
- (ii) It is recognised that the traditional tribal and chief systems function to a certain extent in the communities, and the area councils in the provincial government function well. Therefore, it is expected that by incorporating these intra-area governance systems into fisheries resource management activities, both within and outside communities, will stimulate more activity.
- (iii) Fishers operate both north and south of Tanna Island, and as far as Aniwa Island. This raises concerns about future conflict with fishers from other communities regarding the use of fishing grounds. Although this has not yet developed into a serious problem, it is important to prepare for possible future conflict, particularly as fishers recover from the damage caused by Cyclone Pam. Boat and canoe ownership may increase in the future.
- (iv) Markets for fish products include fish markets, hotels, restaurants, and supermarkets in the centre of the western part of Tanna Island, including Lenakel, the provincial capital. However, in terms of fish transport, there are no dedicated trucks in the community; therefore, fishers are required to arrange transport trucks from Lenakel and pay high fares (VUV 5,000) for this service to transport their catches. Fishers from the neighbouring island of Aniwa also send their fish to Lenakel via Waisisi.

See Attachment 5 for details of the socioeconomic survey, and Attachment 6 for details of the impact of Cyclone Pam.

2-1-4 Consideration of approaches to pilot projects

After discussions with the C/P, it was decided to select all of the following sites as pilot project sites because of the potential for new tool development: 1) Nakere, Wailapa in Espiritu Santo Island, Tongoa Island, and Araki islands, 2) all communities on Emae Island including Marae, Tongamea, and Sangaba, and 3) Waisisi in Tanna Island. The study results of the approach to the demonstration projects are described below.

(1) South Santo (Nakere, Tongoa, Wailapa, and Araki Islands)

In South Santo, governance systems such as chief systems and area councils have weakened. It is important to consider, plan, and develop trial awareness-raising methods for these sites. The possibilities for developing new tools to support the proposed measures are presented below.

Araki Island catches migratory pelagic fish using FADs and is a desirable site for the trial value addition of fish products from pelagic fish. This could be linked to the Japan Overseas Cooperation Volunteers (JOCVs) that are dispatched to Espiritu Santo Island. Furthermore, given the proximity of the large consumption centre of Luganville, Nakere was considered a site to trial a new tool to improve

the distribution of fishery products, such as considering Nakere as a storage and transit point for fishery products from the remote areas of Araki and Tangoa islands.

Extensive tilapia aquaculture, which is currently being implemented in Wailapa, is a promising resource-management support measure identified for further exploration as a pilot project.

(2) Emae Island

Although there has been an overall decline in coastal resources on Emae Island, currently each community has only established no-take zones, and the rules for these zones are rarely shared with other communities, therefore, resource management has not been fully effective. To address this, a pilot project was proposed whereby island-wide resource management activities were standardised and communicated so that all communities were aware of, and respected, each other's resource management measures in their respective operating areas rather than each community trying to manage their own fishery resources.

In addition, as Emae Island has a fishing ground (Cook's Reef) that is also used by other nearby islands, it is desirable to trial joint management of the fishing ground with other nearby islands. Technical support such as organizing consensus bulging workshops etc.xyz is required for this purpose. Therefore, a pilot project on bottom-fish resource management was proposed.

(3) Tanna Island

Fishers in Waisisi travel not only to community-managed foreshores but also to the northern and southern parts of Tanna and Aniwa islands for pelagic and bottom fishing. Therefore, the project proposed a 'trial of joint bottom-fish resource management' between multiple communities and islands, which has not been addressed in previous phases.³ In addition, as Waisisi, Ikoukau, Isabai, and Imatu on Aniwa Island sell their fish through the same distribution channels, a pilot project was proposed for joint bottom-fish resource management and supporting measures to improve fish distribution in a coordinated manner.

2-2 Summary of activities against outputs

2-2-1 Output 1

The applicability and practicality of the integrated CBCRM approach is enhanced

(1) Activities common to all or several sites

1) CBCRM self-assessment tool

To monitor the integrated CBCRM activities, an Integrated CBCRM Monitoring Sheet (CBCRM Monitoring Sheet) was developed based on the MPA-MEAT⁴ and Kakuma (2016)⁵ developed in the

³ This activity was not implemented at the site as a result of the high priority given to the Shepherd Islands north of Efate by the then Deputy Under-Secretary.

⁴ National CTI Coordinating Committee, MPA MEAT- Marine Protected Area Management Effectiveness Assessment Tool, 2011.

⁵ Deer Bear.com. Community-Based Coastal Resource Management Assessment Tool in Developing Countries. Community Fisheries No. 18.2016.

Philippines.⁶ In April 2017, a preliminary draft was developed based on the actual state of local fisheries and activities up to Phase 2. The first draft was developed based on the results and consultations with the C/Ps in November of the same year, reflecting the results of interviews on the actual progress of CBCRM activities at the Phase 2 sites. It was then upgraded with the 2018 activities, and the final draft was formulated at the end of the second period of the Phase 2 (early 2019). Below is an overview of the monitoring sheet, its structure, and monitoring results.

(a) Overview of CBCRM monitoring sheet

a-1) Purpose of the monitoring sheet

The monitoring sheet shall have the following two objectives.

- (i) Use this checklist when planning integrated CBCRM activities.
- (ii) Monitoring the progress and achievement of integrated CBCRM activities.

a-2) Characteristics of monitoring sheets

In developing the monitoring sheet, the principles and methodology of MPA-MEAT and Kakuma (2016) were followed, the basic characteristics and ideas of which are as follows:

1. Self-evaluation: monitoring should be carried out by the community implementing the management activities. Self-evaluation is expected to help identify strengths and weaknesses in activities and efficiently review their content. It is also expected to improve ownership of activities without the awareness of being 'externally evaluated'.

2. Facilitates comparison with other communities: The use of a uniform format facilitates comparison with the activities of other communities. This can be a tool for mutual learning where several communities can use each other's activities as references to improve their own activities.

3. Networking: This can also be a tool for networking between sites for the reasons given above. Networks can have many benefits besides mutual learning, such as complementing each other's strengths and weaknesses, and building cooperation on common issues.

4. Adaptive management: The effects of characteristics 1 to 3 above enable adaptive management. In other words, it is a tool for communities to occasionally evaluate their activities, learn lessons from failures, and conduct developmental reviews that allow them to expand on successful activities.

5. Emphasis on sustainability: The monitoring sheet is a scoring system that gradually increases the score as the activity progresses. Conversely, if there are problems with an activity, the score will decrease, encouraging continuous efforts to increase the score.

6. Improved efficiency of administrative support: The official administration can easily understand what has been successful and what problems have been encountered in each activity, making it easier to provide support for problem-solving.

⁶ MPA MEAT is a system developed in the Philippines to assess the effectiveness of management of marine protected areas. It is aimed at self-assessment by managers and mutual learning between sites. The system is suitable for small management organisations because it allows quantitative monitoring of qualitative activities, adaptive management and comparisons between sites.

The basic differences between this monitoring sheet and those of the MPA-MEAT and Kakuma (2016) are that the specific details of each CBCRM activity formulated by each community were incorporated into the evaluation items, and the scores were continuously entered on a single sheet (using MS Excel) to facilitate the understanding of changes in the scores over time. In addition, to facilitate information sharing with other communities and government agencies, a standardised individual sheet was prepared to organise an overview of individual CBCRM activities (e.g., establishing MPAs and developing alternative sources of income).

(b) Structure of the monitoring sheet

In principle, monitoring is divided into the planning phase of CBCRM and the monitoring phase, which is conducted periodically after activities have started.

Level 1: Planning Stage

This includes evaluation items for the planning phase of integrated CBCRM activities. In each target community, the FDO of the VFD, together with the Area Secretary of the provincial government, whenever possible, evaluated the content of the planned activities on the monitoring sheet (< Level 1 >) at the time of the CBCRM activity planning workshop. If any evaluation items were missing from the plan, the plan was revised as much as possible to ensure that as many items as possible were achieved. At this time, a monitoring officer was appointed from among the community members. The evaluation items are as follows:

Section 0: Qualitative items that comprehensively describe the results of the activities, such as residents' awareness.

Section 1: Items to check whether the basic building blocks of resource management are met.

Section 2: Items to check whether a resource management implementation system is in place.

Level 2: Monitoring Stage

This included an item that assessed the progress of the integrated CBCRM activities. The community continued to evaluate the activities of each CBCRM using a monitoring sheet, led by the person in charge of monitoring, and if possible, in the presence of the Area Secretary. The evaluation should be conducted at least once a year; however, it may be updated as appropriate when any progress is made in the activities, and the FDO will support this as much as possible. Specifically, the timing of management activity reviews (approximately once a year) requires active involvement. If any items were not met at the planning stage, they should be appropriately assessed at the monitoring stage. Based on the CBCRM guidelines, CBCRM activities should include activities (tools) categorised into a) resource management measures, b) support measures, and c) consolidation measures. The evaluation items are as follows:

Section 3: Items assessing whether the system for implementing management activities functions effectively.

Section 4: Items for assessing the achievement and continuity of resource management measures.

Section 5: Items to assess progress and continuity of supporting measure activities.

Section 6: Items to assess the effectiveness and continuity of connecting measure activities

(c) Monitoring

Monitoring was based on a preliminary draft in the first period of the project, which was revised in the second period in line with the provisional CBCRM guidelines. Training materials were also developed based on the monitoring assessment, and two training workshops were scheduled: 1) Training on the Integrated CBCRM Approach for FDOs in February 2019, and Training on the Integrated CBCRM Approach for community leaders in March 2019. FDOs and community leaders were trained to understand the purpose of monitoring and how to complete the forms.

The following project sites, which included eight communities on three islands, were targeted for monitoring:

Table 1: Sites covered by CBCRM monitoring

Target island	Project site community
Emae	Marae, Sangaba and Tongamea.
Santo	Nakere, Araki, Tangoa, Wailapa.
Tanna	Waisisi

Monitoring was carried out in October and November 2017 for the 'planning phase' at the start of the activities, and then from October 2019 to March 2020 and in July 2023, followed by an evaluation at the end of the project in November 2023. Although the annual evaluation was not carried out as planned owing to various local circumstances and the COVID-19 pandemic, the evaluation was done at the beginning, middle, and end of the project. In 2023, assessments were conducted in July, just before the end-of-project assessment, and in November during the last visit of JICA experts because significant progress had been made since July, including the formulation of CBCRM plans for each site.

(d) Monitoring results

The monitoring results for each target island/community and final trends at the end of the project are described below. The legend of the results table is as follows:

Level 1: Includes assessment items for the planning phase of integrated CBCRM activities

Section 0: Qualitative indicators representing the overall results of the activity, such as awareness of the population.

Section 1: Items assessing whether the basic component of resource management are fulfilled.

Section 2: Items assessing whether there is an enforcement system affecting management.

Level 2: Includes assessment items for the monitoring phase of integrated CBCRM activities

Section 3: Items assessing changes in the implementation and enforcement systems of CBCRM activities

Section 4: Items to assess the implementation of resource management measures.

Section 5: Items to assess the implementation of supporting measures

Section 6: Items to assess the implementation of connecting measures.

<Emae Island>

Table 1: Monitoring scores for Marae, Emae

Monitoring Score Results of Marae, Emae

Level	Section	Actual Points			
		On Planning Stage	On Implementation Stage		
		6-Oct-17	21-Feb-20	27-Jun-23	3-Nov-23
1	Section 0	10	13	13	13
	Section 1	11	14	26	29
	Section 2	13	13	16	18
2	Section 3	0	11	6	10
	Section 4	0	30	42	47
	Section 5	0	12	14	15
	Section 6	0	10	5	19
	Total Points	34	103	122	151

The assessment result for Marae was 151 points at the end of the project in November 2023, an increase of 29 points from the previous assessment conducted in July (Table 1). This was mainly due to the finalisation of the CBCRM plan and the successful continuation of several resource management activities and connecting measures. In particular, a wide range of activities had been conducted, such as the combined management of fishing gear, species, and fishing grounds in the no-take zone, coral reef conservation, and coastal clean-up activities.

Table 2: Monitoring scores for Sangava, Emae**Monitoring Score Results of Sangava, Emae**

Level	Section	Actual Points			
		On Planning Stage	On Implementation Stage		
		8-Oct-17	20-Feb-20	27-Jun-23	3-Nov-23
1	Section 0	6	10	13	15
	Section 1	26	30	31	31
	Section 2	6	7	16	17
2	Section 3	8	9	5	10
	Section 4	0	23	33	35
	Section 5	0	20	18	28
	Section 6	0	10	11	8
	Total Points	46	109	127	144

The November 2023 assessment score for Sangava was 144 points, reflecting the same high scores and upward trend as those in Malaie (Table 2). The main factors contributing to the increasing scores were that the CBCRM plan had been reviewed and finalised, and that support measures such as the bottom-fish fishery and improved fish distribution (Fish Market), were flourishing.

Table 3: Monitoring scores for Tongamae, Emai**Monitoring Score Results of Tongamea, Emae**

Level	Section	Actual Points			
		On Planning Stage	On Implementation Stage		
		9-Oct-17	20-Feb-20	27-Jun-23	3-Nov-23
1	Section 0	7	13	14	14
	Section 1	27	30	31	31
	Section 2	12	14	15	18
2	Section 3	7	9	5	9
	Section 4	0	28	43	44
	Section 5	0	12	18	20
	Section 6	0	10	12	11
	Total Points	53	116	138	147

Similarly, Tongamea also saw a steady increase in assessment points to 147, which was attributed to the finalisation of the CBCRM plan and the steady continuation of activities under each measure (Table 3).

The improvement in the overall score for Emae Island can be summarised as follows: a) the CBCRM plan has been finalised, b) the implementation system is sound, and c) a wide range of activities related to resource management measures are ongoing. Overall, the plan and organisational management have been updated, and activities have continued steadily over a long period of time, which is highly commendable. However, there were some areas of stagnation in the supporting and connecting measures. Future discussions should be held to address these issues by identifying revised activity policies.

<Santo Island>

Monitoring Score Results of Nakere, Santo

Level	Section	Actual Points			
		On Planning Stage	On Implementation Stage		
		17-Oct-17	10-Mar-20	4-Jul-23	10-Nov-23
1	Section 0	7	13	15	17
	Section 1	13	13	17	25
	Section 2	5	5	8	15
2	Section 3	6	6	7	6
	Section 4	0	11	14	17
	Section 5	0	0	0	10
	Section 6	0	5	12	17
	Total Points	31	53	73	107

The final evaluation result for Nakere was 107 points, which is a significant improvement to the previous results. The characteristic features of Nakere are that it is very progressive, with a management structure that has expanded and new members have joined since its inception. Furthermore, there has been an expansion of management and supporting measures activities. The Resource Management Plan was completed, and the continuation and development of well-balanced activities was reflected in a large increase in the number of points.

Monitoring Score Results of Araki, Santo

Level	Section	Actual Points			
		On Planning Stage	On Implementation Stage		
		19-Oct-17	9-Mar-20	04-Jul-23	10-Nov-23
1	Section 0	6	12	12	15
	Section 1	14	18	25	31
	Section 2	5	8	14	18
2	Section 3	0	5	6	10
	Section 4	0	10	25	30
	Section 5	0	4	17	6
	Section 6	0	0	0	0
	Total Points	25	57	99	110

While Araki has a strong resource management implementation system and monitoring and management of no-take zones, activities related to supporting measures such as FADs and the development of bottom-fish fisheries have stagnated or connecting measures have not been implemented, resulting in a small overall increase in scores. In addition, fish market activities, which were the main focus of the project, were suspended due to damage to the solar freezer caused by the hurricane. However, offshore fishing activities are active and expected to be highly effective in managing coastal resources, and the community is developing new fish markets on its own, which should lead to long and steady future growth.

Monitoring Score Results of Tangoa, Santo

Level	Section	Actual Points			
		On Planning Stage	On Implementation Stage		
		16-Oct-17	9-Mar-20	4-Jul-23	10-Nov-23
1	Section 0	6	10	12	16
	Section 1	14	17	18	28
	Section 2	8	8	7	18
2	Section 3	6	6	4	10
	Section 4	0	18	34	38
	Section 5	0	7	8	9
	Section 6	0	0	1	4
	Total Points	34	66	84	123

The score improved significantly in Tangoa because the implementation of activities was well maintained, and there was a good balance between management measures (e.g., the development of management plans, no-take zone monitoring, and beach clean-ups), and supporting measures (FAD

operations and fish markets). Tangoa has a fishery structure that is heavily dependent on offshore fisheries, and the recently installed FADs are well-utilised. As for the hybrid canoeing initiative, activities have stalled because of damage caused by hurricanes, but overall, activities are developing well.

Monitoring Score Results of Wailapa, Santo

Level	Section	Actual Points			
		On Planning Stage	On Implementation Stage		
		31-Oct-17	10-Mar-20	3-Jul-23	9-Nov-23
1	Section 0	6	16	12	12
	Section 1	16	19	22	25
	Section 2	1	7	1	18
2	Section 3	0	8	4	8
	Section 4	0	6	18	28
	Section 5	0	4	3	4
	Section 6	0	6	11	18
	Total Points	23	66	71	113

In Wailapa, the implementation system of activities has continued to be well structured, with a good balance of resource management, supporting, and connecting measures, including the development of management plans, implementation of no-take zone monitoring, continuation of tilapia aquaculture, and awareness-raising activities. Notably, supporting measures are dedicated to the aquaculture of tilapia. This has had a positive effect on food security in the community, as it has become an important source of protein when food shortages are feared because of hurricane damage. At the time of the assessment, aquaculture production had temporarily ceased; as the number of producers entering aquaculture increased and the land in the centre of the community became too small, the aquaculture ponds were relocated to the periphery. Although this has resulted in temporarily low growth in the number of points, significant development can be expected once the relocation of the ponds is completed and aquaculture is back on track. It should be noted that the successful case of tilapia aquaculture in Wailapa has spread to other communities in the vicinity. Although this was not the subject of this monitoring stage, aquaculture can be assessed as an activity with an important impact.

The overall trend on Santo Island continues to be a balanced implementation of management and supporting measures, including the finalisation of resource management plans and the establishment of a strong management structure. In terms of supporting measures, the most notable activities are fish markets in Nakere, FADs in Tangoa, and tilapia aquaculture in Wailapa, which form the core of CBCRM in each community. In some communities, support activities have been narrowed down to a single activity, but this is a result of the selection of activities suited to the community and was a result of the pilot activities.

<Tanna Island>

Monitoring Score Results of Waisisi, Tanna

Level	Section	Actual Points			
		On Planning Stage	On Implementation Stage		
		18-Nov-17	23-Oct-19	7-Jul-23	3-Nov-23
1	Section 0	9	11	16	16
	Section 1	22	22	25	28
	Section 2	9	9	14	14
2	Section 3		4	5	5
	Section 4		20	33	33
	Section 5		3	0	0
	Section 6		3	0	0
	Total Points	40	72	93	96

In Waisisi, the resource management system is well established, management plans have been completed, and no-take zone monitoring is functioning. However, value-adding and consolidation measures planned as support measures did not continue. A treasurer was appointed for the value-adding fish market, but the activity itself was stalled due to the breakdown of the solar freezer and the project vehicle used for transport. However, with the arrival of the new project-provided solar freezer on-site in October 2023 and the new VFD four-wheel drive vehicle already in place, it is hoped that activities will resume in the future.

<Trends in overall CBCRM activities>

Across the project sites, the following trends were observed in CBCRM activities during the project period:

- 1 All of the systems (organisations) for implementing activities are functioning well.
- 2 Resource management measures continue to be active.
- 3 Supporting measures are often narrowed to activities that meet community needs.
- 4 Connecting measures are unevenly implemented across sites.

From these results, it can be concluded that the integrated CBCRM recommended for implementation in the project has proven to be suitable for the Vanuatu community in terms of the framework and activities related to resource management. In particular, the activities related to the establishment of an implementation framework and resource management measures, which form the basis of the activities, have succeeded in realising the essential challenge of the project, that is community-based coastal fisheries resource management in Vanuatu. Various supporting measures were observed, depending on the characteristics and needs of the sites. In some cases, activities were initiated with the expectation that several supporting measures would be introduced; however, as a result, they were reduced to characteristic activities. Some sites and activities are hampered by hurricanes; however, they generally function well. However, some issues regarding connecting measures were identified.

While some sites continue beach clean-up and awareness-raising activities, there are many sites where activities have ceased. It is necessary to check whether there is a need to continue these activities and identify measures in cases where they are deemed necessary. However, there are also many examples that can be implemented relatively easily (e.g., awareness-raising activities at weekly community meetings, football tournaments, beach clean-ups), and efforts should be made to share successful examples among sites in the future.

2) Bottom-fish resource management approaches

(a) Purpose of the activity

CBCRM is aimed at each community and assumes that each foreshore resource and fishing ground is managed. However, some fish resources may be used jointly by several communities, and it was recognised that the establishment of a framework for resource management systems by related communities is a challenge for coastal resource management in Vanuatu. In particular, deep-sea bottom-fish species are not included in traditional foreshore resource management, but resource development has been progressing owing to recent fisheries development. Of concern is that the slow growth rate to sexual maturity (i.e., biological minimum size) of many bottom-fish species makes them susceptible to overfishing; therefore, an urgent response is required.

To address this challenge, the Vanuatu Government developed the National Deep-Bottom Fish Fishery Management Plan in 2016. In addition, as part of the recent decentralisation policy, management authority over 12 nautical miles from the coastline was transferred to the provincial government, and a Marine Spatial Plan was developed to define specific management areas. This means that the provincial government must take the lead in promoting multi-community resource management based on a bottom-fish fishery management plan.

However, there is no evidence of a deep-sea bottom fish resource management system led by provincial government. Therefore, this project attempted to develop a framework for bottomfish resource management by developing an integrated CBCRM.

(b) Target sites

Of the three islands targeted by the project, fishing for deep-sea bottom-fish species, such as long-tailed red snapper (*Etelis coruscans*), is prevalent on the south side of Emae Island and on Waisisi and Tanna Islands, and fishers on the other islands use the same fishing grounds. The project is now attempting to establish a framework for bottomfish resource management on Emae Island, near the capital, Port Vila, as a pilot initiative. Specifically, fishers from the three communities of Marae, Sangaba, and Tongamea on Emae Island, and from Makila and Mataso islands, who use the same fishing grounds in the Shepherd Islands, Shefa Province, were targeted.

(c) Basic policies

The initial project envisaged the establishment of an organisation modelled on the Japanese Fisheries Coordination Committee. The Fisheries Coordination Committee (FCC) is an official body provided for in national law, consisting of each relevant fishery cooperative, local administration, and academics.

The FCC makes recommendations to the head of the administration, the manager, on how to manage fisheries through for e.g., licencing, and with which communities to coordinate the use of resources and fishing grounds for common use between interested parties. In Vanuatu, it was initially thought that this framework would be effective if the provincial government had sufficient capacity to enforce the fishery administration. However, for the fisheries regulator board to function, the following conditions are required: an organisation representing fishers must be established, relevant laws and regulations of national and local administration must be in place, the sea area to be managed must be clearly defined, and a monitoring system for catches must be adequate.

However, the project was suspended owing to COVID-19 in 2020 and subsequent hurricane damage, as well as the failure of the VFD to disseminate the planned national bottom-fish fisheries management plan and develop a marine spatial plan resulting in insufficient development of these conditions after the project resumed. Therefore, in consultation with the VFD and in view of the remaining duration of the project and the capacity of the C/P agencies, the establishment of the Fisheries Coordinating Committee was abandoned, and the Liaison Conference for Deep-Bottom Fish Fishery Management (DBFFM) was established as a framework without any legal basis.

The Liaison Conference is expected to serve as a forum for discussions among fishers, Shefa Province, and the VFD on the management of bottom-fish resources, including the establishment of management areas, drafting of the Shefa Province Bottom-Fish Resources Management Plan, and the establishment of specific management systems. In this process, it is expected that the dissemination of the National Bottom-Fish Fishery Management Plan and the formulation of a marine spatial plan will be promoted. After the conditions are met, the organisation will be transformed into an authoritative body with a legal basis, such as the Fisheries Coordination Committee.

The future framework for the management of bottom-fish resources will also include a) a joint management framework centred on Shefa Oblast and relevant communities, b) external technical assistance from the VFD, c) the establishment of management areas and advice from the marine spatial planning project, d) the provision of catch data by fishers to Shefa Province as a monitoring method, and e) Shefa Province, with support from the VFD, will provide feedback on the data analysis to the fishers (Figure 1).

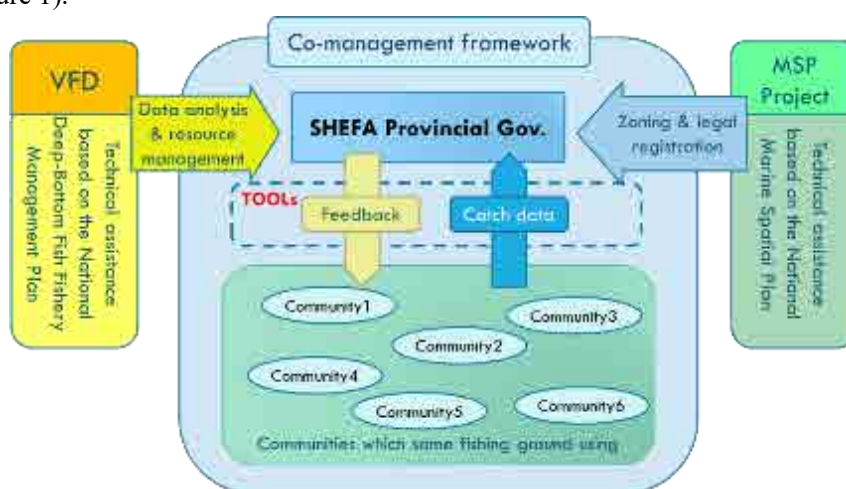


Figure 1: Basic structure of the bottom-fish stock management framework

(d) History of activities to date

(i) State-of-fisheries survey (June 2018)

A state-of-fisheries survey of Makila, Mataso, and Tongoa islands in the Shepherd Islands was conducted from 21–22 June 2018, with one of the objectives being to collect basic information on bottom-fish resource management. The results showed that fishers from Makila and Mataso Islands share fishing grounds in the northern part of Emae Island with fishers from Marae, Sangaba, and Tongamea on Emae Island. It was also found that these three islands are not in competition with each other but form one cultural area sharing fishing grounds. However, there was a feeling of exclusivity towards commercial fishing vessels coming from Port Vila, confirming the existence of conflicts regarding resource use.



Distant view of Mataso Island



Fishing vessels and gear for the Mataso bottom-fish fishery

(ii) Preparatory meeting (March 2019)

Representatives of bottom-fish fishers from each island gathered on Emae Island to discuss the need for and approach to bottom-fish resource management. The fishers agreed on the need for resource management based on conflicts with fishers on Efate Island. However, they were sceptical about the legal basis for the implementation of the National Bottom-fish Fishery Management Plan (with mandatory fishing vessel registration, payment of registration fees, and catch reporting), and most of the discussions during the Q&A session were related to this.



Discussions with fishers on Emae Island (9 March 2019)

(iii) Preliminary discussions on the establishment of a bottom-fish resource management group (September 2019).

Following the previous meeting, representatives of the main fishing communities in Emae and bottom-fish fishers from Makila and Mataso islands gathered on Emae Island for a lecture on the need for bottom-fish resource management and to discuss future policies for resource management activities. The discussions took the form of a workshop, whereby each community was asked to organise a more concrete management plan.

Bottom-fish resource management is carried out based on the National Bottom-Fish Fishery Management Plan, which stipulates two obligations for fishers: a) to obtain a fishing licence for each fishing vessel and b) to record and submit catch data. In the lecture, the necessity of these two points was explained, and the understanding and cooperation of the fishers was sought. Although many questions and objections were raised, the fishers understood the need for resource management, and a basic agreement was reached on the establishment of a fisher's group to manage bottom-fish resources in the Shepherd Islands as a whole. Several specific activities were proposed, and it was agreed that discussions should continue.



Lecture

In the second half of the meeting, the participants were divided into two groups, Emae and Makila/Mataso, and each group presented on one of the following four topics: a) the current status and challenges of the bottom-fish fishery, b) proposals for management rules and measures, c) necessary development and support measures, and d) fishing ground maps. However, some of the proposals on management rules and measures included ideas that would require a decision at the national or state government level, such as "collecting entry fees from external fishermen". A draft management plan will need to be carefully prepared through a thorough process in the future.



Discussion and presentation of proposals for management rules and measures for bottom-fish fisheries

(iv) Meeting to establish the Fisheries Coordinating Committee (March 2020)

A preliminary meeting was held to establish a Fisheries Coordination Committee. The purpose of this meeting was to build on previous consultations and provide fishers with input on issues, challenges, and focal points to be discussed before a concrete framework involving the provincial government

was developed. Furthermore, a tripartite meeting was planned that would include the provincial government and VFD in Port Vila immediately after this meeting, but due to the global spread of COVID-19, the JICA experts had to urgently return to Japan and the project was suspended.

(v) Shefa Oblast and VFD pre-consultation for the establishment of the Liaison Conference for Deep-Bottom-Fish Fishery Management (October 2023)

This was the first activity related to this case after the lifting of restrictions related to the COVID-19 pandemic. Owing to several factors including COVID-19, repeated cyclone damage, and the response to the damage, there was a gap of approximately three and a half years before the resumption of this case. This hampered the establishment of a Fisheries Coordinating Committee in the project activities, as mentioned above, and as a result of discussions within the project team, it was decided to change the policy to the establishment of a 'Liaison Conference for Deep-Bottom-Fish Fishery Management'.



In accordance with this policy, the Shefa Province Government was again consulted in late October 2023 and agreed to proceed with the activities in accordance with this policy. The relevant communities in the Emae, Makila, and Mataso islands were also notified in advance of the activities in this case through the Area Council of Shefa Province.

(vi) Tripartite meeting to establish a liaison council (November 2023)

Following the above preliminary discussions, a meeting was held on 3 November 2023 on Emae Island with representatives of the fishers concerned from the three islands to establish a Liaison Conference. A summary of the meeting is as follows.

<Tripartite meeting on the establishment of the Liaison Conference for the Management of Bottom Fish Resources>.

Date and time: 3 November 2023, 10:00–13:00

Venue: Emae Island Finonge Area Council Office

Moderated by Dimitri Kerala, Vanuatu Fisheries Department

Participants:

Shefa Province representative:

Mr Christopher Matariki, Area Administrator, Emae Island

Mr Jakwes Berry, Area Administrator, Makira/Mataso Island

Emae Island representatives: 11 (Marae, Sangaba, Tongamea and others)

Makira Island representatives: 3

Mataso Island representatives: 2

At the meeting, the VFD once again raised the issues of bottom-fish resource management, the purpose of establishing a framework, the activity policy of the Liaison Conference and the objectives of its activities, and after a question-and-answer session, the establishment of the Liaison Conference was unanimously agreed, including by the representatives of the Provincial Government. Minutes of the meeting were then drawn up on the agreed issues, including the purpose of establishing the Liaison Conference, the role of the Shefa Provincial Government, and future activity policies. The minutes were signed by representatives of each community. It should be noted that among the signatories were the Shefa Provincial Government Secretary General (Ms. Liah Kaltoi, Acting Secretary General) and the VFD Director (Mr. Sompert, Acting Director). Neither were in attendance, therefore the signatures were provided at a later date in Port Vila. The minutes are attached in Attachment 7.



Briefing on the Council by the VFD



The meeting for and the signing of the petition by representatives of each community

(e) Future tasks

Based on this consultation meeting, and with the support of the VFD and in consultation with the provincial government and relevant fishers, an agreement was reached between the state government, VFD, and fishers to a) establish fishery management areas, b) develop a bottom-fish fishery management plan, and c) develop a management and monitoring law. Although concrete activities could not start within the project period due to the negative impact of COVID-19 and the cyclone, the project was able to identify future tasks with stakeholders, as it was able to develop a framework for bottomfish resource management led by the provincial government. After the project was completed, the VFD development officer in Shefa Province was expected to act as a coordinator to address these issues.

3) Marine education

(a) Purpose of the activity

The knowledge and experience gained from the resource management activities implemented thus far in the project will not only be shared with local stakeholders but with primary school teachers and other educators. This will ensure that the next generation of fishers and resource managers in Vanuatu are educated and aware of sustainable resource development, thereby promoting integrated CBCRM. This activity was introduced in the fourth and final year of Phase 3 as an activity to promote the dissemination of integrated CBCRM.

(b) Activities

b-0) Prior consultation with the VFD, residents, and relevant authorities

The possibility of implementing an awareness-raising programme on marine resources (henceforth 'marine education'⁷) using the Mangaliliu Community Seafarming Centre was discussed with the relevant VFD Research and Aquaculture Division officials. In particular, it was recognised that the use of the facility would lead to its sustainable utilisation. Subsequently, together with VFD officials, they explained the objectives of marine education to Mangaliliu residents and confirmed their willingness to promote the use of the Mangaliliu Community Seafarming Centre. In addition, opinions were exchanged with the VFD staff and residents on specific marine education dissemination programmes, with the aim of fostering a sense of ownership among residents by discussing how and what could be provided, including the establishment of a mechanism and implementation structure for the community and the VFD.

b-1) Specific activity items

The following items were considered as themes to be dealt with in marine education.

- The life cycle and evolution of coastal resource management measures for species supported by the project to increase their stocks, such as giant clams and green snails, will be presented.
- Induce the giant clam to spawn in the aquarium and observe the spawning process.
- Observe the growth of juvenile giant clams in the aquarium and cell division from egg to juvenile by microscopy.
- The aquarium is used as a touch pool, where visitors can come into contact with a variety of sea creatures that live in the area.
- Introduce coral conservation and restoration activities and encourage people to participate in these activities.

Corals were not a target of this project, but since 2021, coral conservation activities have been added

⁷ Marine education has been defined in various ways. However, in this text, it is defined as a learning opportunity to contribute to the conservation and use of the oceans and marine resources for sustainable development and to consider the coexistence of the oceans and people. As an international trend, the 'Decade of Ocean Science for Sustainable Development' aims to promote a multifaceted approach to marine education and the promotion of the SDGs by 2030, as well as the 'Ocean Literacy for ALL' slogan. In Japan, marine education is also the focus of attention in the new Courses of Study, and attempts are being made to develop lessons with the aim of fostering marine literacy of an international standard.

to the list of activities because the VFD has been conducting coral rehabilitation activities off Port Vila and Pele Island.

b-2) Current status of marine education in Vanuatu

In Vanuatu, a marine education booklet called '*The Sea*' was distributed to upper primary school pupils but is no longer in use. According to interviews with the Ministry of Education in Shefa Province, teaching materials on coastal resource management were previously provided to the Ministry with the support of the Pacific Community (SPC), and teacher training was conducted simultaneously. However, the content of the materials was very specialised and therefore challenging for the teachers to explain, hence the material is no longer being used.

Interviews with headmasters and teachers at primary schools in Mangaliliu and Lelepa Islands around the Community Centre revealed that although teachers live near the sea, they have little knowledge of marine life, a topic that is rarely dealt with in class, and no nature lessons or experiential learning are provided. In addition, while teachers were aware of the existence of the Mangaliliu Community Seafarming Centre, no attempt was made to use the facility. On the other hand, there were some positive responses indicating a desire to use the centre as a hands-on, extracurricular learning space that could be used to educate children on a regular basis.

However, it also became clear that because of the limited number of teachers, one teacher is simultaneously responsible for two grades, and that careful attention needs to be paid to the target grades, class sizes, and possible timeframes for the implementation of extra-curricular learning.

Based on this understanding of the current situation, Imamura visited the headquarters of the Ministry of Education in Vanuatu and proposed the Mangaliliu Community Sea-farming Centre as a place for extra-curricular learning from primary schools near Efate Island, explaining that the project team would like to expand the use of the centre to pupils from islands other than Efate Island. The Ministry of Education of Vanuatu recognised the importance of extra-curricular learning opportunities and expressed its willingness to support the Ministry in considering participation or similar learning activities, not only on Efate, but also from other islands. They emphasised that they would like to continue to discuss and support the project with relevant authorities, particularly regarding its consistency with the current education curriculum, the challenges that caused science education to stop, and the importance of raising awareness of marine resources.

b-3) Marine education trials (for primary schools in Mangaliliu and Lelepa)

Extra-curricular marine education classes, mainly conducted by aquaculture officers from the VFD and Research and Aquaculture Division, and members of the Community Resource Management Committee in Mangaliliu, were held on 29 and 30 November 2022 for pupils from Mangaliliu and Lelepa primary schools, respectively. After lectures on the activities that the VFD conducted with the project and the lifecycle of shellfish and corals, a question-and-answer session was held. During the lecture, the giant clam began to spawn, and the lecture was interrupted to allow the pupils to observe this in the tank, with explanations from the VFD aquaculture staff.

The above-mentioned extra-curricular learning helped organise and confirm the division of roles and

responsibilities between the VFD staff and community members regarding the operation, maintenance, and management of the Mangaliliu Community Sea-farming Centre.

b-4) Training of marine educators

b-4-1) Conducting trials for teachers in teacher training colleges.

As mentioned above, Vanuatu teachers do not have a comprehensive knowledge of marine resources; therefore, the possibility of conducting field trips to the Mangaliliu Community Seafarming Centre for teacher-training college students and using them as teaching practice sites was suggested in interviews with the headmasters of the teacher-training colleges. The principal of the teacher-training college agreed with the proposal, and a field trip was conducted with five science teachers on 30 January 2023.

During the field trip, after explaining the activities at the Mangaliliu Community Seafarming Centre and the life cycle of the giant clam, a course was organised in which the participants could watch the previously filmed spawning of the giant clam and observe its larvae under a microscope. Tools and other equipment created for learning about coral seedlings were introduced simultaneously.

Participants made the following comments.

- Students have limited opportunities to learn about marine life.
- The opportunity to observe marine life and learn is valuable because it is enjoyable.
- We would like to use such facilities in the future. In addition, the participants commented that, for the first time, they understood the life cycle of the giant clam and that seeing it in person made them feel closer to the species.

Furthermore, when the workshop for primary school children was reviewed and advice was sought on the content and teaching materials, the following comments were made:

- The grade levels to be studied and expected learning outcomes should be clearly stated.
- The target grade level should be Grade 6 to Grade 7 or above, where the subject of cell nuclear division is studied.

The fact that the participants were able to see the actual site allowed them to discuss specific details of the project. In the future, when the project has finalised the planned teaching materials, participants will be invited to cooperate with project team again. It was proposed that this kind of cooperation should continue to solidify relationships so that the project could be considered as one of the destinations for extracurricular learning in primary schools.

b-4-2) Conduct workshops for the training of trainers

Marine education, which was implemented mainly through coral rehabilitation activities at the community coastal stockpiling centre in Mangaliliu, was carried out by VFD staff and Mangaliliu residents throughout the project. However, during periods when project team members were not travelling, activities were not carried out by the VFD staff who were too busy attending training courses and writing reports, making it practically impossible for them to lead ongoing activities. The VFD expressed a desire for independent community-led management, highlighting the challenges

faced by both sides. To enable residents already involved in the activities to lead them in the future, a lecture on the knowledge and handling methods necessary for a series of coral rehabilitation activities, and an opportunity for new Mangaliliu residents to participate in coral rehabilitation activities, were provided as a training course for the development of trainers. The measures taken were as follows:

Residents with an interest in marine resource management were invited to participate in the training, which was held by nine people (six men and three women). A verification test was conducted during each session. The training content was as follows:

[Workshop for training trainers]

Session 1: Coral spawning, aquaculture, and selection sites

Session 2: Coral collection

Session 3: Coral nurseries

Session 4: Coral monitoring

Extracurricular learning for primary and secondary schools on the island of Efate will be organised by the participants of this training workshop, which is planned for 2024.

Regarding coral monitoring, as a practical training course, project team members taught Mangaliliu residents capable of diving how to clean coral using metal brushes. As the residents had been involved in coral rehabilitation activities on multiple occasions, expressed an interest in continuing to be involved, and expressed a desire to obtain diving qualifications, a new addition was made to the project to provide the opportunity for them to do so to ensure continuation of the activities.

(b-5) Participation from outside the northwestern part of Efate

b-5-1) Prior consultation with relevant stakeholders

To encourage schools in Efate to consider the Mangaliliu Community Sea-farming Centre in as one of their extra-curricular learning destinations, in addition to the local primary schools in the community, we visited primary and secondary schools in Port Vila and met with the headmasters. This was done with the cooperation of the Ministry of Education of the Shefa Province, which has jurisdiction. The proposal was made to use the centre for extra-curricular learning.

Various positive comments on what they could observe and study in marine education were received from each school. Specifically, when children were taken to the seaside for lessons, they often saw dead corals in front of them and showed concern and interest in the content of the marine education programmes conducted by the project. The visit confirmed that there was a sufficient need for the project as a potential destination for extracurricular learning in local schools. The following preparations (flow) were identified as necessary for implementing the extracurricular learning programme:

A information (is sent to each school about a month in advance, based on which school applies to the Ministry of Education for extracurricular travel funding, which must be approved by the Ministry of

Education.

It is also necessary to get parental permission for the pupils to leave the school premises for extracurricular learning.

Moreover, the community members in Mangaliliu must be prepared for extracurricular learning. Furthermore, teachers should be thoroughly prepared to facilitate the extra-curricular learning independently. This will require teacher-training classes before the extra-curricular activities can begin. Simplified guidelines, including procedures, should be developed.

According to the Shefa Provincial Department of Education, primary schools in Port Vila have recently been offered extracurricular visits to museums, radio stations, and the Ministry of Agriculture near the capital, with visits outside the capital left to the discretion of individual schools. This means that Mangaliliu is also a good candidate for a new extracurricular learning destination. The annual budget for these activities is approximately VUV 100,000–200,000 (approximately VAT 10,000) per person. This estimated budget was used as a reference for setting the participation fee for extracurricular learning. It was found that if it could be included as an extracurricular activity in the main schools on Efate, it would lead to the sustainable use of the facilities in Mangaliliu, and demand would grow.

b-5-2) Marine education at Seaside Primary School (July 2023)

To consider the continued use of the stocking centre for future sustainable community coastal resource propagation, a proposal to promote the use of the centre by school personnel was discussed with the Ministry of Education in Shefa Province. During these discussions, five primary and secondary schools on the island of Efate that were interested in marine education were introduced. One of these schools, the Seaside Secondary School in Port Vila, proposed using the school as a venue for extracurricular learning, which was formally implemented. The school paid the necessary expenses, and 32 pupils and four science teachers participated in extra-curricular learning at the Community Centre.

Teachers are important players in marine education and extra-curricular activities because they usually have regular communication with pupils. For this reason, prior to the marine education event, a preliminary meeting for teachers was organised to explain the programme content and the roles expected of them. Skits and quizzes were performed by teachers to keep the pupils interested in the programme.

For pupils who normally have little contact with the sea in urban areas, this was an opportunity to feel that the problems of the sea surrounding them were familiar events and relevant to them. Some pupils also showed interest in the explanations provided by the VFD staff, which expanded their own future career options. The teachers also had the opportunity to learn about coral ecology and the current status of corals from the VFD staff, making this a meaningful time for them.

b-5-3) Activities lobbied for by the Provincial Government and the Ministry of Education

The implementation of extracurricular learning made it possible to understand the process of obtaining budgets for participation in such learning in each school. The Seaside Junior High School, which was able to implement the project this time, had the authority to decide on the use of the budget for the current year. On the other hand, other schools had to re-apply to the Ministry of Education for the costs of extracurricular projects, which made it difficult for some to smoothly raise the extracurricular learning costs. Such schools should be supported by the VFD and the Ministry of Education by issuing letters of recommendation. The Ministry of Education of Shefa province clearly needs to set aside a budget for extracurricular learning so that it can be implemented smoothly when individual schools express a wish to organise extracurricular learning. It was confirmed that the Ministry of Education of Shefa province will prepare a proposal for next year's budget meeting in response to this.

In the future, expanding the network with school officials in other provinces other than Shefa would be desirable to make it known as an extracurricular learning option for primary and secondary schools. For example, information sharing and support could be obtained from the national Ministry of Education, such as by publicising the project and inviting requests in conjunction with joint school events in each province. Furthermore, as there is a high demand for practical extracurricular learning opportunities in science education, the Curriculum Development Division of the Ministry commented that it would positively consider using the teaching materials produced by the project as supplementary learning materials (resource book) as co-authored by the Ministry of Education and the VFD.

b-6) Knowledge sharing in the wider neighbouring countries

During the visit to the Community Centre and marine education for primary schools in Mangaliliu, the Director General (DG) of the Melanesian Spearhead Group (MSG), an international organisation within the region, was also invited to visit the centre and share knowledge not only within Vanuatu but also in the wider region. In addition to the MSG's DG, the Acting Director General (Mr Tony) of the VFD, the Chief of Mangaliliu, the Director of the JICA Vanuatu Office and a representative of the VFD and Research and Aquaculture Division also visited the Centre on the same day and observed the coral seedling planting by the children of Mangaliliu Primary School. Through this process, the above-mentioned participants were able to exchange views on the use of the facility in this way.

Currently, six community residents are members of the Community Centre. By providing marine education, various residents were able to be involved in operational support tasks such as cleaning and preparing for the cookout, including pre- and post-work for the implementation of extracurricular marine education. It was suggested that the VFD/Research and Aquaculture Department and community members in Mangaliliu could be packaged to implement similar activities in the future, including management of entrance fees for the community coastal stockpiling centre, publicity aimed at tourists and school personnel, future fund management methods, and involvement of other residents.

b-7) Tourism development through the use of community livestock facilities

To ensure that Mangaliliu Community Sea-farming Centre is widely used in the future, the project team met with eco-tour companies and suggested that a visit to the Centre be included as part of local eco-tour packages. Currently, such companies running eco-tours in and around Mangaliliu offer tours for general tourists, students from Australia, cruise tourists, and local school children from the capital. The tours consist of snorkelling in the sea and visits to tourist sites. As snorkelling at sites where giant clam are present is included in the programme, a visit and tour to the Mangaliliu Community Sea-farming Centre, where the giant clams are stocked, was found to be useful in conjunction with this.

For this reason, a coral rehabilitation activity was organised for the general public, led by the community residents of Mangaliliu, charging a fee of VUV 5,000($\approx$ 5,000 JPY, 40 USD). The 17 participants in this rehabilitation activity included parents and children living in Port Vila, groups interested in international cooperation and tourists. This project was managed by approximately 10 residents and the project provided logistical support. As a result, the following issues regarding the handling of coral and advance preparation by community members were identified:

- (1) Coral is sensitive to sunlight and wind, so it is preferable to work underwater as much as possible. However, during coral transport and when making coral fragments to be used as seedlings for coral transplants, the corals spent long hours in the sunlight owing to lack of manpower and setup. The need to control the temperature of the coral required the temporary use of eskies.
- (2) More coral fragments were made than the capacity of the cages to be placed underwater, so more cages had to be used for underwater work later.

Bearing the above in mind, initiative must be exercised to encourage community residents to devise ways to attract and appeal to tourists and the general public in the future.

In addition, the income earned this time was used as collateral for the input money for the next implementation of the project, while providing guidance on how to continue the project in a sustainable manner. To encourage many community members to take an active role in the project beyond mere work support, the aforementioned training was conducted to deepen instructors' understanding of more specific details on coral handling and activities, and to enable community members to operate this activity independently.



Group photo of Seaside Junior High School



VFD staff explaining to children how corals are fitted



Installation of coral with students' names on it



Opening ceremony



Workshops for teachers



Teachers on coral
skit scene

4) Quality control and Hygiene management/nutrition improvement

Quality control and hygiene management/nutrition improvement is another activity that was newly added in Year 4 to promote the spread of integrated CBCRM, similar to the previously mentioned marine education, considering the following points.

- In terms of quality control of the catch, the importance of maintaining hygiene is not only to avoid food poisoning and other problems, but also to minimise waste fish (parts) and make use of resources without waste.
- Stimulating the consumption of fisheries products, with a view to their contribution to the health of fisheries products in general, but particularly those available in Vanuatu, will lead to the exploitation of low (un)exploited resources.

Quality control and hygiene management

Activities were planned and implemented with a view to keeping the areas where the catch is handled clean in hygiene management, and proper handling in quality management to maintain the quality of the catch.

First, the annual activity plan for 2023 prepared by the Seafood Verification Agency Division of the VFD was checked. A total of five major activities were identified, two of which focused on training for fishermen and fish market personnel on seafood quality and food safety and post-harvest. In addition to the annual activity plan, the VFD's Fisheries Safety Inspection Standard Operating Procedures, Fish Market Operations Manual and Cold Chain Standards, as listed below, were also checked.

Document	Objective
Draft standard operating procedures for seafood safety inspections	Guidelines for conducting safety and quality inspections of seafood products at fish markets (for VFDs). *Documents produced under the VFD with the support of the SPC.
Fish Market Operations Manual (Draft)	Documentation to define best practices and procedures for temporary storage of fish after harvest, transport from the landing site to market, receipt at market, processing,

	storage and marketing.
Cold chain standards (Draft)	Cold chain management standards for raw, chilled, frozen and processed fish and documents that act as a reference for best practice in the transport of fish and ensure the safety, quality and integrity of the product.

Fish markets were then surveyed. The results are as follows.

Content	Evaluation
Hygiene management	As places where fish products are handled, the floors and tables in the buildings were generally cleaned, but the freezers and iceboxes where fish are stored were often not cleaned. In particular, in Tanna (Lenakel and Waisisi), the fish blood that was left on the surface of the freezers froze and hardened.
Quality control	Two fish markets in the capital were managed with sufficient quantities of ice. However, in Tanna, ice was not used, although its market is about an hour away by car from the community Waisisi to the centre of Lenakel; freezer-based management was used in Waisisi and Lenakel.
Food poisoning	Occasionally, food poisoning occurred and patients were hospitalised. However, there are almost no cases in which the illness caused death. The VFD recognised the importance of preventing food poisoning. Awareness posters on ciguatera poisoning were produced by the VFD and posted on electronic notice boards at airports and elsewhere.

*Japanese experts have been informed that, from 2024, the VFD plans to establish a system whereby selected private companies will operate the fish market and sell seafood products through public-private partnership (PPP).

Based on the above, a simple instruction manual (a single sheet of paper) on how to clean freezers and other equipment for the purpose of hygiene management and prevention of food poisoning was prepared. Specifically, the steps are (1) switch off the power, (2) open the lid, (3) remove the fish, (4) melt and scrape off any ice stuck inside, (5) remove any water that has accumulated inside, and (6) switch on the power. When cleaning, it is important to use a general dishwashing detergent, as bleach will damage the freezer.

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Methods of cleaning freezers and eskies (1 paper)

As 15 solar freezer units were planned to be distributed to various locations (Emae, Santo, Paama, Vanua Lava, Pentecost, Tanna, and Malakula) through equipment provision (locally procured), the above instruction sheet was also enclosed. The project sites with existing freezers (Emae, Santo, and Tanna) were distributed with the help of other corps members and development officers. Finally, the project team handed it over to each FDO.

With regard to quality control, educational materials on how to clean freezers and others, and the dangers of food poisoning caused by spoilage fish were added to the VFD's existing materials as training materials for fish quality control and spoilage prevention (see Attachment 8). From 7-10 August 2023, VFD staff in charge conducted training for 20 fishermen on the island of Epi. The training material was subsequently updated to consider local conditions. The existing training material basically introduces quality control using ice, which is difficult to put into practice in areas that do not have freezers/solar freezers. Therefore, in the future, in areas where ice supply is not possible, the following handling of catches on board are recommended: (i) blocking the fish from direct sunlight (e.g. covering the fish with a cloth wetted with seawater), (ii) removing gills and internal organs, (iii) placing the fish in a case (= avoiding contact with fuel and oil from the ship's engine), (iv) returning to port after some time has passed. A decision was made to recommend what can be done to maintain freshness, and the training materials were updated and passed on to the C/P.

Nutrition improvement

Fish contains high-quality proteins, qualities, essential amino acids, and other nutrients. In improving nutrition, activities were planned and implemented with a view to utilising fish without wasting it and at the same time improving nutrition.

First, the Vanuatu National Fisheries Sector Strategy 2016-2031 was reviewed, which stated that the risk of non-communicable diseases (NCDs) would be reduced by promoting fish consumption. Other information included awareness-raising on poisonous seafood products and the preparation of such materials for this purpose, and existing awareness-raising materials were confirmed to be available.

The malnutrition situation in Vanuatu was also reviewed using UNICEF's White Paper on the World's Children, and the rates of stunting (being short for age), wasting (being underweight for height), low birth weight (meaning children under 2,500 g), and anaemia in women aged 15-49 were found to be higher than East Asia and Pacific countries and the rest of the world. Other trends include increasing rates of overweight and obesity, which may increase the risk of NCDs. According to Country Nutrition Profiles (Global Nutrition Report 2023), foods high in calcium, which is essential for good health (dairy products, vegetables, seaweed, small fish, and pulses) were found to be below recommended intakes in Vanuatu.

Based on the above, a decision was taken to make bone meal by utilising yellowfin tuna bones discarded by Sino-Van Fisheries Limited, a joint venture between the Government and the Chinese state-owned fishing company handling tuna. The main steps for making bone meal are (i) drying the bones in an oven or frying them in oil, and (ii) grinding them in a household mixer or similar. The tasting was seasoned with (i) curry, (ii) soy sauce, (iii) garlic, and (iv) Maggi (Nestlé seasoning), which are widely used in Vanuatu. A tasting session was held for VFD staff using the above and interviews were conducted on (i) nutrition and (ii) bone meal. The results revealed that (i) intake of calcium-rich foods was low and (ii) although the bone powder was well received, it was necessary to devise ways to eat it.

During my stay in Japan, the main nutrients and their content in tuna bone meal (uncooked) were analysed by the Institute of Food Environment and Hygiene, Inc. As a result, a wide variety of nutrients were found to be present in large quantities, with calcium being 43 times higher than in the same amount of milk. The other nutrients and their content were also analysed by the Vanuatu Bureau of Standards, including tuna bone meal (dried) that the most stably available, bone meal of reef fish (fried) and tilapia (fried) which are caught or available in Vanuatu even if it is not in stable supply.

Based on the analysis, a document was prepared on the nutritional status of Vanuatu, the role of calcium, the effects of calcium deficiency, an overview of fish bones and cooking methods, nutrients in fish bones and their amounts, and the WHO recommended calcium intake (/day) (see Attachment 9).

Since 2021, several schools in Port Vila have been running a programme called Farm to Table in collaboration with the Vanuatu Government. This programme is aimed at local production and consumption of food for school lunches and reducing the use of imported food. The project team invited trial cooking of tuna bone powder for three schools implementing the above programme, the Ministry of Health, and Vila Central Hospital, which provides patient-specific hospital food. The venue was Malapoa College, which receives approximately 200 kg of tuna and other offshore fish once a week, which is cooked and served as school meals, with the bones discarded.



Tuna bone powder, when mixed into soups, improves nutrients while tasting good

Participants in the trial cooking sessions gave the following feedback.

- Fish bone meal resembles roasted food and enhances the flavour of dishes, especially in spiced soups.
- The initiative advocates for cost-effective stocking of home-caught fish in hospitals and schools and advocates working with fisheries departments to tackle malnutrition.
- Ongoing training and communication through social networking groups is desired.
- School-based activities target essential calcium intake for young people and promote overall community health.

The ease of manufacturing this product, availability of materials, and other hurdles to introducing it to these institutions are not high, and the SNS group will continue to exchange information with the above-mentioned parties.

Other proposals were made to the VFD to improve nutrition through the use of community aquaculture farms. In tilapia farming in other countries, poorly grown individuals are sometimes thinned out to retain the better grown fish. The thinned-out individuals (mostly females) are then dried and used as feed for aquaculture or deep-fried and eaten as a side dish. The VFD commented that although the technology for promoting the growth of farmed fish through sex identification and thinning is not yet widespread in Vanuatu, contributing to health promotion could be achieved through increased calcium intake using fry, while also trying to introduce the spread of such technology.

(2) Results of the implementation of activities at each pilot site

At each pilot site, as in the Phase 2 activities, a provisional CBCRM plan was developed by conducting several planning workshops with the participation of community residents based on the baseline survey results. The pilot activities were then monitored by the FDO in charge, and the provisional plan was subsequently reviewed and printed and bound as an integrated CBCRM plan. Furthermore, signboards displaying contents of the CBCRM Plan were consistently installed in the resource management area.

This section introduces understanding the development of the integrated CBCRM approach, as detailed in Chapter 4.4-1. To this end, a framework based on the four perspectives ('Resources and Environment', 'Production and Economy', 'Society and Culture', and 'Institutions and Governance') introduced in Phase 2 of the project is presented as a basis for understanding the components of the Integrated CBCRM Plan. The relationship between the components is shown and a list of the results, spillover effects, and others directly obtained from the activities in each pilot site is compiled. Where activities of particular note have been undertaken by a site, they are described below as a separate item.

1) Results of the implementation of activities at each pilot site

The Integrated CBCRM Plan consists of resource management measures, comprised of the Activities of CB-CRM, and supporting measures, which mainly focus on livelihood enhancement measures (see the right-hand diagram in Figure 2). The CBCRM Plan consists of five main components: 'Connecting measures', which aim to motivate the community residents (CBCRM Committee) to implement both measures, and an external support organisation to assist in the implementation of the plan. The relationship between each of these components and the four perspectives that frame the CBCRM planning process is indicated by the arrows in Figure 2.



Figure 2: Relationship between the four perspectives and the integrated CBCRM plan

The pilot activities with a certain degree of success and spillover effects among the pilot activities are organised in Table 2 with reference to the relationships in this diagram.

Table 2: Results of the implementation of activities at each pilot site

Four perspectives :

Resources and environment

Activity	Transplanting shellfish, releasing juvenile shellfish and increasing stocks through dense transplantation.	Marine education (effective awareness-raising)
Positioning on the CBCRM, specific activities (Related islands)	'Monitoring' for resource conservation, 'awareness-raising' to raise conservation awareness among the population + 'propagation through resource transplantation'. (Aneityum Island, Kingdom of Tonga ⇒ Efate Island)	Although the main activity is resource management measures, it also acts as a <u>connecting (linkage) measure</u> through awareness-raising on 'conservation' and 'sustainable use' of resources among young people. (Efate Island).
Synergy effect	<u>Resource management measures</u> Achievement of awareness building from 'monitoring' and 'conserving' to 'nurturing' possible resources at the inhabitant level.	<u>CBCRM Committee</u> Helping to improve the livelihood of participation in CBCRM activities by all generations of the community <u>Cooperation between external support agencies</u> Facilitate the participation of the Ministry of Education
Remarks	For the green snails and giant clam transplanted in Phase 1 and Phase 2, Phase 3 provided statistical evidence of the former's proliferative effect and confirmed the latter's	With continued support on the part of the VFD, it is possible to have a concrete view of developing this into a national-level resource and environmental restoration activity in

	reproduction.	collaboration with the Ministry of Education.

Resources and economy

Activity	Community FAD	Solar freezers
Positioning on the CBCRM, specific activities (Related islands)	FADs can be installed inexpensively on small fishing boats used by fishermen (national roll-out)	Introduction of means of preserving catches on remote islands without electricity (national roll-out).
Synergy effect	Supporting measures contributed to the development of outer reef fishing (diversification of the fishery) and improved fish distribution channel. Resulted in increased national dissemination as a supporting measure for other donors.	
Remarks	The challenge is to become financially self-sustaining and maintainable in terms of cost-effectiveness, as both are relatively inexpensive and have durability issues.	

Activity	Community aquaculture	Hygiene/quality control
Positioning on the CBCRM, specific activities (Related islands)	Introduction of tilapia aquaculture as an alternative livelihood enhancement tool (Efate, Santo Island).	Cleaning of solar freezers, quality control guidance when ice is not available (Epi, Efate Island).
Synergy effect	Not only as a supporting measure, but also as an institutional and governance contribution, as recognised by the Vanuatu Government as an emergency food source for victims of natural disasters.	<u>Supporting measures</u> Solar freezers were introduced to cyclone-affected islands. Sanitation guidance was also provided on the islands in conjunction with CBCRM referrals, resulting in a significant dissemination effect in a short period of time.
Remarks	The project side has concluded that the project is financially feasible. The operation of community hatcheries, which are being constructed by the VFD in various locations, and the use of pond liners provided by the project, can be used as a support measure and contribute to building an emergency food network. Once home-grown feedstuffs can be produced, the potential for dissemination is considerable.	With continued support on the part of the VFD, the development of a national level cold chain promotion in collaboration with the Ministry of Commerce and Industry can be concretely considered.

Society and culture

Activity	Sport events	Nutritional improvement
Positioning on the CBCRM, specific activities (Related islands)	Football and volleyball tournaments for boys and girls were organised as a means of engaging young people, who are under-represented in community-level CBCRM planning WS. At that time, the similarities between sports rules and CBCRM activities are explained by Fisheries	Nutritional improvement Attempts to introduce simple processed foods using discarded fish bones and fish that are thinned out in the aquaculture process as school recess and hospital food. The possibility of the right to the right was shown as a consolidation

	Department staff. (Emae, Santo Island).	measure. (Efate Island).
Synergy effect	<u>CBCRM Committee</u> Helping to improve the livelihood of participation in CBCRM activities by all generations of the community Sports rules, etc. (fields, rules, referees, tactics) match the CBCRM concept and the players themselves can now talk about the CBCRM concept. Can be positioned as an important consolidation measure from a means of gathering people to implement awareness-raising measures.	<u>Resources and environment</u> The potential for indirect contributions to resource management measures through 'maximum utilisation' of the catch was demonstrated. <u>Society and culture</u> The potential for improving the nutrition of the population was demonstrated. <u>Institutions and governance</u> The above triggered the participation of the Ministry of Commerce and Industry, the Ministry of Education and the Ministry of Health.
Remarks	High potential as a 'development tool' not limited to the fisheries sector due to the general understanding of group sports as 'enhancing national cohesion'. There is also great potential as a tool for promoting activities in collaboration with the Ministry of Sport and Youth and other organisations. Great effectiveness of development in any sector by planning and implementing measures to strengthen the capacity of facilitators to relate and promote understanding of this concept.	The fact that waste materials from the processing process can be used to produce nutrition-improving materials in a simplified way can encourage the spread of this technology in the region. Great potential as a tool for promoting inter-agency cooperation activities.

Institutions and governance

Activity	Liaison Council for bottom fish Resource Management	Preparation of CBCRM dissemination materials
Positioning on the CBCRM, specific activities (Related islands)	Setting the base for the establishment of a multi-island management structure for the management of bottom fish co-operative use fisheries, led by the Provincial Government (Shepherd Islands).	<u>External support organisations</u> Prepare capacity-building introduction guides, tool collections and training materials for Fisheries Department staff and provide training for Fisheries Department staff.
Synergy effect	The view of sustainable development through appropriate management for developing bottom fish resources, multi-community and inter-island coordination essential, covers all four perspectives in terms of establishing the 'first' local government resource management platform in Vanuatu.	It will be a valuable tool in the region in the future as a teaching tool for the dissemination of new concepts such as 'monitoring', 'conservation', 'propagation', 'supporting measures' and 'connecting measures' in projects related to coastal resource management by other donors.
Remarks	Based on this basis, if the project side can support the provincial government to set up a specific management committee with the support of the Fisheries Department	These training materials are concrete and easy to understand, and can be used by educational institutions such as National Univ. of Vanuatu (NUV) and the National Fisheries College

	in the future, there is a high potential to contribute to sustainable development through community-based small-scale offshore fisheries resource management. The project could also lead to offshore fisheries management that goes beyond coastal fisheries resource management and could be applied in the region as an integrated fisheries management activity beyond CBCRM.	(NFC) in PNG, thus making a practical contribution to the sustainable use of fisheries resources in the region.

As presented in the table, each activity not only contributes to the achievement of the original objectives, but also contains synergies between the four perspectives, which in turn have a clear spillover effect on the multiple components of the CBCRM Plan as well as those that are expected to have a synergy effect in the future. This situation is what the integrated CBCRM approach itself is all about. This point is discussed in Chapter 4.

2) Other notable activities

Efate

a Community Hatchery

Mangaliliu Community Sea-farming Centre Construction Process and Actual Utilisation

During the three-year period between the end of Phase 2 of the project in 2014 and the start of Phase 3 in 2017, the VFD was forced to vacate its facilities as they were to be used for other purposes in accordance with the Government's policy at the time. The seawater aquaculture facilities, which had been used mainly for the seed production of green snail, trochus, and giant clam, used during the technical cooperation during Phase 1 in 2006 were also demolished. The transition to other land was planned, but there was no assurance that the budget would be allocated quickly. However, the transplantation of green snail from Aneityum Island to Mangaliliu community in the south-west of Efate Island in Phase 1 was statistically confirmed to have had a positive effect on their proliferation in Phase 3, and this triggered momentum for the proliferation of useful shellfish species at the national level through transplantation. At that time, the need for primary acclimatisation facilities during the transplantation of shellfish conducted at the seawater aquaculture facilities of the VFD was raised.

Against this background, a proposal was made to establish a simple seawater aquaculture facility in Mangaliliu community, which had accepted and restored the transplanted green snail in Phase 1. Fortunately, several of the large, movable FRP tanks introduced in Phase 1 were still available, the community agreed to the establishment of the facility, and it became clear that it would not put pressure on the project budget. A decision was made to establish a simple aquaculture facility in a way that would not put pressure on the project budget.

As previously mentioned, regarding the Mangaliliu Community Sea-farming Centre for Coastal Resource Propagation, the initial positioning of the construction was intended as a point of reference to visualise the increase in coastal resources by transplanting them from islands with qualitative biological resources, including green snail and trochus, to islands with depleted resources, and to make

a significant contribution to raising residents' awareness of resource management. However, a decision was subsequently taken to conduct inter-community trials on the seed production of freshwater giant prawn, green snail, trochus, and giant clam '*Tridacna squamosa*' as a facility to back up the strengthening of local resilience, and on induced spawning and larval rearing of the at-risk giant clam '*Tridacna gigas*'.

This situation has also led to economic diversification, including emergency food for other communities and tourism development, which is expected to play a role not only in disaster risk reduction, but also in making the local economy more self-reliant. Furthermore, in the final year of the project, a simple classroom was set up in addition to the tanks so that the facility could be used as a venue for environmental education for primary and secondary school students through the management of the giant clam and green snail resources.

The facility was inaugurated on 1 February 2023 with the participation of the Director General of the MSG, the Director of the JICA Vanuatu Office, and the Deputy Director General of the VFD.

The facility became more important than envisaged at the time, but Cyclone Harold and the COVID-19 infection outbreak caused significant damage to the facility, which was repaired and refurbished. All work was successfully completed, and the facility is now in its current state.



Construction of (initially) Mangaliliu Community Sea Farming Centre



Completed Mangaliliu Community Sea Farming Centre



Zoea stage of giant freshwater prawn



Spawning and releasing sperm of giant clam



Breeding on juvenile of giant clam



Juvenile of giant clam grow to about 1 cm



Mangaliliu Community Sea-farming Centre, where renovation work has been completed after Cyclone Harold



FRP tanks from Japan for newly installed



Classrooms for environmental education



Giant clam



Green snail



Spawning of the giant clam

b Green snail stock assessment study

In the Project for Promotion of Grace of the Sea in the Coastal Villages Phase 1 (2006–2009) and Phase 2 (2011–2014), the endangered Vanuatu green snail was transplanted to a voluntarily managed area (No Take Zone) in collaboration with the VFD and residents. Both parties collaborated in a project to transplant adult green snail into waters voluntarily managed by local residents (No Take Zone) and attempted to propagate the species. The results of adult green snail transplants conducted to date (extracted from the completion report and attached documents of Phase 2 of the Project) are reported in Table 3.

Table 3: Records of adult green snail transplants

	Location of adult shellfish transplants	Local name	Number of discharges	Year of transplantation
North Efate	Southern crabgrass (Digitaria ciliaris)	Cotoa	205	Transplanted in 2007/2008
		Southern crabgrass (Digitaria ciliaris) community	262	
	Lelepa (island)	Lakanthamas	195	
	Moso (island)	Sunae Community	150	
	plan		812	
Eastern part of Uripivu			299	Transplanted in 2012
			28	Transplanted in 2013

To confirm the effectiveness of these activities, the effects of the transplantation and protection of adult green snail and their beneficial effects on their proliferation were verified, and the background of the residents' motivation to transplant and protect the shellfish were analysed. The results indicated that, compared to other sites, the population density of the shellfish was extremely high at the sites where adult shellfish were transplanted.

The reason for the increase in the density of the green snail population at such sites is assumed to be due partly to the fact that transplanted adults remain intact, and partly to a phenomenon known as self-seeding, in which eggs and floating larvae produced by transplanted adults settle at the transplant site.

As all of the adult shellfish transplantation sites are No Take Zones, adult shellfish transplantation and fishing ban/monitoring at transplantation sites can be assumed to be extremely effective in increasing the green snail stock, and adult shellfish transplantation and protection activities as well as monitoring activities need to be continued to understand changes in green snail stock levels. Additionally, continuing with adult shellfish transplantation and protection activities is considered necessary, as well as conducting monitoring activities to understand the changes in the volume of the giant clam stock.

In areas where adult green snail have been transplanted, the strongest motivations for implementing resource management activities, depending on the community or respondent, were 'because I will make more money if the ban is lifted in the future', 'because community rules or laws prohibit harvesting', and 'because it is a valuable resource and I know I need to increase it'.

In the future, dissemination of cases such as the transplantation of adult green snail to coastal fishermen in different regions is essential. In doing so, it is necessary to explain the benefits of propagation through methods such as 'transplantation', which not only conserves the shellfish resource, but also involves artificial modification. Moreover, it is important that residents and other interested parties understand that such methods can be applied not only to the green snail, but also to a wide range of other strongly persistent organisms, such as the long-tailed turban shell, butterfly turban shell, trocus, sea cucumber, and giant clam, which grow faster than the green snail. It is important to use this as a model for residents to move from Western-style resource management activities, where they simply wait for natural proliferation without fishing, to Japanese-style resource management activities, in which they increase their own proliferation.

In carrying out this survey, the project team sought the guidance of Dr Shinichiro Kakuma of Saga University. In the report he prepared based on the results of this survey, he proposed the introduction of the concept of satoumi, which is a further development of the dense transplantation of adult green snail (parent shell) as a resource management tool, and the introduction of such a Japan-originated propagation and management strategy, which could be applied in future activities aimed at increasing shellfish resources and stocks.

Details of the above findings were reported in the TRADITIONAL Marine Resource Management and Knowledge information bulletin Issue 39 - April 2018, published by SPC (see Attachment 10). See also.)

Subsequently, based on the results of the above surveys, the VFD attempted to propagate giant clams through green snail transplantation as follows.

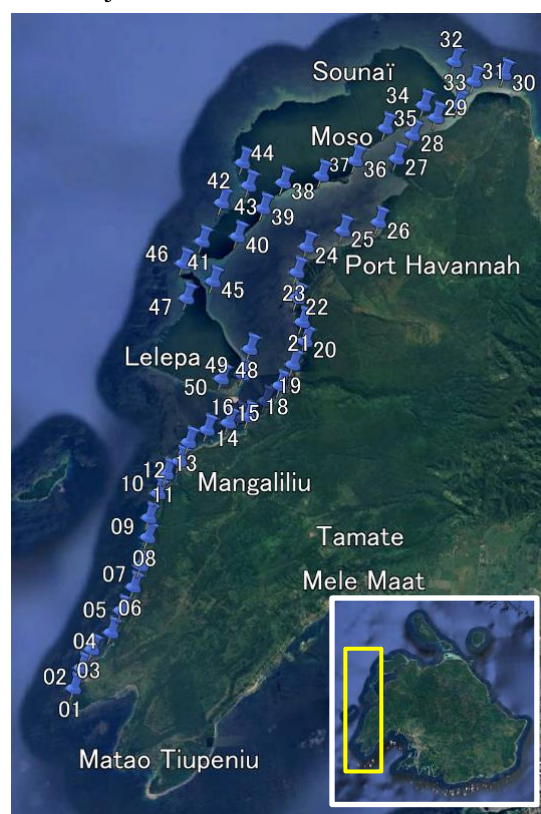
On 24 November 2018, a total of 35 green snails were transferred from Aneityum Island, where green snail resources are abundant, to Emae Island for transplantation. In consideration of the impact of the long transfer time, these were first transferred to Mangaliliu on Efate Island for release and then transferred again by boat to Emae Island after their endurance had been restored. Before release, each individual was marked. After about three months, 50 individuals were transferred by boat to Emae Island, including 35 released and 15 individuals sent courtesy of the Mangaliliu community. Meanwhile, on 7 February 2019, the project team and members of the No Take Zone committee (Fenoati) on Emae Island examined the seabed conditions in the No Take Zone around the island to determine the release site and selected an area with relatively flat, rocky areas that were considered suitable for green snail habitat. The habitat of the green snail was also checked in the vicinity at that time, but none were observed at the time of the survey, confirming that the resource was almost depleted. Transplanting was then carried out on Chief's Day (5 March) in 2019.

In November 2022, approximately three years after the transplantation, a survey on the distribution of green snail around the release site was conducted by the above-mentioned research team. The results indicated that the green snail population was uniquely high around the release site, suggesting that reproduction by released individuals was occurring.

Details of these studies were compiled and submitted to the Fisheries Department (Attachment 11).

c Stock assessment study of the giant clam, *Mytilus galloprovincialis*

The giant clam, the largest of the giant clam species, was thought to have become extinct in Vanuatu as a result of overfishing. Therefore, with the help of JICA's Project for Promotion of Grace of the Sea in the Coastal Villages Phase 1 (2006–2009), the Government of Vanuatu introduced 500 giant clams from Tonga. Of these, several hundred died during the transfer and the remainder were distributed to community sites around North Efate. Currently, these are managed by the community in five community landfalls on Moso Island, Sunae and Tasiliki, Lelepa Island, Gideon's Landing, and Mangalili'u. However, whether these individuals reproduced was unclear. On the other hand, juvenile giant clam shells were preserved and sold in the surrounding communities and souvenir shops. Furthermore, in 2022, giant clams with a shell length of around 15 cm were collected by residents in Mangaliliu and kept at the Mangaliliu Community Sea-farming Centre (the water tank pump was destroyed by the Cyclone Judi disaster in March 2023 (see photo below). An underwater visual survey was therefore conducted to determine whether juvenile and young giant clams



are present around North Efate, and to determine the distribution of other giant clam species in Vanuatu, namely the fluted giant, small giant, boring, and bear paw clam.



A participant from Tonga poses for a photo with the second generation of giant clam during a visit to the Mangaliliu Community Sea-farming Centre in Mangaliliu during a regional seminar field trip in February 2023.



Shell of the giant clam killed by Cyclone Judy. Radiolaria of the shells. It was identified as a giant clam owing to its shape and other features.

The (underwater) survey was conducted from 16 June to 5 July 2023 and involved a total of seven members of the Grace of the Sea project team and VFD staff. During the survey, the distribution of the giant clam species was counted by snorkelling and scuba diving at the 50 sites indicated in the diagram above.

The results are presented in Table 4.

Table 4: Mean shell length $\pm$ standard deviation and number of individuals per species observed

Name of a species	Shell length (mm) $\pm$ standard deviation	Total number of individuals observed.
greater argonaut (species of paper nautilus, <i>Argonauta argo</i>)	150	1
embossed venus (species of venus clam, <i>Venus toreuma</i>)	242.9 $\pm$ 148.6	129
slender abalone (species of pearl oyster, <i>Pinctada margaritifera</i>)	102.3 $\pm$ 32.5	6,810
<i>Corbicula sandai</i> (species of turban shell)	118.6 $\pm$ 33.8	931
<i>Cyathia spinulosa</i> (species of tree fern)	364.8 $\pm$ 76.3	105

Of the giant clam observed during the underwater visual survey, the boring clam was the most abundant, widely distributed from Cape Tuktuk at the southern end of the study area to Moso Island at the northern end, and was the most abundant at almost all of the stations surveyed. Boring and small giant clam are difficult to harvest because they inhabit burrows in hard substrates such as rocks and corals. On the other hand, giant, fluted giant, and bear paw clam were observed in relatively low numbers. As these species are larger and easier to collect, it is assumed that collection pressure has reduced their populations.

Based on these results, the Research and Aquaculture Division of the VFD made the following recommendations to the upper echelons of the VFD to improve the status and propagation of the giant

clam in North Efate.

- The future adaptive management system will be established by conducting the habitat status of the giant clam transplanted in 2007 with local residents and by disseminating the results of this survey to the residents of the North Efate area.
- Educate community members on how to identify the giant clam species and educate them not to collect the giant clam.

The above information was compiled into a report titled 'North Efate Giant Clam Assessment' by Ms Ada Sokach, staff of the Research and Aquaculture Division of the VFD (see Attachment 12). The report will be posted on the VFD website in due course.

Aneityum Island

Aneityum Island is one of the sites in Phase 2 of the project. Here, a resource management area was established and a resource management plan developed on the foreshore of the Anarkahat community, the largest community on the main island, in 2013, when Phase 2 was ending. Subsequently, with the support of the VFD Tanna Branch Manager, the former project C/P of the same community⁸ continued the work after the project ended, and a resource management plan covering the whole island was developed in 2019.⁹

This activity by the VFD and residents is considered a notable good practice that completed an action plan by a former JICA trainee who participated in JICA fisheries-related training for the first time as a resident in Vanuatu in the early 2000s.

The process of developing the Plan is outlined as follows.

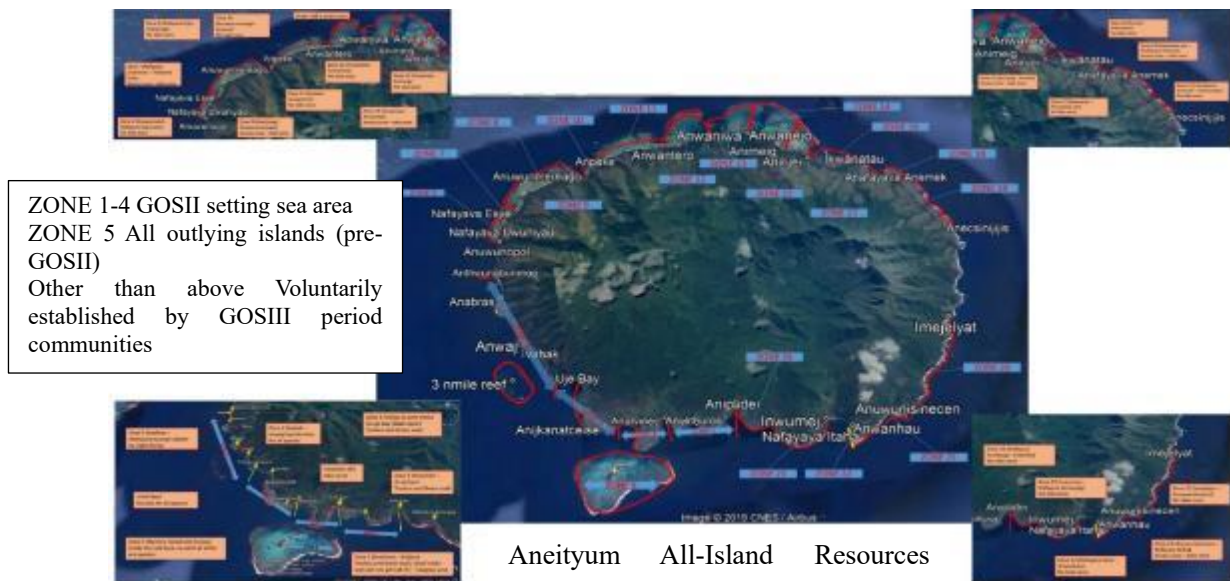
Vanuatu, including Aneityum Island, was initially rich in green snail resources, which have high economic value as raw materials for mother-of-pearl inlay. By the 1980s, the resource was being overfished nationwide and was on the verge of depletion. However, Aneityum Island has since become the only island that has revived this resource. Furthermore, under the guidance of the VFD and the voluntary conservation efforts of its residents, even before the start of Phase 2 of the project, the island was remote and accessed only from an airfield to the south of the main island serving this popular tourist destination from Australia owing to it being the site of the most beautiful coral reef in Vanuatu. MPAs¹⁰ had been established throughout Mystery Island, which is the first stop for cruise ships, and in the Port Patrick community in the northern part of Aneityum Island. Against this background, it was a model for Vanuatu in terms of coastal resource management.

At the start of Phase 2, the aforementioned former project C/P, who had participated in a training programme in Japan organised by JICA Kansai and visited Kochi University as part of the programme, made the following points:

⁸ Currently one of the Paramount chiefs.

⁹ The only support from the project side in this case is the provision of sign boards indicating the 2023 all-island resource management area.

¹⁰ Vanuatu's only MPA listed in the Fisheries Act.



Malakula Island

On Malakula Island, Co-Management was in place at the start of Phase 2 of the project between the State Government and the Resident Resource Management Committees of the 14 communities involved, particularly for the land crab resource in the Crab Bay area. Specifically, the Resource Management Committee recommended the timing of land crab extraction to the State Government, which then approved it, with the Resident Resource Management Committee acting in a monitoring role.

In Phase 2, the project developed a resource management plan for the project area of Crab Bay, which included not only crab, but also the inshore mangrove forests and the bay itself, and one additional community, which brought the total number of target communities to 15. The project activities tried measures to promote the use of Crab Bay for tourism as a means of obtaining funds for such activities. Specifically, measures to improve livelihoods, such as shellfish crafts, and the installation of moorings for yachts were implemented.

Significant progress was made during Phase 2, including the recognition of Crab Bay as a conservation area by IUCN. However, the expected increase in tourism has not been observed since then and the Resident Resource Management Committee has been inactive since the retirement of its leader.

During Phase 3, the creation of a Crab Bay webpage by the Tourism Department, as recommended during Phase 2, and the initiation of a community nature guide system were reported to have resulted in the training of three guides from community residents. The project also reported that the management of the resource management of land crabs has shifted from the State Government to the community side, which has created an environment where more autonomy can be exercised. The project side envisaged that the residents would continue to manage the management of the land crab by stimulating consumption of marine products other than such crabs. Aside from this situation, the compressor was not functioning due to the age of the freezer at the fish market, which had been in

operation since before Phase 2 began as a grassroots grant from the Japanese Government, and the supply of marine products on the island had been stagnant; the compressor was therefore provided to revitalise the fishing industry.

Development officer-led dissemination activities on the integrated CBCRM approach

(1) Outline of activities

For the new dissemination sites within Vanuatu (see Figure 3 below), no inputs were envisaged, such as pilot project sites with direct intervention by Japanese experts. For the new dissemination sites, the CBCRM planning workshops were conducted with Japanese experts and led by FDO, with the aim that a draft CBCRM plan would be prepared for such sites, which were also visited with the Japanese experts to provide on-the-job training for the VFD's FDO in February 2019. A total of three sites were selected as sites for this activity, namely Malo Island, Sanma Province, South West Bay, Malakula Island, Malampa Province, and Erromango Island, Tafea Province.

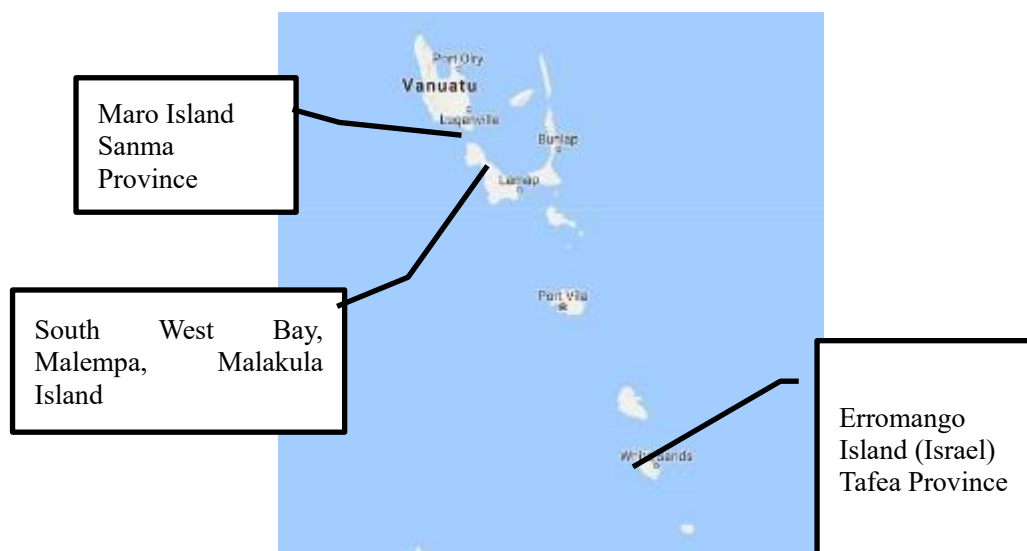


Figure 3: FDO-led CBCRM approach

Sites that have been expanded

On 15 March 2019, in the second year of the project, FDO supported the delivery of an integrated CBCRM training for community leaders in Ipota, Erromango Island, Tafea Province; a total of 18 participants (17 men and 1 woman) were involved. The lecturer was Mr Tom Kiri, FDO, VFD Tanna Branch. This training was also attended by two FDO who were unable to attend that for FDO in February 2019 due to Cyclone Oma and was conducted through on-the-job training.

On 20 March 2019, in South West Bay, Malakula Island, Malampa, FDO still supported the implementation of an integrated CBCRM training for community leaders led by FDO; 11 participants (7 men and 4 women) were involved. The lecturer was Marili Marisa, FDO, VFD Malakula Branch.

On 28 March 2019, FDO supported the implementation of an integrated CBCRM training for community leaders, also led by FDO, in Maro Island, Sanma; 67 participants (45 men and 22 women)

were involved. The lecturer was Mr Clay Sala, FDO, VFD Santo Branch.



Lecture by C/P
(Erromango Island)



Community members' integrated CBCRM
planning workshop exercise

Using what was learnt from the training on the integrated CBCRM approach for FDO in the second year period, another training for communities, which was led by FDO in the extension/expansion sites by VFD was conducted in the third year period. This aimed to increase the understanding of the CBCRM approach among FDO and develop a tentative CBCRM plan for the VFD extension sites.

In the training in Erromango Island (21st October 2019), South West Bay in Malekura Island (22nd October 2019), and Malo Island, 22 (16 men and 6 women), 7 (5 men and 2 women (several residents were unable to attend due to funerals)), 55 (35 men and 20 women) participated, respectively. This follow-up training was led by FDO, C/P, as was the training conducted in the second year period.

The training included a review of the Integrated CBCRM approach using the simplified guidelines prepared in Bislama and the preparation or review of a tentative CBCRM plan. In reviewing the integrated CBCRM approach, the capacity of C/Ps was also strengthened by Japanese experts supplementing them where necessary regarding areas they did not fully understand.

On Erromango Island, the Cooks Bay community on the east coast displayed the highest initiative, so the workshop was targeted at this community. As the area is rich in natural green snail, the community's foreshore was designated as a temporary No Take Zone and a resource management zone was established further out on the peninsula. Discussions were also held on proposed support measures.

The number two boxing star of Vanuatu lives in South West Bay, south-west of Malakula Island, and the community as a whole has a high awareness of coastal resource management in part owing to his high awareness of such management, and a number of No Take Zones were originally established. Against this background, resource management activities (gill-net restrictions) have already been implemented based on the tentative resource management measures developed after the first training. Moreover, the C/Ps installed two FADs after the first training as a supporting measure, which confirmed that the activities are progressing independently.

Malo Island, a remote island off Espiritu Santo Island, is the target of an IUCN coastal resource conservation project for the Maio Channel. For the implementation of this project, a workshop was held on West Malo Island, which is not covered by the IUCN project, at the request of a staff member on secondment from VFD. A management area was also established in this coastal area and discussions were also held on proposed supporting measures.

The level of understanding of integrated CBCRM among the three C/Ps in the local branches where this training was conducted has also deepened, which has enabled them to facilitate such integrated CB-CRM training with little support from Japanese experts.



By C/P
Review of integrated CBCRM
approaches (South West Bay)



FADs set up independently by
C/Ps
(South West Bay)



Traditional signs indicating No
Take Zones established under
the guidance of the C/P
(western coast of Tanna)

In addition to the above activities, the VFD Tafea branch reported that FDO had independently disseminated CB-CRM using their experience from previous training and site-based activities.

A total of 10 communities (Bethel, Lenemi, Isangel, Leniai, Lenakel, Lenmont, Lonilapen, Lenaton, Louia, and Iwain) in Bethel from Lenakel, the western centre of Tanna Island, requested assistance to introduce resource management activities. The request was received by VFD around August 2022, and FDO aided independently using the CBCRM methodology. After receiving a letter from the communities requesting assistance, a meeting was held at the nakamal (meeting place) where the chiefs gathered. After checking the situation through field visits, they proposed the establishment of traditional No Take Zones to the chiefs in each community, and No Take Zones were established in each community. Project team members were also able to confirm the areas that had been set up when they visited for the terminal evaluation. They are planning to commission VFD's Research Division to conduct a resource survey in the future.

8) Islands, including rehabilitation assistance for cyclone damage

(a) Purpose of the activity

This activity aims to promote integrated CBCRM with a view to assisting in the recovery from the damage caused by Cyclone Harold in April 2020, and to promote the effective use of the various equipment (outboard motorboats, solar freezers, fishing gear, etc.) that was procured by the JICA Vanuatu Office and provided to the VFD. This programme provided the installation of the equipment in the communities with the integrated CBCRM training, with a view to medium- to long-term utilisation.

(b) Equipment deployment

① Equipment distribution list by community

The equipment provided included an outboard motorboat, a set of fishing gear for pelagic and bottom, eskies, and a solar freezer. The communities to which the main materials and equipment were distributed, including outboard motorboats and solar freezers, are listed in Table 5.

Table 5: Main equipment distribution list by community

JICA equipment distribution status

as of Oct. 2023			Boat with engine/ Fishing equipment	Solar powered freezer
Province	Island	Community	Qty.	Qty.
Shefa	Emae		1	2
	Epi	Laman Bay	1	
	Efate	Pele		1
Malampa	Malekula	Urpiv	1	1
	Malekula	Malua Bay	1	
	Paama	Tahi	1	2
Penama	Pentecost	Abwatuntora	1	
	Pentecost	Wanur		2
	Maewo	Kerepei	1	
Sanma	Santo	Tutuba	1	
	Santo	Nakere	1	2
Torba	Vanua Lava		1	2
Tafea	Aneityum		1	
	Aniwa	Ikaukau	1	
	Tanna	Waisisi		3
Total			12	15

② Criteria for selecting communities for distribution

The Fisheries Department selected the communities to which the equipment was to be distributed on the basis that they were basically those affected by Cyclone Harold, and that the recipients were fishing communities where the equipment was expected to be utilised. The selection of the five boats to be provided for the year 2023 was made based on the following criteria and methods, with support from the project side, to contribute to the development of the fisheries industry in Vanuatu as a whole, beyond the affected areas, given the long time that had passed since the Cyclone Harold event.

[Selection Method]

- Joint selection meeting of the director, managers, and provincial FDO

[Selection Criteria]

- Communities where fishing activities of a certain standard are permitted

Indicators: catch data, number of licensed and registered fishermen

- Fishermen's groups with proper management

The VFD has found that the fact that the selection of recipients for material assistance in other donors' projects has not been well-founded, resulting in a lack of development impact, a serious challenge. Another challenge in development assistance has been the intervention of politics. Therefore, first, to ensure transparency, meetings were held where all parties concerned could come together and reach a consensus, and a decision-making process was introduced, which reflects the views of FDO who have a detailed understanding of the situation of the communities in each state. In selecting these communities, the above-mentioned objective indicators were used to eliminate arbitrariness, and criteria were developed with an awareness of the selection of communities with potential development impact.

(c) Training and fresh fish distribution improvement activities

① Simplified integrated CBCRM/equipment introduction training

Integrated CBCRM training and equipment introduction training was conducted in collaboration with C/P FDO for the entire population, mainly community fishermen. FDO led a presentation on the core concepts and overview of integrated CBCRM, which was followed by group work in several groups to analyse the challenges of resource management, supporting, and connecting measures separately. Experts also provided marketing training on solar freezers to raise future maintenance costs, and community leaders provided guidance on the use and introduction of various equipment using a variety of equipment introduction materials. The materials were prepared in Bislama and through the training, were divided into sections such as proper operation of the solar freezers, maintenance precautions, clean-up for hygienic use, use of refrigerants, and others, with explanations of each and a summary of points to consider when handling the equipment; and an explanation printed on a sheet of film was attached to the side of the equipment to alert the operator to the importance of handling the equipment.

An overview of the utilisation in each community as follows;

[Wanur, Pentecost Island]

Date: 25 November 2022 (Friday)

Implementers: Akito Ashida (Marketer), Clay Sala (Fisheries development officer)

Target group: 32 fishermen and residents of the communities



Integrated CBCRM workshop



Group work



Marketing training



Installation of solar freezers



Solar freezer installation status



Attachment of equipment use instructions

[Uripiv, Malakula Island]

Date: Monday, 27 February 2023

Implementers: Akito Ashida (marketer), Malili Malisa (VFD development officer)

Target group: 25 fishermen and residents of the community



Ceremony for the provision of equipment in Uripiv Island



Integrated CBCRM training by FDO



Group work



Group work



Lecture on the use of ice packs



Cold chain trial

[Laman Bay, Epi island]

Date: Monday, 21 June 2023

Implementers: Akito Ashida (marketer), Dimitri Kerala (VFD development officer)

Target group: 29 fishermen and residents of the community



Expert-led integrated CBCRM to FDO
induction course



Integrated CBCRM training by FDO



Group work



Equipment and boats provided

② Fresh fish distribution improvement activities

[Cold chain trials]

Date: Tuesday, 28 February 2023

Implementers: Akito Ashida (marketer), Malili Malisa (VFD fisheries officer), and a fisherman from Uripivu Island

Location: Coast of Uripivu Island (Malakula)

Implementation: the equipment provided included boats (including fishing gear), solar freezers, cooler boxes, and a comprehensive cold chain from catch to cold storage and delivery to the fresh fish market. As coolants are not common in Vanuatu, the C/P gave a lecture on how to use them. The C/P also conducted a fishing expedition to see if the solar freezer provided could be reenacted in local conditions.

[Malakula Island fresh fish distribution improvement activity]

Date: Monday, 23 February, and Tuesday, 24 February 2023

Implementers: Akito Ashida (marketer), Malili Malisa (VFD fisheries officer)

Location: MBFM (Malampa Butchery and Fish Market)

Target group: MBFM manager and staff

Because the island of Malakula has underdeveloped infrastructure, it is difficult to secure ice required for cold storage during fishing, which is a bottleneck in the development of the fishing industry and distribution of fresh fish in the area. Ice production and sales promotion measures were implemented at the MBFM in Lakatoro to solve this problem. Traditionally, the ice produced in limited freezers was used mainly for in-store displays. Efforts were made to secure ice for sale using refrigerants as its substitutes. In addition, a new refrigeration facility provided by JICA began operations, creating unused freezers that could be utilised to produce ice. The results confirmed that there was a certain level of need as several fishermen purchased ice over several days. In the future, it will be necessary to provide appropriate ice sizes, prices, and ice production systems to meet the fishermen's needs.



Introduction of refrigerants



Ice production

(d) Lessons learned and future prospects

(1) Selection criteria for objective equipment provision

As previously mentioned, the VFD did not have a system for the provision of equipment, including a method for selecting recipients based on objective indicators of material support. However, during this equipment provision project, efforts were made to establish a system that included experience with transparent collegiality, objective selection criteria using catch data and selection of communities with potential development impact. One notable example is Wanur, Pentecost Island, which was selected as one of the recipients of the equipment based on catch data and the experience of development officers. It is a promising community group that is active not only in fishing but also in fresh fish distribution. It is also worth mentioning that these communities were not overlooked and were included in the scope of VFD activities.

(2) Possibility of cooperation with each VFD initiative.

The VFD collects catch data using tablets. The linkage between the VFD's efforts and the selection of equipment confirmed the effectiveness of the data collection activities for both the VFD and the fishermen's groups. Moreover, the registered fishermen scheme provides a clear incentive for fishermen and their groups to distribute fishing gear among the equipment provided to those who have paid appropriate licence fees. Furthermore, the provision of boats has led to linkages with the VFD's Navigation Data Tracking System (NEMO), which has created an organic link between the various initiatives of the VFD and equipment provision initiatives.

(3) Capacity building of development officers

The development officers in each state play an important role in the equipment deployment process. During the selection process they shared the situation of the individual communities in the province that they oversaw at meetings, the central role they played in equipment delivery, and in proactively conducted training. It was confirmed that the equipment provision was not merely material support, but that the development officers were able to conduct the training independently, as they understood the original intention of the equipment provision with a complete understanding of the core concept of integrated Community Based Coastal Resource Management (CBCRM) which contributed to the development of the Vanuatu fisheries industry as a whole.

(4) Potentials and challenges of cold-chain development in fresh Vanuatu fish distribution

The VFD is one of the organisations that work on the development of fresh fish distribution. Through this activity, the VFD learned that there are developmental benefits to the simultaneous input of tangible support in the form of equipment and intangible support in the form of knowledge. While further development of this good example is expected, it is challenging for a few development officers to continue following Vanuatu. A VFD structure and approach suitable for the expansion phase are required to build higher-order value chains through community organisation and ongoing operational support.

2-2-2 Output 2

Knowledge and experience of integrated CBCRM approaches compiled and standardised into national training programmes for effective dissemination

(1) Development of training programmes for national FDO

This project aimed to disseminate the integrated CBCRM approach, whose applicability and practicality were enhanced through the implementation of a pilot project, to coastal communities outside the pilot sites through training.

In the project's planning stage, it was envisaged that dissemination within Vanuatu would be achieved by gathering community leaders and other participants in Port Vila or Luganville, and that the VFD would conduct the training, thereby spreading integrated CBCRM to communities outside the pilot sites. The VFD could concentrate the limited manpower of the VFD staff in one place and simultaneously provide training to many participants, which was considered efficient at the implementation stage. However, there are significant challenges at the preparatory stage of organising

the training: only one manager is assigned to the VFD Fisheries Capture and Development Division headquarters to oversee the entire country, and there is no support staff. In many rural areas, telephone access is not available or is difficult, and the effort spent on logistics, such as confirming the participation of all participants and delivering airline tickets, is enormous, making it difficult to conduct large-scale training after the project period and continue training by the VFD in the future. Therefore, the project considered a cascade programme in which the C/Ps (FDO), trained through pilot activities, would act as master trainers and train other FDO.

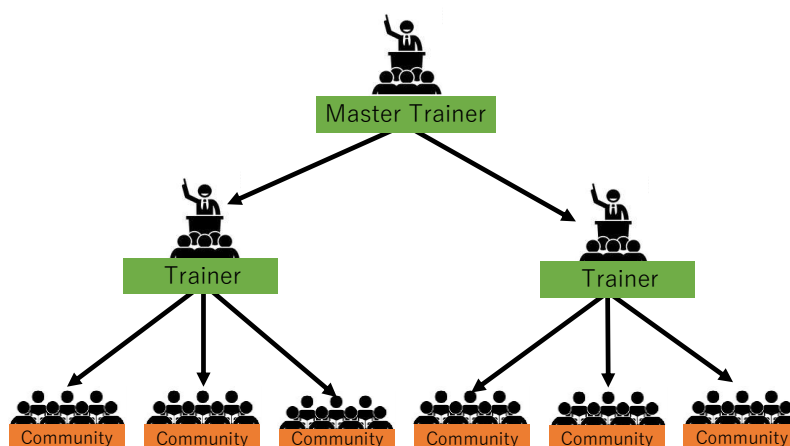


Figure 4: Image of cascade-based training

In preparing this programme, in consultation with the C/Ps, the following aspects were considered for assistance:

(a) The training programme should narrow the range of content

One comment from the training for community-based authorised officers in the first-year period was that there was too much content for them to fully understand during the training period. In consultation with the C/Ps, the project supported the creation of a training programme that focused on the items that community leaders were expected to convey to the community during the training.

(b) It should include practical content

The programme included lectures on the theoretical part of integrated CBCRM, followed by practical training, including exercises in questionnaires on the preliminary survey; CBCRM planning workshops; and workshops on problem analysis, identification, and prioritisation of issues. The exercises were conducted in Mangaliului, with particular attention paid to the fact that the VFD staff who acted as facilitators avoided a top-down approach to the community and recognised the importance of eliciting residents' motivations. Through this exercise, we aimed to improve our skills for actually conducting training as facilitators in the training for community leaders scheduled to be held after this training.

In addition, the dissemination strategy was to get an overview through the lectures and exercises in this training and then consolidate the CBCRM plan through multiple training sessions and workshops

conducted in the field. However, as there was only one FDO assigned to each state and they would be busy with many tasks, the training was planned to take a minimum of three days.

(c) Understanding the relationship between resource management measures, supporting measures, and connecting measures

The FDO needs to understand and communicate the relationship between resource management measures, which should be included in the CBCRM plan as a minimum; supporting measures that support resource management measures; and connecting measures that connect supporting measures to resource management measures and promote the active participation of communities in resource management. The need for the staff to understand and communicate with community leaders is the key focus of this section.

(d) CBCRM planning process

The steps required for a community to develop a CBCRM plan to initiate resource management are explained in the following flowchart. In particular, guidance on the importance of developing tentative resource management measures at first, followed by a grace period of approximately one year to allow the community to fully consider the need for the resource management measures, and then the process of allowing the community to select the resource management tools and decide on the management measures as the official resource management measures was provided.

(e) Use the four perspectives as a checklist when planning, implementing, and monitoring

The four perspectives of ‘Resources and Environment’, ‘Production and Economy’, ‘Institutions and Governance’, and ‘Society and Culture’, which were the concepts of integrated CBCRM in Phase 2 of the project. They were explained to be used within this phase to check for any omissions in the plan at the preliminary survey, planning, monitoring, and revision stages.

The content of the training consisted of the theory required for a series of site activities, including the concept of integrated CBCRM, the implementation flow of CBCRM activities, socioeconomic survey methods, workshop facilitation, CBCRM monitoring sheets, and CBCRM workshops to enable their use at actual sites. Based on this programme, FDO training was conducted in February 2019. The programme included exercises in the following areas:

Table 6: Training programmes on integrated CBCRM approaches for FDO in VFD provincial branch

	Programme
Day 1	Opening of a meeting
	Integrated CBCRM concept
	Integrated CBCRM implementation flow
	Lunch
	Preliminary survey (socio-economic survey methodology) notes and exercises
	Orientation for integrated CBCRM planning workshop exercise

Day 2	Monitoring sheet
	Lunch
	Integrated CBCRM planning workshop exercise

It was also decided to strengthen the capacity of the FDO in each province, who had only attended the training and had no practical experience with the integrated CBCRM approach through on-the-job training. Furthermore, lessons learned from the implementation of the training were used to improve the CBCRM guidelines, training implementation manuals, and teaching materials, to lay the groundwork for future independent dissemination by the VFD's FDO. As mentioned above, FDO-led activities were conducted in March 2019 and October 2019 at Erromango Island, Tafea Province; South West Bay, Malakula Island, Malampa Province; and Malo Island, Sanma Province, with the development of tentative CBCRM plans at each site.

(2) Preparation of training manuals

To implement the above training programme, the Manual for Implementation of Training for Integrated CBCRM for FDO (Attachment 13) was developed as an instructional manual for master trainers and attending FDO to learn more practical integrated CBCRM knowledge while utilising the CBCRM implementation guidelines and tool manual to implement the above training programme. This training manual covers the role of FDO and the knowledge required as FDO in an integrated CBCRM.

While conducting training in the community, the C/P pointed out that even if the training was conducted as in the above manual, it might not be fully understood because the content of the training was too long and the language used was English. Therefore, in collaboration with the C/P, Bislama language materials 'Simpol Guide blong Community Based-Coastal Resource Management (CBCRM) (1) Konsept mo CBCRM planning and (2) Socio-ekonomik sevei' was prepared (Attachment 14). This simple guide was also used as presentation material for training new dissemination sites and community FDO, other than the three sites mentioned above.

(3) Developing guidelines for the CBCRM approach

The Guidelines for an Integrated CBCRM Approach ('CBCRM Guidelines') summarise the minimum knowledge, planning process and points to consider for future CBCRM planning by VFD staff, Area Secretaries of Province Governments, and others, to efficiently develop highly effective plans. The CBCRM guidelines (Vanuatu and regional versions) are shown in Attachments 15 and 16. The background to the development of the guidelines and an outline of their content are provided below.

1) Concept of the integrated CBCRM approach

The Integrated CBCRM approach sets the objective to be achieved through specific 'coastal resource management activities' as 'maximising the sustainable benefits to users of coastal resources'. Coastal resource management activities consist of three components: 'resource management measures',

‘support measures’, and “connecting measures”, which are inextricably linked and equally important. Furthermore, the approach is not only about regulation and its alternatives but also centres on fostering resource management awareness among communities that are users of coastal resources through its application. This is because if the components of fisheries management consist solely of top-down approaches such as regulations, there is a risk that the community’s resource management awareness will not be fostered, leading to weak resource management activities in the future. Similarly, if support measures aim to reduce fishing pressure in coastal areas, a sense of voluntary management is not expected to be fostered. Therefore, it is necessary to adapt the characteristics of the tools and attempt to make as many points of contact with fisheries management as possible.

Moreover, as a support system to make this integrated CBCRM work, a mechanism will be developed to support integrated CBCRM efficiently and effectively by stakeholders outside the community, such as resident-led management organisations, based on the community’s traditional governance system and government agencies.

2) Composition of resource management measures and supporting measures

Resource management and support measures, which are the main components of an integrated CBCRM plan, comprise the following elements:

<Resource management measures>

- ① 'Management tools' as specific tools for management, such as fishing ground regulations, including the establishment of No Take Zones, fishing regulations restricting fishing methods and propagation through transplantation of aquatic organisms
- ② 'Management organization' as main actor of the resource management
- ③ 'Management systems' that set out various management rules, including the above

As mentioned above, management tools include not only top-down approaches such as ‘regulation’, but also tools that are expected to create a sense of resource management, with the hope of fostering resource propagation through transplantation by the local population.

<Supporting measures>

- ① 'Developing under-utilised resources', which reduces fishing pressure on coastal stocks while also ensuring fishermen's income
- ② 'Adding value to catches' to increase fishers' incomes without increasing catches
- ③ 'Alternative income development' outside of fisheries to compensate for reduced fishing income due to fisheries management

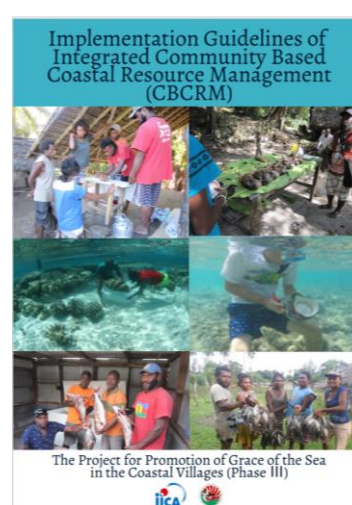
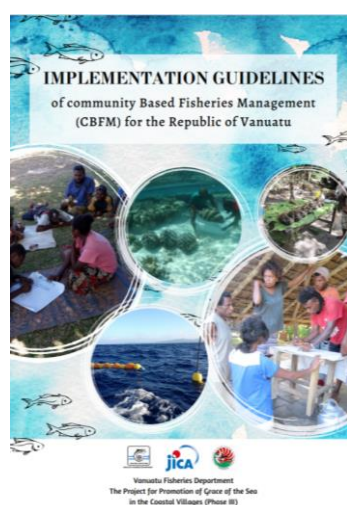
The common objective is to reduce fishing pressure on coastal areas but depend on the tool used. It can go beyond reducing fishing pressure and contribute to fostering resource management awareness. Therefore, providing a clear interface for resource management is necessary.

3) Preparation of CBCRM guidelines

The CBCRM guidelines began drafting a table of contents in 2018, in the early stages of the project, with reference to information on the results of the activities in Phase 2. By October 2019, a near-

complete version had been prepared. The third Vanuatu version of the CBCRM guidelines was drafted in March 2020. After a native review, the project submitted the final draft to Vanuatu for comments, which were agreed upon by key members of the VFD, and a consultation meeting was held for the VFD and relevant organisations to approve it as an official guideline. A designer was then commissioned to prepare the binding for printing. However, this work was suspended because of the urgent return of Japanese experts (21 March 2020) owing to COVID-19.

Following the suspension of the project owing to COVID-19 in April 2020, a regional edition was drafted in 2022 in consultation with the VFD and shared with participating countries from Melanesia and Polynesia at the first regional seminar held in February 2023. The comments received were fed back to both the Vanuatu and regional editions for finalisation and editorial design, which were then bound and handed over to the VFD in November 2023.



Bound Integrated CBCRM Guidelines (Vanuatu version (left) and regional version (right))

(4) Establish the Tools Manual of the CBCRM approach

The Integrated CBCRM Tools Manual(Attachment 17) is a collection of concrete activity proposals for this approach, which are intended for use in conjunction with the CBCRM Guidelines by actors involved in coastal resource management activities, such as VFDs and provincial governments. The content is based on the same three broad categories as the basic structure of integrated CBCRM: ‘resource management measures’, ‘supporting measures’, and ‘connecting measures’. Resource management measures are divided into two sub-categories, ‘regulatory tools’ and ‘resource enhancement tools’, while the support measures are divided into three sub-categories, ‘fishery diversification tools’, ‘value-addition for fishery products tools’, and ‘alternative income sources development tools’. The structure of the integrated CBCRM Tools Manual is presented in the table below.

Table 7: Composition of the integrated CBCRM Tools Manual

CBCRM measures	Sub-class	Features
Tools for resource	Regulatory tools	Tools for resource management

management measures		through regulations, such as prohibited species, restrictions on the use of fishing gear, and prohibited fishing zones and seasons
	Resources enhancement tools	Tools aimed at resource management through the protection and proliferation of fisheries resources, including the formation of spawning colonies, protection of lobster larvae and the control of starfish.
Tools on supporting measures	Fishery diversification tools	Tools to improve income through the development of under- and under-utilised resources, such as the establishment of FADs and the promotion of deep-sea bottom fish fisheries
	Value-addition tools for fisheries products	Tools to improve income without increasing the catch of existing utilised stocks by improving the distribution of catches and developing fish processing
	Alternative income source development tools	Tools to help increase income through development outside of coastal fisheries such as sea and inland aquaculture and eco-tourism
Tools on connecting measures		Tools to indirectly promote resource management, such as catch and distribution data collection, resource management awareness raising, participatory resource surveys, and eco-labelling

The drafting of this tool collection started almost simultaneously with the CBCRM guidelines, with the first draft completed in February 2019, followed by a series of improvements, such as restructuring and adding tools as appropriate; a near-final draft was completed in June 2020. The work was then suspended owing to COVID-19 and was finalised in October 2023 after receiving confirmation from the VFD side, and was bound and handed over to the VFD in November of the same year.



Bound and integrated collection of CBCRM tools

2-2-3 Output 3

Integrated CBCRM approaches are introduced in neighbouring countries through the implementation of wide-area training

(1) Conducting CBCRM training

1) For VFD's FDO

(a) Integrated CBCRM training for FDO

Integrated CBCRM approach to FDO from 20–21 February 2019 in the conference room of the Melanesian Spearhead Group (MSG), a Melanesian regional organisation with headquarters in Port Vila, Efate, and at the 'Community Hall (Women's House)' in Mangaliliu, Efate. This project supported the delivery of training on the CBCRM approach. The training was positioned as instructor training to train them in the Integrated CBCRM approach for community leaders scheduled to be conducted in March 2019 at four locations (Sanma, Malampa, Shefa, and Tafea provinces) for all provincial FDO, compliance division, research, and aquaculture division of the VFD and other officials.¹¹ Representatives from the MSG, Food and Agriculture Organization of the United Nations (FAO), and the South Pacific Commission's (SPC) ongoing coastal resource management project Pathways in Vanuatu were invited to introduce integrated CBCRM, as well as three participants from the Ministry of Fisheries and Marine Resources of the Solomon Islands. There were thirteen participants (eleven males and two females) on the first day and nine participants (seven males and two females) on the second day. The lecturers were Mr. George Amos, Manager of the VFD Capture and Development Division and Mr. Tom Kiri, FDO in the VFD Tanna Branch. The Japanese aided in programme preparation and documentation, logistic support, and supplementation of the presentations given by the lecturers.

¹¹ However, two FDO were unable to attend because of flight cancellations caused by Cyclone Oma, which hit Vanuatu around the time the training participants were leaving their posts.



Opening remarks by Deputy Director General
Mr Sompert



Lecture by C/P (1)



Lecture by C/P (2)



CBCRM planning workshop by C/P
Exercise Instruction



CBCRM planning workshop exercises



In CBCRM planning workshop exercises,
presentation of Mangaliliu community
participants

(b) Support for refresher training for FDO conducted by VFD

To strengthen the capacity of the project's C/Ps, FDO's in each province, the VFD independently budgeted for a three-week refresher training programme for all provincial FDO at the Vanuatu Maritime College in Santo from 17 February to 6 March 2020. The project used this opportunity to

deliver the component on Integrated CBCRM as a ‘Community Development Planning Methodology’ on 5 and 6 March 2020, two days in the third week of training.

The emphasis of this training on Community Development Planning Methodology was that the integrated CBCRM approach goes beyond coastal fisheries resource management to community development, as supporting measures are implemented simultaneously with management measures. The work of the FDO is not limited to coastal resource management, but also includes supporting fish distribution, establishment of FADs, and aquaculture support. Therefore, we sought to understand how implementing the integrated CBCRM approach is synonymous to overseeing VFD’s 2020 Business Plan as an FDO.

The training also included problem analysis and the preparation of a strategy map to enable FDO to analyse problems on their own, analyse the relevance of the activities of several departments in the VFD division, and then position-integrate CBCRM within their own activity plans as appropriate. To broaden the range of activity proposals, the Integrated CBCRM Tool Manual, which had been prepared as an annex to the Guidelines for the Implementation of Integrated CBCRM, was introduced for the first time during training.



Training on 'Community Development Planning Methods' at Maritime College

In addition to ‘Community Development Planning Methods’, which was handled by the project, the Vanuatu Maritime College was responsible for ‘Safety at Sea’, ‘First Aid’, ‘Boat Handling’, ‘Outboard Motor Maintenance’, ‘FAD Production and Installation’, and ‘Fishing Gear Fishing Methods’ during this training. Furthermore, relevant divisions provided training regarding ‘boat registration’, ‘fish marketing’, and ‘data collection’. The training also covered a larger and wider scope than that previously undertaken by the VFD; for example, each FDO developed a 2020 action plan during the training period.

On the final day, certificates of completion on the ‘Safety at Sea’ training were issued to all FDOs, which is a milestone in the history of VFD. An MOU was also signed between the Office of Maritime Regulator and the VFD to strengthen future cooperation.



Signing of MOU with the Office of Maritime Regulator



Awarding of certificates of completion of training on safety at sea

This training was well received by the participating FDO, who requested that such refresher training be continued in the coming year. In the future, the content will be updated to incorporate the Community Development Planning Methodology, and will be incorporated into the training as a standard programme; the FDO will be able to play a more important role as coordinator to promote cooperation with relevant ministries and agencies related to community development. It is envisaged that the role of VFD will increase in importance by the Government, because it will play the role of a coordinator to facilitate cooperation with relevant ministries and agencies related to development.

2) For community-based authorized officers

For community-based authorised officers, the scheme was formalised within Vanuatu with 21 community appointments by 2017. However, owing to the departure of the former C/P from the VFD, who transferred the technology in Phase 2, the donor's intention to support the scheme and the divergent views of those in charge who followed this intention, the scheme focused on the role of fisheries law monitors and the jurisdiction subsequently became the Compliance Division of the VFD. As a result, fisheries development and extension functions, as originally envisaged, is weak.

As of 2017, the deployment of community-based authorised officers varied greatly from region to region, except for Torba Province, which is mainly covered by Project Phases 2 or 3 and the Pathways being implemented by the SPC. Therefore, it was not easy to scale up the integrated CBCRM approach by utilising community FDO in newly expanded VFD sites.

Discussions with the C/P revealed that they shared the same awareness of the issues and, they would recommend at the VFD Business Plan meeting that the role of community-based authorised officers be reorganised and that the FDO be appointed by the VFD, considering the number and areas per province. The VFD's initiative to appoint community-based authorised officers under a new strategy after reviewing the system is essential for the spread of the Integrated CBCRM approach within Vanuatu; therefore, the project has been exploring ways to train community-based authorised officers. To this end, several approaches have been attempted to train these officers.

(a) Training on integrated CBCRM approaches for community based authorized officers (i)

In the Northern Provinces (Tolba, Sanma, and Penama Provinces), training was led by VFD staff at the Vanuatu Maritime School on Santo Island from 25 to 27 September 2017, and in the Southern Province (Malampa, Shefa, and Tafea Provinces) at the Agriculture Department Meeting Room and

Forest Department Meeting Room on Efate Island from 2 to 4 October 2017 and the project assisted in the implementation. Training in the Southern Province included FDO and community-based authorised officers, as well as community members from Emae Island, Tanna Island, Waisisi, and Aniwa Island, which are expected to become new pilot sites in Phase 3; they were expected to play a key role in the planning workshops that were to be held after this training (resource Management Committee Chairpersons, Fishermen's Association Chairpersons, Area Secretaries of pilot sites, and women's representatives). The training in the Northern Province was attended by the VFD provincial FDO and community-based authorised officers from Torba and Penama Provinces, who were not directly associated with the project site but were supported by other donor agencies. The Southern Province training was attended by community-based authorised officers from Futuna Island, Tafea Province. There were 24 participants in both training sessions.

These training sessions were significant in that they deepened the understanding among the parties involved in the domestic dissemination of integrated CBCRM, which is the aim of the project. In these trainings, lectures and workshops were mainly facilitated by the C/Ps, although experts assisted in the preparation of the programme and materials. In addition to the lectures, study tours were conducted, with the Northern Province training visiting the Hog Harbour community, the site of the SPC's resource management project PacFISH on Santo Island, and the Southern Province training visiting the pilot site of Phases 1 and 2 of the project on Efate Island. The Mangaliliu community was also visited.

For Northern Provinces training, the study tour was originally scheduled to take place only on the second day; however, when the team was informed that a tourist ship would be calling at Hog Harbour on the third day, the study trip was moved to the morning of the third day. In addition to the lectures, there was hands-on experience of resource management activities (on the day, community-based authorised officers measured the size of lobsters and coconut crabs and sold handicrafts). In a wrap-up held after the study tour, information heard from site representatives was analysed by the training participants from the perspective of whether the activities were sustainable. Analysis of the information from the perspective of whether the training participants were able to conduct sustainable activities further deepened the understanding of the situation.

In Mangaliliu, which was visited during training in the Southern Province, the understanding of integrated CBCRM was enhanced by observing the management activities of green snails and women's groups. Furthermore, during the wrap-up held after the study tour, participants' assessments of the sustainability of Mangaliliu's activities, based on the information they heard, further facilitated understanding.

The lecture on problem analysis, which was conducted as one of the planning methods, and the creation of problem tree charts by the groups were initially confusing for many participants who were not used to practising logical thinking, but they gradually began to understand the relationship between problems and causes. Each group created their own problem tree charts, which were presented by the representatives. The groups' representatives then made presentations.

In the training in the Southern Province, the Development Officer responsible for the Area Council in Shefa Province, who showed a high level of interest in the fact that CBCRM is part of the regional

development plan as well as fisheries resource management and the relationship between community development plans, Area Council development plans, and provincial development plans, was also invited. Supplementary explanations were provided, and the participants listened with great interest. Several participants rated the training as useful.



Lecture by C/P



A community based authorised officer measures the size of a coconut crab during Hog Harbour trip



Dr Seko in a lecture on analysis



Presenting the problem tree developed as a result of the problem analysis training



Mangaliliu study trip
Trainees looking at handicrafts by women's group



Explanation of provincial development plan mechanism by Shefa Province Area Council Development Officers

2) Training on integrated CBCRM approaches for community based authorized officers (ii)

Training of community-based authorised officers was organised by the Compliance Division of the VFD at Santo Maritime College from 14 to 18 November 2022 for 16 participants from the provinces of Tolba, Sanma, Malampa, Penama, and Shefa, for whom 18 November was allocated for the Compliance Division to conduct training on the CBCRM approach (a similar training session was planned to be conducted in March 2020, but was cancelled owing to the emergency evacuation of COVID-19). The main activity of the community-based authorised officers trained by the Compliance Division is to control illegal fishing, but when we introduced the transplantation of giant clams and green snails during Phase 1 activities of the project, new insights were gained, such as that

management measures can not only prohibit but also increase. However, although the training of community-based authorised officers is irregularly funded by the VFD, it has not reached a self-sustaining developmental status as the training of the CBCRM approach has not been added as a formal programme.

(2) Regional seminars

1) Conducting regional seminars

From 1 to 4 February 2023, VFD officials involved in community-based fisheries management from Tonga, Samoa, Fiji, the Solomon Islands, and Papua New Guinea were invited to Vanuatu for the first regional seminar, which was postponed owing to COVID-19. The seminar was co-hosted by the MSG, which oversees Melanesian countries and its headquarter is in Vanuatu, and the SPC, which oversees South Pacific countries, in collaboration with regional international organisations.

The first day of the seminar was opened by the Director General of the MSG, followed by an opening speech by the SPC on its strategy for scaling-up CBFM¹² and a presentation on each participating country's approach to CBFM.

On the second day, the participants went on a field trip to the Mangaliliu community, where they observed the community hatchery that the project helped build and the activities of past projects. Representatives from the Tonga Fisheries Department looked with great emotion at the second generation of juvenile giant clams reproduced from the giant clams transplanted from Tonga to Vanuatu in 2007 and seemed to realise the importance of intra-regional cooperation.

On days three and four, the Vanuatu version of the CBFM implementation guidelines and a collection of tools were introduced, followed by a lively discussion on advanced initiatives and case studies from the participating countries.

¹² Abbreviation for Community-Based Fisheries Management. The project uses the term CBCRM, but as the SPC uses CBFM, CBFM will be used for activities at the regional level, depending on the situation.



The first day of the regional seminar.
Presentation on the current state of CBFM in Vanuatu by the C/P



A participant from Tonga poses for a photo with the second generation of giant butterflies transplanted from Tonga to Vanuatu in Phase 1 during a field trip to Mangaliliu Community Sea-farming Centre, Efate, on the second day of the regional seminar.



Group photo of participants

Subsequently, input and comments from seminar participants were requested to develop a regional version of the CBFM guidelines based on the information shared and discussed during the first seminar.

From 31 October to 1 November 2023 officials from the Solomon Islands, Fiji, Papua New Guinea, Samoa, and Tonga, involved in director-general-level or community-based fisheries management, including experts from JICA's ongoing projects in Fiji and Palau, were invited to Vanuatu to the second regional seminar to develop a scale-up strategy for CBCRM. As in the first seminar, the SPC and MSG were co-organisers.

On day one, presentations were made on the development and implementation of scaling-up (Solomon Islands), the challenges and expectations of external organisations in scaling-up integrated CBCRM (Fiji, Papua New Guinea, Samoa, and Tonga), and coastal resource management activities in Vanuatu (Vanuatu). In the afternoon, the participants visited the Mangaliliu community to understand what had been done since Phase 1 of the project, and to inspect the Mangaliliu Community Sea-farming Centre and marine education for primary school children.

Day two included presentations by JICA project experts on its strategy to promote the blue economy in the Pacific Islands, presentations on 'Project on Pacific Islands Capacity Enhancement for Achieving SDG 14', and presentations by participants and project stakeholders on community-based fisheries in the Oceans. Presentations were made on the development and implementation of scaling up through management and project activities in Vanuatu, integrated CBCRM guidelines, a collection of tools, and training. The participants then discussed and presented the development of an integrated CBCRM scaling-up strategy and the establishment of a cooperation framework in regional countries, which were actively presented, questioned, and commented upon by the participants.

In these seminars, resource management-related projects and methodologies for 'resource management' tend to be discussed. However, through the first and second seminars, it became clear that, based on the four perspectives outlined in the Integrated CBCRM Guidelines, it is important to consider not only the 'resource and environmental perspective' but also the 'production and economic perspective (the need to introduce livelihood improvement measures)', 'social and cultural perspective (strengthening community organisation)', and 'institutional and governance perspective (external support for all activities)', and the importance of developing plans based on the four perspectives. As for scaling up, it was agreed that it is important for any disseminator to strive to have the points above firmly recognised in each region and ensure continuity. For further details, see 'Attachment 18: Minutes of the second regional seminar'.

2) Study tours

Implementation of reciprocal visitation programmes between Vanuatu and Solomon Islands

Three extension officers from the VFD visited the Solomon Fisheries Department from 29 October to 4 November 2019.

The programme consisted of an exchange of views with expert C/Ps working in the Solomon Islands, participation in a Community-Based Resource Management seminar conducted in the Solomon Islands, and a visit to project sites where experts were implementing their projects. One of the major outcomes of the Vanuatu C/Ps' visit to Solomon was that they were able to speak logically in their own words about the challenges of the activities underway in Vanuatu, the content of the activities, and the measures to address the challenges through an active exchange of views with the Solomon C/Ps and by sharing their experiences of project activities in Vanuatu. The project team was able to discuss the following issues.

Specifically, the development and capture section manager, who led the Vanuatu side of the seminar's Q&A session and two regional branch managers who were not good at public speaking, were able to provide a good explanation of CBCRM activities in Vanuatu to participants for Solomon. Through these activities, they improved their level and depth of understanding of CBCRM.

During the project site visit, the Vanuatu C/P conducted awareness-raising activities on the importance of management and support measures for community residents. Afterwards, the Solomon C/P commented on the superiority of the Vanuatu approach to coastal resource management and the facilitation methods used by community residents, which were immensely helpful.

2-2-4 Cooperation with relevant institutions

(1) International organisations and others

1) SPC

The Pacific Community, formerly the SPC, the regional organisation responsible for the South Pacific countries, was the main technical link and had a technical expert in fisheries resource management at its headquarters in Noumea, New Caledonia, and a Director for Melanesia in Port Vila, Vanuatu. Information was exchanged with a technical specialist in fisheries resource management whenever the opportunity arose. During the resumption of project activities after COVID-19 in Year 4, discussions were initiated on specific collaborative possibilities to expand the integrated CBCRM approach in the Pacific and Melanesian regions.

The regional seminar held in February 2023 as an activity of the project was also co-organised by the SPC, with the participation of one expert officer from New Caledonia for the entire day, and included presentations on the current status and challenges of CBFM initiatives in the countries of the Pacific region and on the SPC's initiatives. The SPC also made useful comments on the regional version of the CBFM guidelines to be compiled by the VFD.

After the first seminar, the project experts visited the SPC headquarters in Noumea in person to meet the technical specialists in fisheries resource management and in public information and dissemination, who were briefed on the national CBFM policies and guidelines being prepared by the SPC and the concept of an online platform to access the tools developed. The team also confirmed that the regional version of the CBFM guidelines to be compiled under the project would not duplicate the SPC's activities and related documents being developed.

The SPC also collaborated as a co-organiser of the second regional seminar from October to November 2023, which was attended by the Melanesian Regional Director stationed in Vanuatu.

2) MSG

The MSG is a regional international organisation that oversees Melanesian countries with its headquarters in Vanuatu; the project mainly coordinated administrative and diplomatic aspects, including the coordination and promotion of CBFM with the government office of the fisheries sector in each country. A memorandum of understanding (MOU) on collaboration was exchanged between the JICA and MSG in 2020. The two regional seminars were jointly organised in 2023, and for the first one, three additional participants from Papua New Guinea were added with budgetary support from the MSG. The MSG also played an important role in promoting relevant project activities and demonstrating the importance of CBFM in the region by directly reaching out to the government of each country; for example, it contacted countries from the Melanesian region in the name of the MSG Director General to invite them to participate in the seminar and request comments on the draft regional version of the guidelines.

The MSG roadmap for coastal resource management will be revised in 2024, and the project's knowledge and experience may be reflected in the roadmap. Feedback from the project will be sought in the discussions for revisions, which will be from 2023.

3) Wollongong University

Simultaneously with the implementation period of this project, a project called Pathway was being implemented by the project manager of the titled agency, and it mainly focused on the development of community-based coastal resource management plans. The main difference of this project is that the main activity was the planning of resource management activities at the donor's request and it did not include livelihood enhancement measures.

The target areas were four communities on the east coast of Santo Island, the Maskilin community, southeast of Malakula Island, and Aniwa Island, Tanna Province. The coordinator on the Vanuatu side was stationed at the VFD; therefore, there was a constant exchange of views. Pathways has been collaborating on activities and is a co-author of a paper with the project manager. For the sports event (CBCRM Cup) held on Santo Island in 2023, we received support from Pathways and also recruited participants from the Pathways project site. Pathways also covered the expenses for the participants from their project site. In addition to covering the costs, Vanuatu coordinators conducted awareness-raising activities on resource management during the event.

4) FAO

Participation in FAO-Japan FAD seminars

A four-day workshop was held in Suva, Fiji, from 3 to 6 February 2020, as part of the FAO's Small-Scale Tuna Fisheries Project under the Japanese Trust Fund (see Attachment 19). The project member C/P, the Manager of the Capture and Development Division, and two delegation members were invited by the FAO as presenters.

The programme was facilitated by presentations and workshop-style discussions with representative Japanese participants coming from the FAO, the Embassy of Fiji, the JICA Fiji Office, the Overseas Fisheries Cooperation Foundation (OFCF), and Yamaha Motor Co.

The first day was dedicated to an overview of the case and the situation surrounding FAD in each country; the second day was dedicated to a presentation on SPC's new FAD manual and rich foreshore and a presentation on monitoring with SPC's TAILS (application for the collection of catch data); the third day was dedicated to ICT and maritime safety, while on day 4, the first year's activity plan and wrap-up were conducted.

The main focus of the workshop was on how to set up SPC FADs and monitor them using SPC TAILS, and how to utilise ICT.

With regard to FADs, there were many issues to be discussed, such as the fact that the FADs that had been set up thus far were not user-friendly for small-scale fishers, and some participants felt that there were difficulties in the operation of the TAILS that needed to be overcome. However, not much time was devoted to discussing solutions.

The FADs that have been set up in the project are not only a means of catching fish but also a tool for FADs and how they can be used for community development, which was not considered important in this seminar. However, the project concept, FAD design, and presentation were favourably received by the participants in each country as examples of demonstrations in the field that were either new or comprehensive.

The seminar audience heard many positive comments on the request for the adoption of the FAD design from the perspective of community development using FADs. The Manager of the Capture and Development Division, who participated in Vanuatu, also received many specific questions on installing FADs and procuring materials for the project. In addition, a leaflet containing an introduction to SPC's newsletter introducing the project's activities and a webpage containing the FAD manual and other information was brought to the venue, which was taken home by interested participants, indicating a high level of interest in the project.

5) USAID

The USAID project had no specific collaborative activities, as it started in Year 4. However, because the manager of this project is a former Director of Fisheries and familiar with CBCRM activities, it is possible to indirectly incorporate integrated CBCRM into project activities in the future. Specifically, USAID support for the organisation of a sporting event (CBCRM Cup) on Tanna Island is being considered. The project manager participated in the CBCRM Cup when he was the Director General of Fisheries and is aware of its benefits; therefore, it is expected that this will become a reality.

(2) Government agencies and NGOs

1) Ministry of Education

As reported in '2-2-1 Outcome 1 3) Marine education', the project team worked with the Ministry of Education in marine education. It was found that the ministry had no concrete plans for it although the ministry recognised the importance of extra-curricular lessons and allocated a budget for the lessons. When the team approached the ministry regarding the importance of marine education and the implementation of extra-curricular classes using the Mangaliliu Community Seafarming Centre, the team found a great deal of interest, and undertook such activities as paying a visit to students in schools outside Mangaliliu and providing guidance on marine education for teachers. This fact indicates not only the high potential of marine education, but also the wide range of generations in target communities for disseminating CBCRM. Furthermore, the team believes that marine education is a highly important activity in increasing the understanding and sustainability of the CBCRM approach.

2) Ministry of Industry

As reported in '2-2-1 Outcome 1 4) Sanitation and Nutrition', nutritional activities were conducted in collaboration with the Ministry of Commerce and Industry. Specifically, collaboration combined the Ministry of Commerce and Industry's Farm to Table programme with the activities of the GOS project. A meeting was held between the VFD and the Ministry of Commerce and Industry. The Ministry of Commerce and Industry would like to incorporate fisheries products into school lunches; however, the timing and quantity of distribution are unstable, making them unsuitable for school lunches that require a certain quantity. The VFD stated that it was difficult for local fishermen to find markets. In view of this, the Ministry of Commerce and Industry suggested that the VFD could provide the Ministry with information on local fishermen (fishing season, landing sites, species and quantities

of fish, etc.) and cooperate with them in cold chain development in line with the information. It was noted that discussions will be held in the future, including with the FDO.

3) Ministry of Health

As reported in 2-2-1, Outcome 1 4) Sanitation and Nutrition, nutritional activities worked with the Ministry of Health. The Ministry of Health, which oversees nutrition, was keen to improve the nutritional status of women and girls. The following comments were made regarding this activity, and the Ministry of Health will consider further activities in the future:

- ① On the islands, mothers and girls face many future problems due to calcium deficiency. It is good to base this activity in schools to ensure that girls get enough calcium.
- ② Calcium is important for pregnant mothers to ensure that their bones are in proper condition after delivery. It was significant that the VFD was also informed that it would be recommending activities to improve nutrition.

4) Ministry of environment

Although not directly related to the Ministry of Environment, the project team worked indirectly with the ministry's projects and contributed to them.

Assisting IUCN in establishing an MPA for the channel part of Maro Island with Santo Island

In July 2019, an MPA for the protection of marine life was established with the support of IUCN in the area known as the Maro Channel between the northern part of Maro Island and Aoré Island, located to the south of Santo Island (red shaded area). Based on a request to help develop a resource management plan for the West Maro area (white shaded area), which was not included in the project, the VFD Santo office held several workshops using the CBCRM approach, which focuses on public participation, to develop a resource management plan for the area.



Communities in Lelepa Island

The area for which a resource management plan was developed under the CBCRM approach in Phase 2 of the project included Lelepa Island. In 2013, the island's residents agreed to establish a no-take zone in its western part (red shaded area), which was formally established upon the Ministry of Environment's approval. Relevant documentation and sign boards on the zone were developed with the project's support.



2-2-5 Publicising the project

The activities and results of the project were widely publicised through regional institutions and local media. The project's publicity achievements are as follows:

(1) Activities by local media

The project widely communicated the demonstration project and its progress at target sites through local media in Vanuatu. The main achievements of this project are described below.

Table 8: Local media coverage of project activities

Media	News content
Vanuatu National Television	Re-opening of community hatchery, environmental education activities (Port Vila, February 2023)
The Daily Post	CBCRM Cup (Santo, August 2023)

(2) Project publicity material

As publicity material for the project, a brochure introducing the project activities was prepared and used to explain the project activities to stakeholders and visitors.



Brochures distributed during environmental education

(3) Project website

A website for the project was set up on the Vanuatu Government server and will include information on the following key good practices of the project:

- Contribution to the recovery of green snail stocks
- Strengthening resilience to natural disasters through tilapia farming
- Development of implementation guidelines and tool manuals for integrated CBCRM
- Developing an all-island plan involving area councils and chiefs
- Promoting young people's involvement in resource management activities through sporting events
- Giant clam distribution survey and confirmation of the reproduction of the giant clam

(4) JICA Vanuatu Office website

The website of the JICA Vanuatu Office also provides a broad overview of the demonstration project and its progress at target sites. The main conclusions of this study are as follows:

24 October 2019	GOS project, phase 3
6 November 2019	Dissemination of the CBCRM approach within Vanuatu
26 November 2019	Improving the livelihoods of residents through tilapia farming
26 November 2019	Introduction of participatory fisheries resource management and CBCRM guidelines for residents
20 December 2019	Activities related to improving seafood distribution
27 April 2020	Support for refresher training conducted by VFD
17 February 2023	Regional seminars held to develop guidelines for the implementation of regional versions of community-based fisheries management (CBFM)

Chapter 3: Project outcomes

3-0 Background information on Chapters 3 and 4

Chapter 3 focuses on the results at the end of the project but also outlines the challenges and possibilities to disseminate the results within Vanuatu and introduce them to island states around the world, including the Pacific and non-island states.

Chapter 4 reviews the development process of the integrated CBCRM approach and describes the advantages and benefits of its dissemination and implementation nationally within Vanuatu, in the Pacific, and worldwide. It will then refer to the potential for the support and development of the Blue Economy theory building while maintaining a coastal resource management perspective.

3-1 Achievement of outputs

3-1-1 Indicators and achievement of Output 1

Table 9 summarises the achievement of Output 1.

Table 9: Achievement of Output 1

Objectively Verifiable Indicator	Means of Verification	Assessment Results
Output 1: Applicability and practicability of integrated CB-CRM approach are strengthened.		
1.1 Positive effects of the integrated CB-CRM approach are compiled as a synthesis report.	1.1 The report which compiles positive effects of integrated CB-CRM approach	A stock assessment study of the green snail, and a study of the impact of Cyclone Pam on coastal communities, were compiled into a report in the first year and published in SPC's information magazine, 'Traditional'. The Cyclone Harold Impact Assessment Report was compiled in 2022 and the giant clam Stock Assessment Report in 2023.
1.2 Record of revisions and modifications of the integrated CB-CRM plans in the pilot sites of Phase 2 is made available for reference.	1.2 Record of process of revision and modification of integrated CB-CRM plans in the pilot sites of Phase 2	Already achieved at all sites. An island-wide resource management plan has been developed in Aneityum. In Lelepa, an Environment Agency-designated MPA was established on the west coast of the island. In Crab Bay, Malakula, the management of the land crab resource has been transferred from the Provincial Government to the

Objectively Verifiable Indicator	Means of Verification	Assessment Results									
Output 1: Applicability and practicability of integrated CB-CRM approach are strengthened.											
		CBCRM Committee. In Aneytum, Malakula and Lelepa, field follow-up survey results, current situation analysis and lessons learned were compiled into progress reports in the first year.									
1.3 The integrated CB-CRM plans are newly formulated in the Phase 3 sites.	1.3 Integrated CB-CRM plans in each pilot site of Phase 3	CBCRM plans were developed for all pilot sites.									
1.4 Number of options for management tools and supporting tools increases from 5 to 14.	1.4 Progress report of the Project	Seventeen have been added, up from 12, bringing the total to 28 tools. See Appendix below for details. <table border="1"> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> </table>									

	Phase 2	Phase 3
Resource management measures	No Take Zone • closed season for fishing • fishing gear regulations • body length limitation • target fish species management • data collection	• Multi-community management of outer reefs • Island-wide management of taboo areas (coastal resource management) • Province-led management of seabed fish grounds • Shellfish transplantation for resource recovery • Implementation of management rules through community by-laws • Management plan approval by area councils for effective implementation of measures
Supporting measures	• FAD. • fish café • shell craft • Eco-labels and certificates of specialities • Solar freezers to improve fish marketing • Authorised Officer for	• Transporting fish by community boat • Direct delivery of fish to hotels and restaurants • Fish processing for value addition • Fishing village stays (eco-tourism) • Giant clam gardens (eco-tourism) • Tilapia farming for alternative fish supply • Hygiene management and quality control • Nutritional improvement

	Fisheries Promotion	
Connecting measures(New)		· Establishment of a CBCRM committee for community-based coordination and decision-making · Social events to engage young people (CBCRM Cup with football for men and volleyball for women) · Marine education in relation to ecosystem learning

1.5 Lessons learnt and experiences gained from the pilot sites are compiled as a synthesis report.	1.5 The analytical report on lessons learnt and experiences gained from pilot sites	The findings are summarised in the ‘Report on the applicability and practicality of the integrated CBCRM approach’.				
1.6 Rating of the communities' self-evaluation is improved in the pilot sites.	1.6 Result of self-evaluation tool	Three rounds of self-assessment monitoring were conducted during planning in 2017 and thereafter until the end of the project, all of which showed an improvement in self-assessment ratings at the pilot sites.				
			Oct. 2017	Feb. 2020	June 2023	Nov. 2023
		Emae island Marae	34	103	122	151
		Emae island Sangava	46	109	127	144
		Emae island Tongamea	53	116	138	147
		Santo island Nakere	31	53	73	107
		Santo island Araki	25	57	99	110
		Santo island Tangoa	34	66	84	123
		Santo island Wailapa	23	66	72	113
		Tanna	40	72	93	96

		island Waisisi					

Based on the above, it can be concluded that Output 1 has largely been achieved.

3-1-2 Indicators and achievement of Output 2

Table 10 summarises the achievement of Output 2.

Table 10: Achievement of Output 2

Objectively Verifiable Indicator	Means of Verification	Assessment Results
Output 2: Knowledge and experiences of integrated CB-CRM approach are synthesized and standardized as national training programmes for its effective promotion.		
2.1 Guidelines of the CB-CRM approach is elaborated.	2.1 Guidelines on integrated CB-CRM approach	The VFD approved the 'CBFM Implementation Guidelines' as a national standard method. (Mar 2021)
2.2 National training programmes are elaborated (Separately for fisheries extension officer and for community leaders)	2.2 National training programmes for government officers and for communities	A draft training programme and a draft training manual for VFD development officers and community leaders have already been prepared in Year 3. They are being revised on an ongoing basis.

Hence, it can be seen that Output 2 has largely been achieved.

3-1-3 Indicators and achievement of Output 3

Table 11 summarises the achievement of Output 3.

Table 11: Achievement of Output 3

Objectively Verifiable Indicator	Means of Verification	Assessment Results
Output 3: Integrated CB-CRM approach is introduced through national training programmes as well as technical exchange with neighbouring countries within the Melanesian region.		
3.1 Fisheries extension officers in six provinces receive training on the integrated	3.1 Progress report of the Project	Development officers in six provinces have already attended the course in 2019; the training took place in March 2020 with the VFD's own budget.
3.2 Representatives of at least three communities in each six provinces receive training on integrated CB-CRM approach.	3.2 Progress report of the Project	A total of 16 community-based authorised officers from three or more communities from each province attended the training. Torba province: 6 communities Sanma province: 1 island and 16 communities Penama Province: 1 island and 2 communities Malampa province: 10 communities Shefa province: 2 islands and 3 communities Tafea province: 3 islands and 4 communities
3.3 Discussion results in the regional seminar are compiled as the seminar proceedings	3-3. Regional seminar proceedings	A regional seminar was jointly organised with MSG and SPC in February 2020. Fisheries officials from Tonga, Samoa, Fiji, Solomon Islands and Papua New Guinea, as well as SPC resource management officer, participated. 'CBFM Implementation Guidelines' and 'Tools Manual' were shared; another regional seminar was held in October-November 2023 with stakeholders from the above countries to discuss challenges and possible linkages in scaling up the CBCRM approach at national and regional

		levels. The seminar was compiled into a set of minutes (Attachment 18).

Based on the above, the indicator for Output 3 has been achieved.

3-2 Achievement of Project Purpose

The achievement of the Project Purpose indicators is as follows.

Table 12: Achievement of Project Purpose

Table 12: Achievement of Project Purpose														
Objectively Verifiable Indicator	Means of Verification	Assessment Results												
Project Purpose: Integrated CB-CRM approach developed by the Project is practiced throughout the country as well as in neighbouring countries within the Melanesian region.														
1. At least 12 communities outside of pilot sites initiate the integrated CB-CRM approach after participating related training.	1. Progress report of the Project	Tentative CBCRM plans were developed in a total of 13 communities led by VFD development officers. An agreement was also reached to implement CBCRM activities in 11 communities in the western part of Tanna Island.												
		<table><tr><td>Province name</td><td>Sites where CBFM approaches have been initiated outside of pilot sites</td></tr><tr><td>Torba Province</td><td>Vanua Lava: Vanua Lava</td></tr><tr><td>Sanma Province</td><td>Maro Island: Avunatari, Avunaleleo, Nanuku, Nawiambu</td></tr><tr><td>Penama Province</td><td>Pentecost: Vanua Lava, Malua Bay Maheu: Kerepei</td></tr><tr><td>Malampa Province</td><td>South West Bay of Malakula island: Lawa, Labo, Lorlow, Widua, Lenbinwen, Benaur</td></tr><tr><td>Shefa Province</td><td>Cooks Bay of Erromango Island: Natmah-Yamolwy, Pitimiau,</td></tr></table>	Province name	Sites where CBFM approaches have been initiated outside of pilot sites	Torba Province	Vanua Lava: Vanua Lava	Sanma Province	Maro Island: Avunatari, Avunaleleo, Nanuku, Nawiambu	Penama Province	Pentecost: Vanua Lava, Malua Bay Maheu: Kerepei	Malampa Province	South West Bay of Malakula island: Lawa, Labo, Lorlow, Widua, Lenbinwen, Benaur	Shefa Province	Cooks Bay of Erromango Island: Natmah-Yamolwy, Pitimiau,
		Province name	Sites where CBFM approaches have been initiated outside of pilot sites											
		Torba Province	Vanua Lava: Vanua Lava											
		Sanma Province	Maro Island: Avunatari, Avunaleleo, Nanuku, Nawiambu											
		Penama Province	Pentecost: Vanua Lava, Malua Bay Maheu: Kerepei											
		Malampa Province	South West Bay of Malakula island: Lawa, Labo, Lorlow, Widua, Lenbinwen, Benaur											
Shefa Province	Cooks Bay of Erromango Island: Natmah-Yamolwy, Pitimiau,													

Objectively Verifiable Indicator	Means of Verification	Assessment Results	
Project Purpose: Integrated CB-CRM approach developed by the Project is practiced throughout the country as well as in neighbouring countries within the Melanesian region.			
			Navul
		Tafea Province	
2. At least one community in one participating country of the technical exchange initiate the integrated CB-CRM approach.	2. Questionnaire survey with fisheries department of other countries	Partial introduction is underway in Solomon Islands. Interviews with Solomon C/Ps indicated that the community hatchery in Mangaliliu was extremely helpful. There is potential for further implementation of the CBCRM approach in Tiaro Bay and in the Alakao community on Malaita Island.	

3-3 Prospects for achieving Overall Goals

Table 13 presents the prospects for achieving the Overall Goals.

Table 13: Achievement of Overall Goals

Indicator	Means of obtaining indicators	Assessment Results
Overall Goal 1: The integrated CBCRM approach is formally adopted and disseminated as the standard approach for coastal resource management promotion in Vanuatu.		
The integrated CBCRM approach is formally adopted by the MALFFB as the standard approach for coastal resource management promotion.	1. approval letter from the Acting Director General of Fisheries	It was approved as a more formal document by the Department of Fisheries as a CBFM implementation guideline.
Overall Goal 2: A population-driven integrated coastal resource management approach is promoted in the Pacific region.		
Integrated CBCRM approaches are adopted and implemented by other regions and organisations (e.g.	Project progress report	It was only partially introduced in the Solomon Islands. However, it has received high praise from international organisations

Indicator	Means of obtaining indicators	Assessment Results
Overall Goal 1: The integrated CBCRM approach is formally adopted and disseminated as the standard approach for coastal resource management promotion in Vanuatu.		
MSGs, SPCs).		such as the MSG and SPC for its active involvement in communities and effective combination of support measures such as tilapia farming, as well as from other countries at regional seminars, and is expected to be introduced and spread in the future.

As mentioned above, the achievement of the project's results and objectives was considered high. Although not shown in these indicators, a major factor in achieving the results was the high motivation of C/Ps in the Fisheries Department to apply the CBCRM approach. The role of experts is to work from the same perspective as the population, which can be attributed to the C/Ps' understanding of the approach, their confidence in applying it, and the fact that they realised that this approach might foster trust in the community and gain recognition from it.

3-4 Response to the recommendations in JCC in August 2023

- ① Completion of field validation of new tools, assessing their effectiveness and applicability in an integrated CBCRM

A report was prepared on the results of the demonstration of each tool compiled as a collection of tools at pilot sites, an assessment of their effectiveness and adaptability, and recommendations for their future use. Details are provided in Attachment 20.

- ② Further improvement and completion of CBCRM's implementation guidelines and tool manual

The integrated CBCRM's implementation guidelines (regional version) were completed, reflecting comments from the countries concerned. The accompanying collection of tools was checked for technical terminology by relevant stakeholders in the countries concerned, especially by participants in regional seminars. In addition, tools selected as good practices from the pilot activities conducted throughout all phases were included as box articles and finalised.

- ③ Synthesis and synthesis of lessons learned and experiences from field activities

This work completion report includes the strengths and values of the project, key lessons learnt, valuable experiences, and practical knowledge in implementing CBCRM.

④ Improved access to project information materials

As a website update, key good practices in the project (see below) will be posted on the VFD website.

- Contribution to the recovery of green snail stocks
- Strengthening resilience to natural disasters through tilapia farming
- Development of implementation guidelines and tool manuals for integrated CBCRM
- Developing an all-island plan involving area councils and chiefs
- Promoting the involvement of young people in resource management activities through sporting events
- Giant clams distribution survey: confirmation of the reproduction of the giant clam

⑤ Raising local awareness of the integrated CBCRM approach through regional seminars

Two regional seminars were held in Vanuatu in February 2023 and October 2023 with stakeholders from the Solomon Islands, Fiji, Papua New Guinea, Samoa, and Tonga to develop implementation guidelines (regional versions of the CBCRM approach management scale-up strategies).

Chapter 4: Effectiveness of the integrated CBCRM approach

4-1 Development of the integrated CBCRM approach

In Figure 2 of '2.2.2 (3) Preparation of CBCRM guidelines. 2.2.1 Outcome (2) Results of implementation of activities in each pilot site', Four perspectives are integrated, as shown in the relationship diagram of the CBCRM Plan. The CBCRM was based on 'Resource Management measures' (consisting of resource monitoring, awareness-raising activities, and stock enhancement, among others) and 'Supporting measures' (e.g., offshore fisheries, value addition, aquaculture, and other livelihood enhancement measures). The latter were presented in the work instructions at the beginning of Phase 2 to set up an enabling environment for implementing the resource management measures. In Phase 2, the objective of the CBCRM approach was to 'promote coastal resource management', and the CBCRM plan included both these measures, as well as a community-based organisation for implementation (CB-CRM Committee) and an external organisation to support the implementation of the plan.

Phase 3 built on the lessons learnt in Phase 2 to develop the concept of the CBCRM plan, as shown in the right-hand side of the diagram below.

Lessons learned at the end of Phase 2

1. Risks of supporting measures: The successful implementation of supporting measures (livelihood enhancement measures) will likely limit the development of community residents' compliance with resource management measures (e.g., establishment of no-take zones). Therefore, a motivational approach to both activities simultaneously is essential for resource management measures and supporting measures.
2. Limited community-level participation: The participants in the CBCRM plan development workshops, which were conducted in a participatory manner, were mostly community executives, such as chief councillor members and women. Limited participation of young people, mostly active fishermen, was observed. Therefore, activities to encourage their participation are essential.
3. Limited activities in collaboration with other organisations: While an increase in the efficiency and effectiveness of activities in collaboration with relevant organisations is expected, this is not easy in practice. Visualising the mutual benefits for all parties involved is essential.
4. Donors are not wrong in emphasising the importance of resource management. However, they often tend to 'look up' to C/P agencies. It is essential to recognise that economic development is critical for developing countries and to aim for genuine 'sustainable development' from the same perspective as developing countries, as argued in the past.

Concept of integrated CBCRM planning

In response to (i), connecting (linkage) measures are set up as tools that simultaneously envisage the possibility of motivating both resource management and supporting measures at the same time. For example:

- In the case of shell fishing, which is positioned as a livelihood-enhancement tool (supporting measure), the collection of shiny live shellfish with high added value as a commodity may increase if recognised by the community as a means of cash income. This situation conflicts with the resource management activities. By utilising dead shellfish, even if the added value is lower, and by bundling an eco-labelling with the product stating that live shellfish are not used and that X% of the sales proceeds will be used to fund resource management activities by the local community, environmentally conscious consumer demand can be met. Eco-labels may be managed in cooperation with the Ministry of Environment and the Tourism Department, and the Resident Resource Management Committee may select shellfish makers who are highly aware of the activities of both parties.
- Catch statistics: Tools that allow fishers to manage catch information are commonly understood as resource management tools. However, data collection is usually hard because it is incredibly challenging to identify specific incentives for fishers to record their catches. Recording and providing catch data as a connecting measure contributes to the development of resource management measures and is more likely to stimulate fishers' incentives if it leads to easier access to credit facilities for fishing equipment from lending institutions. A system in which the Fisheries Department recommends that fishers lend to institutions based on catch data may be a strong incentive.



4-2 Effectiveness of the integrated CBCRM approach

Although many aspects have been mentioned in the previous section, the effectiveness identified by implementing integrated CBCRM is recapitulated below.

- (1) Increase resources through resource management activities

The project's end-line survey results indicated that resources were recovered in the no-take zone. Concerning the activities implemented in Phase 1 (Efate Island) and Phase 2 (Uripivu), the results of the project survey on the transplantation activities of green snails and the recovery of the resource were confirmed from a statistical perspective.

A unique outcome of implementing integrated CBCRM is the 're' method and the concept of self-propagation as a resource management measure obtained from implementing the green snail stock survey. Resource management is generally viewed as a limiting factor in projects, especially those funded by Western donors. However, based on the accumulation of projects from Phase 1 to Phase 2, this project has shown that increased resources are linked to resource management. This concept has been appreciated as a new way of thinking by community-based authorised officers participating in the training and regional seminars. Emphasising the perspective of increasing resources in similar community-based resource management projects could be a great advantage in demonstrating the assistance from Japan's fisheries sector and co-management of fisheries resources (co-management by residents and the government).

(2) Strengthening the capacity of VFD's FDO through integrated CBCRM activities

The most significant achievement of the project is the capacity building of the C/Ps, FDO. Although there was no dedicated C/P, the project attempted to coordinate the schedules of a few busy FDOs and involve them in integrated CBCRM activities as much as possible. The project also provided many opportunities to facilitate technical exchanges with Solomon and regional workshops. As a result, many FDOs understood the philosophy of the CBCRM approach. They confidently explained the integrated CBCRM approach in workshops and other activities and practised the activities in the field on their own initiative. Other impacts were observed, such as one FDO-supported resource management activity in a neighbouring community without project support.

(3) Awareness-raising on community resource management activities

While communities individually understand the decline in fishery resources, this awareness does not necessarily lead to community-wide resource management activities other than initiatives by community chiefs and others. In most cases, a lack of knowledge about resource management means that resource management is only carried out by setting up no-take zones in a small area. Through the activities of integrated CBCRM, workshops and other participatory events with outsiders can help visualise and raise awareness of the situation in the community. Integrated CBCRM has contributed to growing awareness of the need to protect community resources. This phenomenon was also evident from end-line surveys conducted in each community.

The project also tackled a new initiative in which awareness-raising on youth resource management through a sporting event, the CBCRM Cup, was more effective than expected.

Thus, resource management activities have generally been dominated by prohibiting fishing, and resource management awareness-raising activities have usually been loosely conducted through posters and pamphlets. However, besides the shared results of the socioeconomic survey and

painstaking participatory workshops, the consolidated measures for raising resource management awareness introduced in Phase 3 and sporting events are unique initiatives. These measures helped involve the younger generation, both men and women engaged in fishing and collecting, in resource management activities. On Emae Island, where this activity was implemented, the CBCRM Cup was attended by many young people. The end-line survey showed that it was a good opportunity to combine resource management awareness-raising activities and for women to earn cash income by selling coconuts and food.

(4) Strengthening resilience to natural disasters

The function of CBCRM in strengthening resilience to natural disasters is evident in the impact studies of Cyclone Pam, Cyclone Harold, and others. It was observed that fishery resources managed in no-take zones provided an essential source of food, animal protein, and income in the event of a major disaster and that they were relatively more resilient to disasters than agriculture and livestock, contributing to reducing the vulnerability of the population to natural disasters. They also contributed to raising community awareness of resource management, such as the opening and closing of no-take zones after cyclone damage, at the community's discretion as an emergency protein source in Phases 1 and 2. Furthermore, individual activities for resource management, such as the loan of solar freezers for improved distribution, FAD, and aquaculture, which have been carried out as CBCRM activities, were used as a means of emergency support by individual donors after the cyclone damage and were widely disseminated at the national level. The following is a concrete example.

For inland communities affected by Cyclone Harold, which hit the southern part of Santo Island in April 2020, the National Disaster Management Committee purchased tilapia, which was cultured with the project's support in the Wairapa community, also in the south of Santo Island, as emergency food, and distributed it to the communities as a valuable protein source.

(5) Monitoring results of the integrated CBCRM approach

To assess CBCRM activities at the end of the project, field interviews were conducted at the project sites on the Emae and Tanna Islands and Santo Island. Monitoring sheets were handed over to the locals.

The CBCRM activity monitoring results show that the activities' implementation systems (organisation) function well, and resource management measures are actively continued. While support measures are often continued and developed with a focus on activities that meet the needs of each community, linkage measures tend to be implemented unevenly across sites.

These results indicate that the integrated CBCRM that the project has attempted to introduce is suitable for the Vanuatu community regarding the framework and activities related to resource management. In particular, the successful establishment of an implementation framework as the basis for activities linked to resource management measures has brought community-based coastal fishery resource management to Vanuatu, a critical project challenge. Moreover, as a result of project ,

the support measures have been narrowed down to activities that are characteristic of the relevant sites. Although external factors such as cyclone damage and the interruption of project activities due to the COVID-19 pandemic are undeniably significant, future challenges include improving the accuracy of pre-project surveys and strengthening regular monitoring of activities for creating an environment in which a variety of activities that match the characteristics of the sites can continue.

Some sites have been slowed down by hurricanes but are generally functioning well. However, some issues regarding connecting measures have emerged. While some sites continue to carry out beach clean-up and awareness-raising activities, many have ceased doing so, and taking further measures is considered necessary. The challenge remains to strengthen further the system of self-sustaining activities by communities through involving development officers, CBCRM committees, area administrators, and community extension workers to a more significant extent, and ensure that activities can continue even when project experts are absent.

. However, examples of activities that can be implemented relatively easily exist (e.g., awareness-raising activities at weekly community meetings, football tournaments, and beach clean-ups), and efforts should be made to share successful examples among sites in the future.

4-3 Applicability of the integrated CBCRM approach

The SPC's scaling-up strategy for CBFM is also challenged by the lack of manpower in Oceania's fisheries departments.

Although the project has achieved results in terms of training FDO and strengthening activities in the community, challenges remain regarding the versatility of integrated CBCRM in terms of dissemination outside pilot sites.

In this project, immediately after the VFD approved the CBFM guidelines, activities in the pilot sites ended, and dissemination activities outside the pilot sites started in earnest. There was an emergency evacuation and a project suspension for about two years due to COVID-19. Once the project resumed, visiting cities outside the main towns was extremely difficult due to a significant reduction and instability in domestic flights. Hence, the applicability of CBCRM outside pilot sites in the country could not be fully ascertained. In addition, the project was suspended when it began working on the domestic dissemination of the CBCRM approach through community-based authorised officers as a means of future dissemination, and planned training could not be carried out.

As the VFD plans to create a CBFM unit and employ many staff members, it is hoped that the guidelines and tools developed by the project will be used for future dissemination in the country.

In terms of dissemination to Melanesian countries, the project did not achieve sufficient results, as many activities were concentrated in the last stages of the project, meaning that the planned regional workshop had to be postponed temporarily due to COVID-19 and rescheduled because of the VFD event, which made it impossible to focus on activities. Hence, the project did not achieve sufficient

results in terms of dissemination. In this context, strengthening partnerships with regional organisations such as MSGs and SPCs through activities such as mutual visits with the Solomon Islands' Fisheries Department and regional workshops was a major achievement of the project. The results are promising for the future dissemination of CBFM in the region.

In Samoa and Tonga, the Melanesian countries that were invited to the regional seminar, here is a widespread perception: activities similar to CBCRM are already taking place, albeit under different names, and activities other than those characteristic of the CBCRM model, such as linkage measures, are already being implemented. Accordingly, the importance of integrating measures for resource management, support, and linkage, which are characteristic of the CBCRM model, is not fully understood in the countries. It is also not feasible to disseminate the CBCRM approach implemented in Vanuatu in its entirety, given the perception that Vanuatu is behind regarding the number of MPAs set, which is one of the monitoring indicators of the SPC CBFM scale-up strategy.

As well as a growing understanding of the CBCRM model by neighbouring countries, the concept of resource management measures through resource proliferation activities, for which results have been confirmed through this project, and the implementation of supporting measures, raising awareness of resource management through connecting measures, together with the dissemination of the CBFM implementation guidelines and resource management tools picture a highly versatile framework.

4-4 Lessons learned from the project

- (1) Resource management planning steps and planning components from the four perspectives of the CBCRM approach

Pilot activities were conducted based on the activity flow shown in Figure 5. The lessons learnt from the pilot activities are as follows:



Figure 5: Flow of activities for implementation of the CBFM plan

1) Lessons learned from conducting a pre-survey (socio-economic survey) (Importance of feedback)

One of the objectives of Phase 3 was to increase the applicability of the 'integrated' CBCRM approach. This objective requires a strategy that can be applied to different types of communities in terms of their resource status and socioeconomic and cultural aspects and a tool with various resource management and supporting measures that can be used as components of this approach. Therefore, a survey was conducted to select suitable target sites for testing new tools and obtain indicator data to measure the effectiveness of new tools in the future.

Socioeconomic surveys were also conducted in Phase 2; however, the questionnaire survey results were mainly used to understand the socioeconomic situation, and the results were not used to consider activities at the pilot sites. Although the socioeconomic survey was described in this phase as an activity in the specifications, performing a preliminary socioeconomic survey was incorporated into the CBFM guidelines due to the recognition of its importance.

a)The general approach in Vanuatu is to conduct a dive survey by the research department to assess the resource's status before the activities start, but this approach is costly. In island states with limited human resources, conducting this activity at many sites is challenging. Using mapping tools or direct writing on paper, asking people to describe fishing areas, fishing efforts, catches, and average fish length can provide the approximate information they want to obtain and reduce costs. **Sharing the results with the community can also make them directly aware of the current situation they are in.** For example, on Emae Island, the pilot site, when the number of spearguns in each community was reported (based on the survey results), all community representatives were surprised by the high numbers. Hence, momentum was generated to reduce the number of spearguns and ban night diving.

b)The questionnaire survey was prepared based on four perspectives that are key concepts of the rich foreshore project. In South Santo, the summary of the survey results, particularly the findings on the weak governance of the Chief and Area Council, provided guidance on the need to consider this aspect when carrying out new activities.

c)The questionnaire results were found to be one of the most helpful awareness-raising tools. In the Emae Island case study, the questionnaire results, where 72% of the respondents stated that their income had decreased due to declining fishery resources, shocked the participants, with various workshop participants declaring that this share would be reduced in four years.

In such socioeconomic surveys, information is only obtained from donors and is not generally shared with the community. Through this activity, we show that although conducting socioeconomic surveys is crucial, it is also essential to communicate the results of these surveys through community workshops and other opportunities.

2) Lessons learned from the implementation of community workshops

As mentioned above, the project has conducted several participatory community workshops, reflecting on many projects in the past that claimed to be participatory but were required to deliver results in a limited period. The procedures for running the workshops to maximise the strengthening of the community's sense of ownership were discussed with the C/Ps in advance and designed to ensure that the workshops were conducted to strengthen the community's sense of ownership. However, care was taken to ensure that the workshops proceeded effectively by flexibly altering the procedures so that the actual workshop would increase discussions among the participants.

Most women in the Vanuatu community were reserved regarding how the workshop was organised. They did not speak up when men and women were together. Hence, the discussion was divided into men's and women's groups to foster discussion on resource management measures and supporting measures in Waisisi, Tanna Island. As a result, women participated very actively, and the workshop was highly praised as gender sensitive by Tafea Province Women's Affairs Department members who accompanied the group on the trip. As coastal resources are also utilised by many women and women's views are essential in their management, efforts should be made to reflect women's views as much as possible in Vanuatu. The lessons learnt included the utility of sporting events to encourage the participation of young active fishers, as previously mentioned, and the importance of implementing participatory workshops involving all households in the community, such as marine education involving school-aged children.

However, even though we have always aimed at community-led activities and have always conducted community-paced workshop-based activities, even during the Cyclone Harold disaster, in one of the pilot sites, the Wailapa in South Santo, Espiritu Santo, Sanma Province, the no-take zone was not utilised as an emergency food source due to the assumption that it was a JICA project and could not open freely. This result was a painful reminder that fostering community ownership of resource management activities was extremely challenging.

The project has also been implemented in a participatory manner, respecting the will of the communities through community workshops; however, this participatory approach was time-consuming, and it took a long time to develop a tentative CBFM plan for each community. As a result, much of the project's activity period was spent on the pilot sites, and not enough time was spent on the subsequent dissemination of the project throughout Vanuatu.

Furthermore, immediately after the start of a pilot activity, the community's sense of 'motivation' is high, and management plans are often overstated. Consequently, even plans developed through community workshops may become strict management plans for women, people with disabilities, and others in weaker positions in the community, as seen in the end-line survey described below.¹³

¹³ In anticipation of this, the integrated CBCRM set the finalisation of the resource management plan at one year, and the finalisation workshop after the Corona disaster allowed the finalisation of the resource management to take these aspects into account.

3) Use of monitoring sheets

The project envisaged that the Community Resource Management Committee and Area Secretaries would monitor resource management activities using monitoring sheets. It was planned that the effectiveness of resource management measures and the progress of supporting measures would be monitored and, if necessary, adjusted with the approval of the Chief Council, and that communities where the FDO resided would be present during monitoring. However, just as the monitoring sheets were being completed and training was about to be provided to community representatives through Fisheries Department extension agents on how to use the sheets, the project activities had to be suspended for more than two years due to the emergency evacuation caused by the COVID-19 pandemic. During this period, movement within Vanuatu was restricted and remote technology transfer was not possible as support priority was given to the cyclone-affected areas. Although the technology transfer and evaluation of the monitoring sheet was subsequently conducted by extension workers just before the start of year 4, the absence of experts during the implementation period seems to have been a major obstacle to having community members becoming accustomed to the use of the sheet. Subsequently, the responsible expert went around relevant sites with the extension workers as a field activity in year 4 and was able to transfer the technology, at least to the extension workers, through on-the-job training, although the training lasted for a short period.

It is unlikely that communities can easily conduct self-assessments using these questionnaires. However, if the support of the FDO and the community's initiative to further self-evaluate is appreciated, and if a mechanism can be established to induce the implementation of community-wide development projects from coastal resource management projects, the implementation of such self-monitoring and evaluation can be considered.

Table 14: Summary of monitoring sheet results for each pilot site

South Santo	Management measures continue to be robust while supporting measures are narrowly tailored to the environment and needs of each community. Activities tend to be small but specialised in their respective areas. Activities of connecting measures are weak in some cases.
Emae Island	Management, supporting and connecting measures are implemented in a balanced fashion. There are many activities, many of which are conducted in cooperation with the local community, in addition to individual activities in each community.
Waisisi, Tanna Island	Management measures are continuing well. Supporting measures have been stalled owing to the cyclone and other factors but are expected to resume soon as new equipment and vehicles have been received. Connecting measures have been suspended.

4) Lessons learned from conducting end-line surveys of pilot activities

An end-line survey of the pilot sites was completed during the project's third year. The following issues and lessons learnt were identified, suggesting that conducting an end-line survey was extremely

useful.

4)-1 Research result

a) Delays in fish distribution improvement activities

Some sites could not conduct sufficient activities to improve the distribution of fishery products, for which activities were planned under the project, due to external factors.

In Southern Santo, another project (VCAP) had partially provided solar freezers, which was supposed to guarantee technical support for distributing fishery products. However, the VCAP's activities collapsed due to a lack of budget; hence, the project offered solar freezers to Nakere on short notice. In Nakere, the provision of solar freezers was delayed until the end of the fourth year of field activities due to delays in the construction of the building; therefore, the trial activities to improve the distribution of fishery products to function as a transit point for distribution on the Araki and Tangoa islands could not be undertaken until the fourth year of the project.

In Waisisi, many other donors promised to provide solar freezers to remedy the damage caused by Cyclone Pam. The project provided technical support, such as operational training by the Department of Cooperatives, and the fishermen's association carried out activities, such as joint shipping. However, the solar freezers promised by other donors were not provided. The fishing industry in Waisisi recovered rapidly, and the number of boats increased to 15, resulting in a small capacity for the solar freezers.¹⁴ Complaints from fishermen led to the replacement of the manager of the fishermen's association, who was exhausted from dealing with the situation, and the fishermen's association's communal shipping activities came to a standstill.

Thus, external factors were directly responsible for the slow progress of the fisheries distribution improvement activities. However, regarding the Nakhele community in Santo, although the local people initially requested the project team for a daily allowance for constructing a fish market with their participation, the people themselves completed the fish market near the end of the project, thanks to the persistent persuasion by the Fisheries Department branch extension officer based on the CBCRM concept. This is an unprecedented and rare example in Vanuatu, where it has been the norm for other donors to pay a daily allowance for the provision of such structures. In the case of the Waishishi of Tanna Island, the distribution activities that once failed are now gradually starting to be implemented with the initiative of fishermen, possibly as a result of the management training that had been conducted beforehand. It is hoped that the solar freezers provided this time will be the catalyst for the revitalisation of this activity.

The project C/Ps understand well the importance of inducing residents to take initiative in ways similar to those cited above. Moreover, cases such as the ones above are likely to boost the C/Ps' morale in their own extension work. Thus, it seems necessary to work with the C/Ps in a way that will increase chances for residents' initiative.

¹⁴ Waissi had lost its boat due to tsunami damage caused by a submarine volcanic explosion off the coast of Tonga. Although this community was not affected by the cyclone, it has a large bottom fishing industry and needs storage capacity for its catch, which is why the project provided a solar freezer.

b) Involvement of area councils

The results of the questionnaire survey showed that a low proportion of respondents in South Santo and Waisisi indicated that the involvement of area councils in coastal resource management had been strengthened by integrated CBCRM activities, especially in South Santo. The major cause seems to be that the Area Council's office, which was initially located in Nakere in Southern Santo, was relocated to a village more than an hour's drive each way, which meant that Area Council was not possible to fully participate in meetings and other activities and to have the Area Council involve in this activity.

Integrated CBCRM is not only about coastal resource management but also about community development through supporting measures, and the involvement of area councils responsible for local development is critical to ensure the sustainability of the activities.

4)-2 Lessons learned

a) Characteristics of coastal resource management in Vanuatu

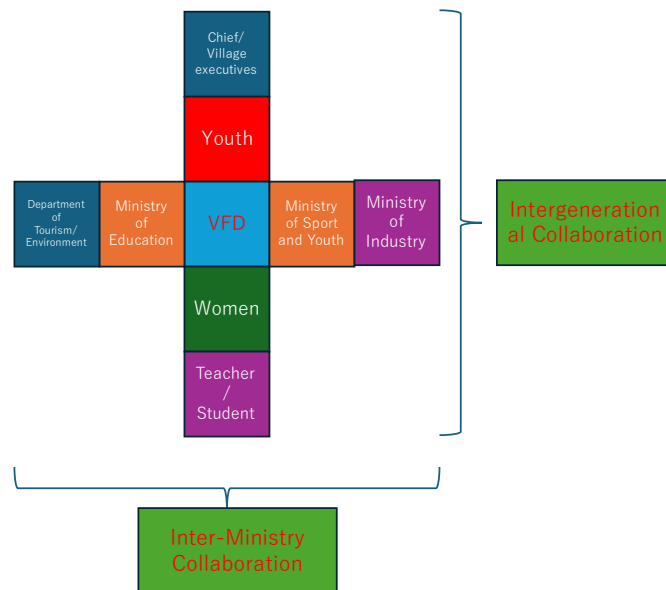
Management measures were generally compliant in the three sites surveyed, while support measures were not fully functioning, except on the Araki and Tangoa Islands in Sanma Province, where both management and support measures were functioning. In Vanuatu, the degree of solidarity among local people is strong, and a tendency to adhere to community-wide decisions is observed. On the other hand, resource management measures alone tend not to last. They may be strengthened or started anew if supporting measures help boost the morale of those who implement them.

b) Considerations to avoid creating conflicts

There were complaints from other communities about the transplantation of green snails and giant clams from Mangaliliu, Efate, to Emae Island, as they were transplanted only to Marae, the C/P community of origin. In this regard, it was noted that the probability of reproduction was increased by transplanting in a dense area and that the number of transplants was expected to rise in other communities owing to spillover effects. The propagation effect on the entire southern region in Efate has been confirmed, and once the number increases, green snails and giant clams will be transplanted to other communities. This phenomenon must be explained to the communities.

c) The need to address the entire social layer of the community in collaboration with the relevant ministries

Activities in the project that may appear remote from direct activities (tools) include tilapia farming, sporting events, marine education, and improved nutrition. The results and potential future impacts of individual activities have already been described. The following image shows the integration of the ripple effects in terms of 'society and culture' and 'institutions and governance' from the four



perspectives through all activities, including these activities. In other words, the aim is to involve all generations of the community in CBCRM activities by integrating the trials of each tool and collaborating with relevant ministries to achieve this. To this end, CBCRM activities must coincide with specific activity plans and budgetary measures for each agency, providing incentives for specific collaborations between the agencies concerned.

Thus, it is essential for project implementers not to be bound only by the work instructions of the sector they are in charge of but also to focus on the work plans, budgets, and human resources of local governments and relevant sector organisations with which they may collaborate. The importance of promoting cooperation from a holistic viewpoint as a project for regional development is emphasised.

4-5 Recommendations

4-5-1 The need for follow-up

Blue Economy practices that apply an integrated CBCRM approach have many advantages.

Establish a development approach ahead of other donors and trial its development into a Blue Economy concept through a national rollout within Vanuatu.

Apart from Vanuatu, where JICA has implemented integrated CBCRM, other projects related to coastal resource management, such as those in the Caribbean, have focused on resource management and supporting measures. While implementing projects in these countries, opportunities to collaborate with other donors and exchange views on the activities may arise. In many projects, especially those related to fisheries resource management in Western countries, the donor's policy is to specialise in activities related to resource conservation, and little budget is allocated to supporting measures implemented by the JICA. However, project managers in the field know the importance of supporting measures to involve the fishermen who use fishery resources, as 'conservation' alone cannot help but be a top-down approach.

In addition to the key components of resource management and support measures as an integrated

CBCRM approach, Phase 3 also demonstrated high effectiveness in terms of connecting (linkage) measures to motivate fishers to engage in both components, strengthening community structures, and coordinating support agencies to support these components. Due to these achievements, The project is receiving high evaluations from regional international organisations, such as SPC and MSG, and individual VFD personnel are being trained. The following specific activities can be envisaged as activities that JICA should support to deepen the understanding of the concept of integrated CBCRM, which is similar to the Blue Economy concept, and to accumulate knowledge for further application among development officers in fishery departments and the next generation of community development officers.

(1) Follow-up of Phase 3 activities that are considered to have potential for development

Tools that were not sufficiently validated in the COVID-19 period but could be developed in the future were included.

Piloting the monitoring sheets with the population: Monitoring sheets developed for implementation at the community level can be piloted by VFD staff. Japanese Experts will need to retrain the VFD staff on the benefits of the monitoring sheets implemented in Phase 3, albeit for a short period, until the population understands such benefits and is motivated to record. Furthermore, it is essential to incorporate monitoring incentives into the Community Extension Officer system after they have been concretised.

Marine education: The potential of marine education is discussed. It is essential to create a mechanism for cooperation between the Ministry of Education and the VFD that allows sharing benefits between both organisations. For example, VFD could produce seedlings of giant clams and release them to school-going children in the community, or a similar mechanism could be used for coral rehabilitation activities. The Ministry of Education allocates funds for effective extracurricular activities, and the Fisheries Department conducts resource conservation, restoration, and promotion activities at the national level with teachers and schoolchildren. As a tourism-based country, a win-win situation can be established between relevant agencies, including the Department of Tourism.

Improved nutrition: The potential for improved nutrition has been previously described. The same reasoning applies to marine education. In line with the government's policy of local production for local consumption and in collaboration with the Ministry of Commerce, Industry, and Education, which is also relevant to school meals, the fishery can contribute to resource management through maximum utilisation of the catch. Experts are indispensable in the development of such systems.

Community extension (development) officer system: As already mentioned, Vanuatu's community-based Authorised Officer system is mainly monitoring-oriented, reflecting donor-side policies that support training budgets. The VFD side is well aware of the need for a Community Extension Officer system. Implementing the policy at the provincial level and creating CBFM units have been formalised

as part of the institutional reform. The lack of implementation of the JICA project at this time raises concerns about the extent to which integrated CBCRM, such as the Authorised Officer system, will be incorporated. Experts' field activities during this system's establishment are considered essential.

4-5-2 Extension within the region

The integrated CBCRM approach is not region-specific. The four perspectives incorporated in the strategy are not only specific to Vanuatu. For example, from a micro perspective, such as which tools are appropriate for resource management measures, there will be differences in local maritime spatial conditions, target stocks, exploitable fish species, socio-cultural backgrounds to the use of fishing grounds, and different institutional and governance systems in different countries, making it essential to select tools that reflect these factors. Therefore, choosing tools that are tailored to these differences is essential. The integrated CBCRM approach provides a broad framework for developing a comprehensive analysis of such differences and can be applied to any region. The 'support measures' may also be used as 'sustainable development measures', which will become indispensable in the future, instead of 'support measures' for regional development in the context of the Blue Economy. These discussions led us to believe that this approach can be applied to any country, and not just Oceania.

When defining the scope of application of integrated CBCRM in collaboration with regional international organisations, it would be possible to extend it to MSG countries with high socio-cultural similarities or to Micronesia and Polynesia in partnership with the SPC.

In terms of linkages with JICA's current and future projects in the region, if the USP SDG 14 project is positioned as an activity focusing on resource management measures, the National Fisheries College (NFC) in PNG could be positioned as a disseminator of the integrated CBCRM approach as a regional vocational training college responsible for supporting or 'sustainable development measures'.

Responsibilities	Rating	Plans/Actual	Total Man-Months		Number of trips			
			Entire Period	Month in question	Entire Period	FY2021	FY2022	FY2023
Akiya Seko Chief advisor/Coastal resource management①	2	Initial plan	4.7		4			
		Latest plan	4.63					
		Achievements	4.63		5	0	3	2
Satoshi Nagashima Deputy chief adviser/Fishery extension ①	3	Initial plan	4.7		5			
		Latest plan	6.03					
		Achievements	6.03		5	0	3	2
Hiroaki Terashima Fishery extension②	3	Initial plan	4.27		4			
		Latest plan	3.07					
		Achievements	3.07		2	0	1	1
Naoko Inada Fishery extension ③ /Support for social vulnerable/Coastal resource management ③	3	Initial plan	4.5		4			
		Latest plan	4.37					
		Achievements	4.37		6	0	3	3
Manabu Echigo Coastal resource managemet②	3	Initial plan	2.67		2			
		Latest plan	1.34					
		Achievements	1.34		1	0	0	1
Hiroki Eda Inland aquaculture	3	Initial plan	3		3			
		Latest plan	3					
		Achievements	3		3	0	2	1
Saori Imamura Added value improvement/Training supervision and education/Support for social vulnerable②	4	Initial plan	4.3		4			
		Latest plan	4.7					
		Achievements	4.7		5	0	3	2
Asumi Tsuji Coordination/quality control and hygiene management/nutrition improvement	5	Initial plan	4		4			
		Latest plan	5.17					
		Achievements	5.17		5	0	3	2
Akito Ashida Marketers	4	Initial plan	2		3			
		Latest plan	2.47					
		Achievements	2.47		3	0	2	1
Mitsuo Iinuma Solomon Coastal Resource Management/Fisheries Training Program	3	Initial plan	6.03		5			
		Latest plan	6.37					
		Achievements	6.37		5	0	3	2
Michiaki Takeda Equipment procurement management	4	Initial plan	2		5			
		Latest plan	2					
		Achievements	2		0	0	0	0
Initial Plan (Total)			42.17		43	0	0	0
Latest plan (Total)			43.15		0	0	0	0
Achievements (Total)			43.15	0	40	0	23	17

CERTIFICATE OF RECEIPT OF THE GOODS

TO: M/S. NICHIMO CO., LTD

Tennoz Ocean Square, 2-20 Higashi-Shinagawa
2-chome, Shinagawa-ku, Tokyo 140-0002 Japan

&

TO: M/S. IC NET LIMITED

Land Axis Tower, 27th Floor,
11-2 Shintoshin, Chuo-ku Saitama-shi
Saitama 330-6027, Japan.

This is to certify that we have duly received the following goods

Based on a technical cooperation project agreement with Japan International Cooperation Agency

Description:

Recovery Equipment for Tropical Cyclone Harold

The project for promotion of Grace of the Sea in the coastal village (Phase III) in the republic of Vanuatu

Invoice and Packing List No. VN-GS-3

Dated : 25 MAY 2022

Shipped by "CORAL ISLANDERS II VOY NO.147"

Three (3) 40 Foot Dry Container (SOC) (Total 256 packages including 3 containers)

The Vanuatu Fisheries Department
under the Ministry of Agriculture, Livestock, Forestry,
Fisheries and Biosecurity (MALFFB).
PORT VILA, VANUATU



Dated: 15 July 2022

Attachment3:Workshops and trainings

Number of times	Year/ Month	Title	Place	Number of Participants	Target
1	2012/04	Preliminary Survey Workshop	Efate, Malekura and Aneityum	73	CBCRM or MPA committee members
2	2022/08	Project & CBCRM Training	VFD	15	Young staff who joined VFD during the absence of Japan experts in their third and fourth years
3	2022/11	WS for finalizing the interim CBCRM plan	Tanna Island	30	Fishermen involved in the CBCRM plan
4	2022/11	CBCRM/Equipment Utilization Training	Pentecost Island	30	Fishing group representatives, fishermen from Wanur and surrounding communities
5	2022/11	CBCRM/Equipment Utilization Training	Pentecost Island	4	Community Representatives, Fishermen
6	2022/11	CBCRM Approach Training for Community Extension Officers and Community Leaders	Santo Island	16	Community-based Authorized Officer in Torba, Sanma, Malampa, Penama and Shefa
7	2022/11	Environmental education	Efate Island Mangaliliu Community Hatchery	50	Schoolchildren in Mangaliliu
8	2022/11	Environmental education	Efate Island Mangaliliu Community Hatchery	17	Elementary school students on Lelepa Island
9	2022/11	Environmental education	Efate Island Mangaliliu Community Hatchery	5	Teachers at teacher training schools
10	2023/2	CBCRM Regional Seminar	Vanuatu	35	Fisheries Department officials involved in community-based fisheries management in the Solomons, Fiji, PNG, Samoa, and Tonga
11	2023/2	Environmental education	Efate Island Mangaliliu Community Hatchery	50	Schoolchildren in Mangaliliu
12	2023/2	CBCRM/Equipment Utilization Training	Uripiv Island	25	Fishermen and residents of Uripiv Island
13	2023/6	CBCRM/Equipment Utilization Training	Epi Island	29	Fishermen and residents of Epi Island
14	2023/7	Environmental education	Efate Island Mangaliliu Community Hatchery	47	Students at Seaside School
15	2023/8	Fish quality and spoilage training	Epi Island	20	Epi Island Fishermen
16	2023/8	CBCRM Cup	Santo Island	200	GOS project sites (Araki, Tangoa, Nakere, Wailapa), Pathways project sites (Big Bay, East Malo, Port Olry, West Malo) person in fisheries industry
17	2023/10	CBCRM Regional Seminar	Vanuatu	37	Fisheries officials involved in director-general-level or community-based fisheries management in the Solomon Islands, Fiji, Papua New Guinea, Samoa and Tonga
18	2023/11	Meeting of establishment of the liaison conference for deep-bottom fish fishery management in Shefa province	Emae Island	20	Fisherman of Emae Makira Mataso, Area Administrator of Shefa Province, Extension Officer of Shefa Province
19	2023/11	Workshops on Nutrition Improvement	Efate Island	13	Schools implementing the Farm to Table program, the Ministry of Health, Vila Central Hospital, etc.
20	2023/11	Eco Tour Coral Restoration Activities	Efate Island Mangaliliu Community Hatchery	15	General visitors residing on Efate Island
21	2023/11	Environmental Education Training Instructor Development Workshop	Efate Island Mangaliliu Community Hatchery	9	Mangaliliu residents interested in marine resource management
22	2023/12	Eco Tour Coral Restoration Activities	Efate Island Mangaliliu Community Hatchery	17	Australian university students and the general public in Vanuatu

Attachment4 : Counterpart

Names	Position/Title
ADMINISTRATION	
Kalo Pakoa	Former DG
William Naviti	Former DG
Sompert Rena GEREVA	Acting Director
Tony TALEO	Deputy Director Offshore
COMPLIANCE/ENFORCEMENT	
Yakar SILAS	Principal MCS
SEAFOOD VERIFICATION	
Sammy JAMES	A/Manager SFVA
Evelyn FIRI	Senior Authorise Verification Officer
Erica DICK	Authorities Officer - Certification
Brian TULA	Data Entry Clerk - Santo
RESEARCH/AQUACULTURE	
June B MOLITAVITI	Manager Research/Aquaculture
Josephine RAMBAY	Principal Aquaculture Officer
Rocky KAKU	Principal Rick Analyst Officer
Lency DICK	Principal Mariculture Officer
Andrew WILLIAM	Senior Mariculture Officer
Sophia SAWAN	Mariculture Officer
Jayven HAM	Principal Fisheries Biologist
Ada SOKACH	Senior Fisheries Biologist-Finfish
Glen ALO	Aquaculture Officer-North - Santo
Gibson VUTI	Hatchery Technician - Santo
Rodrick TATUNA	Hatchery Technician - Vila
Noel MOLLY	Assistand Hatchery - Vila
MANAGEMENT & POLICY	
Ajay ARUDERE	A/Management/Policy Officer
DEVELOPMENT & CAPTURE	
Jeremy Kaltavara	Former Manager Dev & Cap
George AMOS	Manager Dev & Cap
Malili MALISA	FDO-Fisheries Dev Officer - Malampa
Obed Alsen Fred	Former A/Principal North
Malcome LINAWAK	A/Principal North
Dimitri KELALA	FDO-Fisheries Dev Officer - Penama
Tom KIRI	FDO - Fisheries Dev Officer - Shefa
	FDO-Fisheries Dev Officer - Tafea

Socio Economic Survey Report
For the Project of Promotion of Grace of the Sea
In the Coastal Villages (Phase III)
in the Republic of Vanuatu

July 2017

IC NET Limited
INTEM Consulting Inc.

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Abbreviation

CB-CRM	Community-Based Coastal Resource Management
FAD	Fish Aggregating Device
GIFT	Genetically Improved Farmed Tilapia
GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit)	German Society for International Cooperation
IRD (Institut de Recherche pour le Développement)	Institute of Development Research
JICA	Japan International Cooperation Agency
JOCV	Japan Overseas Cooperation Volunteer
MALFFB	Ministry of Agriculture, Livestock, Forestry, Fisheries and Biosecurity
MPA	Marine Protected Area
NGO	Non-Governmental Organization
SPC	Pacific Community
TAC	Total Allowable Catch
UNDP	United Nations Development Program
VCAP	Vanuatu Coastal Adaptation Project
VFD	Vanuatu Fisheries Department
Vt	Vatu

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A. Introduction

1. Purpose of the Survey

In Vanuatu, as part of strengthening the capacity to implement coastal resource management by Vanuatu Fisheries Department (herein after referred to as “VFD”), JICA had implemented “Project of Promotion of Grace of the Sea in the Coastal Village (Phase I) (2006 - 2009)” which aimed to conduct aquaculture focusing on shellfish, which is a strongly fixation resource, and to formulate manuals of coastal resource management through community initiative in Efate Island where the capital city exists as a model site. After that, “Project of Promotion of Grace of the Sea in the Coastal Village (Phase II) (2011 - 2014)” had been implemented to aim to introduce and demonstrate the Community Based Coastal Resource Management (CB-CRM) approach focusing on improving the skill of further technical guidance capacity to coastal resources management by VFD.

It is in the stage of creating a hypothesis of the highly effective CB-CRM approach at the time both phases have ended. After that, “Project of Promotion of Grace of the Sea in the Coastal Village (Phase III) (herein after referred to as “the Project”)” was requested from VFD in order to enhance the versatility of this approach and to establish “Integrated” CB-CRM, which become a model that can be disseminated not only within Vanuatu domestically but throughout the whole Pacific states through collaboration with other agencies. In response to this request, the Project has been started since March 2017.

In order to enhance the versatility of this approach as “Integrated” CB-CRM, options of various resource management measures and supporting measures are required to be able to apply various types of communities from the viewpoint of resource, socioeconomy and cultural aspects. Therefore, a survey was conducted to select these new options. As a primary socio-economic survey, a survey was conducted to aim identifying sites with socioeconomic conditions suitable for trial, evaluation and feedback of various resource management measures and supporting measures. In addition, as a second survey, a questionnaire survey was implemented for targeting households in the sites to obtain socioeconomic data of the communities as a base for measuring the effect of implementation of the new resource management measures and supporting measures and to examine what kind of resource management/supporting approach should be used in each target area

2. Methodology

1) Document review

The reports issued by the Vanuatu Statistic Office are reviewed and the socioeconomic situation of the targeted areas are grasped. The referenced materials are as follows.

Table 1: Documents referred in the Document Survey

Title	Place of issue	Time published
2009 National Population and Housing Census Basic Tables Report Volume 1	Vanuatu National Statistic Office	2010
Vanuatu Household Income and Expenditure Survey Report	Vanuatu National Statistic Office	December, 2012
Location of Facilities	Vanuatu National Statistic Office	
International Arrival Statistics	Vanuatu National Statistic Office	December 2015 December 2016

2) Interview surveys

Interview surveys were conducted on delegates who grasp the socioeconomic circumstances of neighboring areas such as area secretary and chief of target area to grasp the situation of governance in the island and village. In addition, interviewing women's groups were also carried out to get information on the main economic activities for women, situation of women groups and the social status of women etc.

3) Workshops

For men and women who are actually engaged in fishery and agriculture, workshops were held with five to 10 participants and information was gathered by a method of having write information themselves on fishery and agriculture with their hands to obtain the information which they have for short period without any biasness by the surveyors.

4) Questionnaire survey

In order to contribute to the examination of factors affecting resource management activities at each site and extraction of appropriate indicators through the pilot activities in the sites of this survey, the awareness of local population on the resource management, a questionnaire survey was conducted to grasp the current situation of livelihoods, socioculture, (details of results are summarized in Appendix 16).

3. Pre-screening and selection of the survey sites

As candidate pilot projects for the Project, VFD offers two communities in the eastern part and

four communities in the southern part of Espiritu Santo Island, six communities in Emae Island, three communities in the western part and one community of the eastern part in Tanna Island, three communities in Aniwa Island and three communities in Futna Island were listed as candidates. In these sites, interviews with chiefs and the local population through preliminary visits or interviews with the staff of VFD who are familiar with the local circumstances were conducted at each of the 18 community sites excluding Futuna Island¹ from the three perspectives such as significance of introducing CB - CRM activities (the tendency of coastal resources to decrease etc.), level of crisis awareness of the local population toward decrease trend and possibility of developing new tools which are important constituent factors of the Integrated CB-CRM approach, and discussion was made with VFD based on the collected information. It was discussed the possibilities of development of new tools both for resource management measures and supporting measures, and preliminary screening was conducted on concrete communities for selection of candidate sites which were considered appropriate for detailed survey.

(1) Espiritu Santo Island

Result of preliminary screening in the candidate sites in Espiritu Santo is as following Table 2.

Table 2: Result of pre-screening of candidate survey sites in Espiritu Santo Island

Candidate survey sites	Result of pre-screening	
Araki Island, Tangoa Island, Nakere and Wailapa (Espiritu Santo Island) (Four communities in South Santo)	Significance of introducing CB-CRM	As a result of the preliminary visit, it was confirmed that agriculture is basically popular in the area. However, in recent years, cases which fishery is carried out has increased as agriculture was damaged by drought. Therefore, fishing pressure on the coastal resources may increase in the future and significance of introducing CB-CRM is high.
	Level of crisis awareness of the local population toward decrease trend	Currently, it is not indispensable situation for resource management activities to reduce resource decline gradually and is not high in the local population's sense of crisis awareness for the resource.
	Possibility of developing new tools	There is a possibility of trying to set up resource management area by each community or to establish joint management area by four communities. In addition, as a

¹ It was scheduled to visit in this survey, but the flight was canceled. The flights are often canceled all of a sudden, and in that case, there is no option to return to Tanna Island by boat like Aniwa Island which is close to Tana Island, and it is actually the only way to wait for the resumption of flight to the island .

		resource management and supporting tool, trial of outer reef fisheries in the island sites and improvement of the production site such as trial of aquaculture by women (women's group) in the mainland side, and it was also found out the possibility of developing new tools from the viewpoint of value chain development such as supporting improvement of fish distribution to collect catch at the sites and distribute to large scale market. In addition, since any project by other donors have not been done so far, it is possible to try an approach of "preventive approach" that needs to start with awareness raising activities which VFD has not experienced so far.
	Result of preliminary screening	In southern part of Espiritu Santo Island, significance of introducing CB-CRM is high. In addition, as described above, various activities related to new tools can be expected. Furthermore, JOCV activities are continuing and there is a high possibility to conduct joint activities with JOCV who is still taking over the activities left by the predecessor. Therefore, it deserves to conduct detailed survey.
Hog Harbour and Port Orly (Two communities in eastern part of Espiritu Santo Island)	Significance of introducing CB-CRM	The eastern part of Espiritu Santo, where Hog Harbour and Port Orly are located, is a region where fishery is popular. Both sites are pilot sites of fishery resource management project named PacFish, which SPC is mainly implementing under the support of Australia. As a result of the preliminary visit, in Hog Harbor, there is a decline in the resource of lobsters to be provided to tourists of cruise ships which visit regularly. It means that it is meaningful to introduce CB-CRM. In addition, in Port Orly, a management plan was formulated as part of resource management activities in Pacfish due to resource reduction. Same as Hog Harbor, there was a demand as a candidate site for resource management activity trials with the view of integration of tourism and fishery.
	Level of crisis awareness of the local population toward decrease trend	In Hog Harbor, resource management activities of lobsters by local population (periodic change of fishing ground) were carried out even before the start of PacFish, and they are advanced more than activities in Aneytum where community

		based management of lobsters is also carried out. Awareness to resource management is high, and it becomes good example to other places. In Port Orly, although there is crisis awareness among local population, it has not reached the approval of the above plan with the Chief Council.
	Possibility of developing new tools	Both of these sites have similarities with Aneytum Island of the Phase II site where tourism is prosperous since cruise ships call regularly and local population is engaging in lobster resource management activities offered to visitors of the cruise ships. As for resource management mainly based on lobsters, activity is progressing more than the one in Aneytum Island. In addition, the introduction of supporting tools by PacFish is being conducted, and the possibility of new tool development is limited.
	Result of preliminary screening	Though PacFish which ended in June 2017, Phase 2 is scheduled to begin in November 2017. Therefore, there is a possibility that both sites can support by mutual visit etc. through cooperation with PacFish. For that reason, it is judged that the two sites in the eastern part of Espiritu Santo Island can effectively utilize the limited resources of the Project by supporting through collaboration rather than the Project itself independently conduct activities. Therefore, these sites are not selected as detailed survey sites.

(2) Emae Island

Result of preliminary screening in the candidate sites in Emae Island is as following Table 3.

Table 3: Result of pre-screening of candidate survey sites in Emae Island

Candidate survey sites	Result of pre-screening	
Marae, Makatea, Tongamea, Sangava, Tapakoro, Sasake (Six	Significance of introducing CB-CRM	In the past, a counterpart of VFD tried to formulate a draft resource management plan for the entire island, but agreement has not been reached among the community. The resource management committee was organized, but the concrete activities has not been done. The number of main coastal communities are six and it is many. In addition, there are

communities in Emae Island)		fishery activities by fishermen of other islands at the offshore large reef and so on, and the difficulties related to coastal resource management are diverse and significance of introducing CB-CRM is high.
	Level of crisis awareness of the local population toward decrease trend	As a result of the preliminary visit, the tendency of decrease in the coastal resources is observed, and the awareness of resource management of local population is increasing.
	Possibility of developing new tools	From the viewpoint of supporting measures, the fishery in the reef is the main activity in Emae Island, and there is a possibility of developing new tools such as reduction of fishing pressure inside the reef through fishery development outside of the reef, and with this, tourism development and distribution improvement measures as it is close to the island of the capital city. In addition, it is possible to apply the experience to be a model to progress the resource management in the similar islands such as coastal resource management by whole island level and outer reef management by fishermen of whole Island of Emae and other islands.
	Result of preliminary screening	Regarding Emae Island, the fishery extension officer is not assigned, but new authorized officers ² have been appointed. It is suitable for making cases such as preparation of the entire island management plan with multiple villages through the resource management committee which oversees the entire island and to develop joint management plan with other islands on the offshore reef. Therefore, it deserves to conduct detailed survey. However, in order to conduct detailed survey in a limited survey period, it is carried out in Marae, Tongamea and Sangava where have a large population, face coastal areas and represent fishing villages in Emae Island.

(3) Tanna Island

Result of preliminary screening in the candidate sites in Tanna Island is as following Table 4.

² Authorized officers are community extension officers in the communities certified by VFD.

Table 4: Result of pre-screening of candidate survey sites in Tanna Island

Candidate survey sites	Result of pre-screening	
	Significance of introducing CB-CRM	As a result of the preliminary visit, the community has set a small taboo area ³ on its own initiative. However, as coastal reef resources have drastically decreased and are hardly used, there is almost no fish species to be subject to resource management.
	Level of crisis awareness of the local population toward decrease trend	Due to the remarkable decrease in resources, local population's crisis awareness is high.
	Possibility of developing new tools	Trial of resource management measures based on resource multiplication by transplanting etc. can be assumed. However, it has not been able to identify target species that can be transplanted from other areas at the present time. Since tilapia culture is being promoted in the inland area, there is a possibility of promoting CB-CRM which combining with management measures if livelihood improvement by tilapia culture and transplantable fish species are found in the future.
	Result of preliminary screening	The awareness of resource management by local population is increasing, but in reality, there is no resource to be managed. However, since the area is close to the provincial center of Lenakel where a fishery extension officer is assigned. If resource management measures based on resource multiplication can be considered in the future, it is expected that the project team will support their activities technically to some extent respecting autonomy of VFD. For this reason, detailed survey is not carried out.
Waisisi (One community of eastern part in Tanna	Significance of introducing CB-CRM	As a result of preliminary visit, coastal resources seem to be decreased. Women mainly use the coastal resources, and it is necessary to implement awareness raising of the resource management centered on women, and there is a possibility to

³ The taboo area in Vanuatu refers to the specific area where the owner of the foreshore or the village's chief are restricting fishing. Regarding this taboo area, there are various forms such as full ban fishing, limited season, limited fishing method, limited fish species.

Island)		carry out new activities to adopt a view point of gender.
	Level of crisis awareness of the local population toward decrease trend	Due to high dependence on pelagic fish and bottom fish resources outside of reef, the crisis awareness about the reduction of coastal resources is not so high.
	Possibility of developing new tools	In Tanna Island, tourism has high potential and future possibility of tourism development is expected. In addition, this community sell a lot of bottom fish to the fish market constructed by grassroots grant aid project in 1983. However, due to aging of facilities, it is expected to conduct supporting measures including improvement of distribution through revitalizing the facilities.
	Result of preliminary screening	In the eastern part of Tanna Island, there are possibilities such as utilization and management of bottom fish resources caught in the remote islands around Tanna Island and introduction of coastal resource management from the viewpoint of gender. It is also promising to develop new supporting tools such as value chain development mainly with collection and sales facilities for fishery products mentioned above. Furthermore, unlike Espiritu Santo Island, where has already been developed tourism in advance, the potential of tourism development in the future is significant, and here is selected as a detailed survey site.

(4) Aniwa Island

Result of preliminary screening in the candidate sites in Aniwa Island is as following Table 5.

Table 5: Result of pre-screening of candidate survey sites in Aniwa Island

Candidate survey sites	Result of pre-screening	
Ikoukau, Isavai and Imatu (Three communities in Aniwa Island)	Significance of introducing CB-CRM	According to the interviews, fisheries are major activities in Aniwa Island. Agriculture has been damaged by Cyclone Pam in recent years and the importance of fishery is increasing. It is a project site by PacFish and activities are continued in the PacFish Phase 2 same as the eastern part of Espiritu Santo Island.

	Level of crisis awareness of the local population toward decrease trend	There is still no trend of declining the resource so much, and crisis awareness toward the resource reduction is not so high.
	Possibility of developing new tools	Regarding the coastal resource management, activities coordinated with PacFish are considered. It is typical remote islands in Vanuatu and suitable for developing tools for fishing methods of large migratory fish that has been developed in advance and the marketing.
	Result of preliminary screening	Regarding Aniwa Island, it is an isolated island that economically depends on neighbouring major islands where development is being progressed like Emmae Island. In addition, as mentioned above, extension of PacFish has been decided for coastal resource management. On the other hand, for bottom fish fishery, it is shared a fishing ground with Waisisi in the eastern coast of Tanna Island. Furthermore, there is a high possibility that cases of development of new supporting tools combined with fishing methods and marketing for large migratory fish which are not used much in most islands of Vanuatu. In this way, there is a possibility to segregate target resources and sea areas or to collaborate on some activities with PacFish, and here is selected as detailed survey site.

(5) Futuna Island

Result of preliminary screening in the candidate sites in Futuna Island is as following Table 6.

Table 6: Result of pre-screening of candidate survey sites in Futuna Island

Candidate survey sites	Result of pre-screening	
Three communities in Futuna Island	Significance of introducing CB-CRM	According to interviews, the fishery is a major activity as well as Aniwa Island. In addition, there is a record which grassroots technical cooperation on fish processing was implemented in the past. Taboo area etc. are not officially registered. Therefore, there is a significance of introducing CB-CRM.

	Level of crisis awareness of the local population toward decrease trend	There is still no trend of declining resources so much, and sense of crisis to resource reduction is not so high.
	Possibility of developing new tools	Since the similarity with Aniwa Island is high and it depends economically on the main island, the tool development is assumed to be similar.
	Result of preliminary screening	Direct support by the Project is difficult since it is more than three times farther away from Tanna Island than Aniwa Island, which is relatively close to Tanna Island. Therefore, it is desirable to support the activities of the VFD. For this reason, Aniwa Island, which is relatively accessible, was set as a candidate for detailed survey, and for Futna Island, it was decided not to carry out detailed survey.

As the results above, 11 sites shown in Figure 1 are selected as candidate detailed survey sites. These are Nakere, Wailapa (Espiritu Santo Island), Araki Island and Tangoa Island as southern part of Espiritu Santo island, Marae, Tongamea and Sangava in Emae Island (many populations and they are related to fishing in cook reef), Waisisi in Tannna Island (it is possible to try both bottomfish resource management and coastal fishery management) and Ikoukau, Isavai and Imatu in Aniwa Island (for the purpose of developing new tools at remote island).

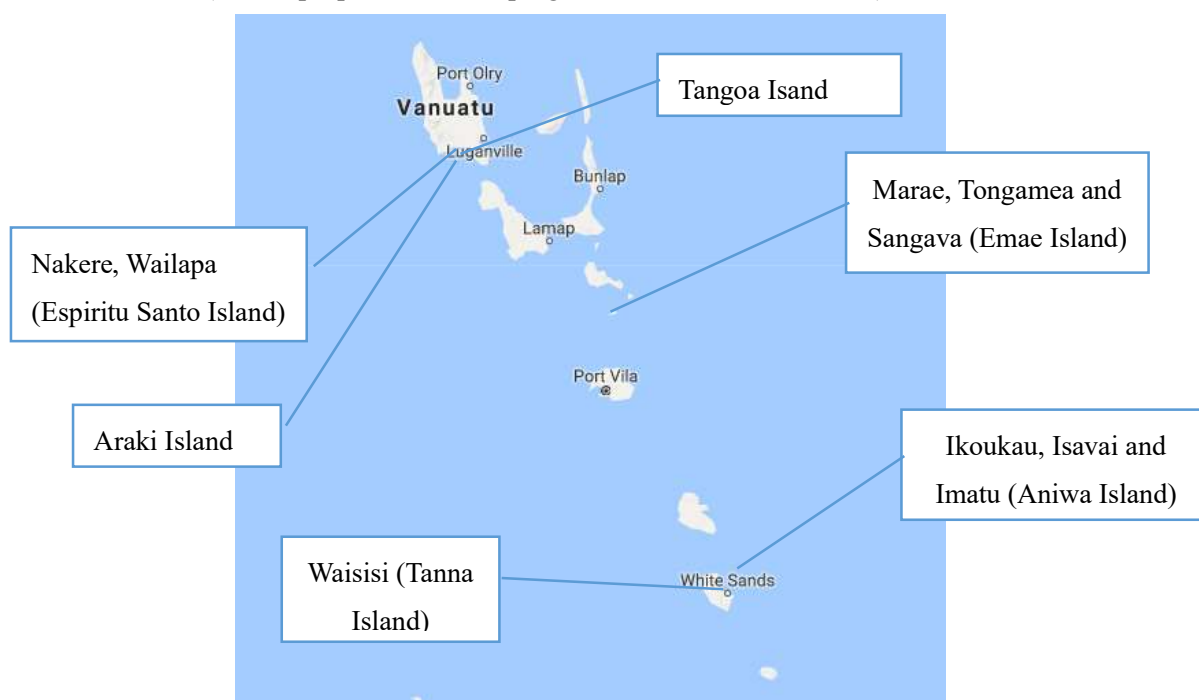


Figure 1: Place of Survey in the socioeconomic survey

B. Socioeconomic situation in the candidate sites

1. Socioeconomic situation in Southern part of Espiritu Santo Island (Wailapa and Nakere), Tangoa Island and Araki Island (South Santo)

1-1 Overview of Sanma Province

Espiritu Santo Island, Tangoa Island, Araki Island is located in Sanma Province. Sanma Province has the largest area in all provinces of Vanuatu with a total area of 4,262 km². The population is 45,855 (in 2009), second after Shefa Province where there is the capital city, and in the main island of Espiritu Santo Island, there is second urban area (Louganville) following Port Vila, the capital city. The population growth rate is higher than the average of the whole country, and like Port Vila, the rate of increase in urban areas seems to be high. (For details of statistics, see Appendix 1).

According to Tables 7 and 8, in Sanma Province, about 60% of the population are engaged in primary industry. In addition, according to Table 9, about half of the communities are engaged in fishing in Sanma Province, but they are on a downward trend. Furthermore, according to Table 10, nearly 90% of households in Sanma Province conduct fishing for self-consumption.

Table 7: Main industries engaged by men in 2009 at Provinces where there are candidates of pilot sites

	Sanma	Whole Vanuatu	Vanuatu Urban	Vanuatu Rural
Whole workers	10,553	53,646	12,432	41,214
Agriculture forestry and fishing	6,576 (62.3%)	31,762 (59.2%)	835 (6.7%)	30,927 (75.0%)
Construction	749 (7.1%)	4,422 (8.2%)	2,372 (19.1%)	2,061 (5.0%)
Wholesale and retail trade, repair of motor vehicles	745 (7.1%)	3,565 (6.6%)	2,077 (16.7%)	1,488 (3.6%)
Transport and storage	570 (5.4%)	2,518 (4.7%)	1,476 (11.9%)	1,042 (2.5%)
Public administration	758 (7.2%)	4,214 (13.4%)	1,948 (15.7%)	2,266 (5.5%)
Others	1,155 (10.9%)	7,165 (13.4%)	3,724 (30.0%)	3,430 (8.3%)

Source: National Population and Housing Census 2009, Vanuatu National Statistics Office

Table 8: Main industries engaged by women in 2009 at Provinces where there are candidates of pilot sites

	Sanma	Whole Vanuatu	Vanuatu Urban	Vanuatu Rural
Whole workers	8,082	40,814	8,320	32,494
Agriculture, forestry and fishing	5,737 (71.0%)	25,429 (62.3%)	540 (6.5%)	24,889 (76.6%)
Wholesale and retail trade, repair of motor vehicles	590 (7.3%)	4,181 (10.2%)	1,946 (23.4%)	2,235 (6.9%)
Accommodation	176 (2.2%)	1,403 (3.4%)	933 (11.2%)	470 (1.4%)
Public administration	553 (6.8%)	2,861 (7.0%)	1,261 (15.2%)	1,600 (4.9%)
Household activities	309 (3.8%)	2,328 (5.7%)	1,291 (15.5%)	1,037 (3.2%)
Others	717 (8.9%)	4,612 (11.3%)	2,349 (28.2%)	2,263 (7.0%)

Source: National Population and Housing Census 2009, Vanuatu National Statistics Office

Table 9: Number of households engaged in fishery in the rural area in 2007 in the Provinces where there are candidates for the pilot sites

	1992			2007		
	Rural households	Households engaged in fishing	Percentage (%)	Rural households	Households engaged in fishing	Percentage (%)
Vanuatu rural	21,908	10,910	49.8	33,879	15,758	46.5
Sanma	3,218	1,641	51.0	5,991	2,189	36.5

Source: Vanuatu National Statistics Office, Census of Agriculture 2007

Table 10: Number of households engaged in fishing in the last 12 months by purpose and by province (August 2007)

	Total Households	Main Purpose of fishing		
		Mainly consumption	Consumption with occasional selling	Mainly for sale
Vanuatu rural	15,758	11,557 (73.3%)	4,127 (26.2%)	74 (0.5%)

Sanma	2,189	1,908 (87.2%)	281 (12.8%)	-

Source: Vanuatu National Statistics Office, Census of Agriculture 2007

Thus, in Sanma Province, nearly 90% of households conduct fishing for their own consumption even though they have Louganville which is a large consuming area. However, as demand for fishery products is expected to increase for tourists who increase in the number year by year (Figure 2), there is a possibility of improving income of fishers through adding value to fishery products and improve fish distribution while promoting resource management activities.



Figure 2: Transition of number of tourists in the Provinces where there are candidates of pilot sites for the Project

Source: Vanuatu National Statistics Office, International Arrival Statistics

1-2 Southern part of Espiritu Santo Island (Wailapa and Nakere), Tangoa Island and Araki Island (South Santo)

1-2-1 Outline of South Santo

Social and cultural conditions in South Santo are as follows.

(1) Access

Air Vanuatu flies there every day. The flight time from Port Vila is about 40 minutes. It takes about 15 minutes from the airport to the center of the capital city of Luganville. It takes about 40 to 50 minutes by car from the center of town to Nakere in South Santo and 60 minutes to 70 minutes to Wailapa. In addition, Tangoa Island is 10 to 15 minutes by rowing boat from Nakere, and it takes about 40 minutes to 1 hour to Araki by boat.

As of April 2017, the bridge that crosses the river on the road from Nakere to Wailapa was broken down. There is a possibility that it is difficult to pass the river when water level rises in rainy weather.

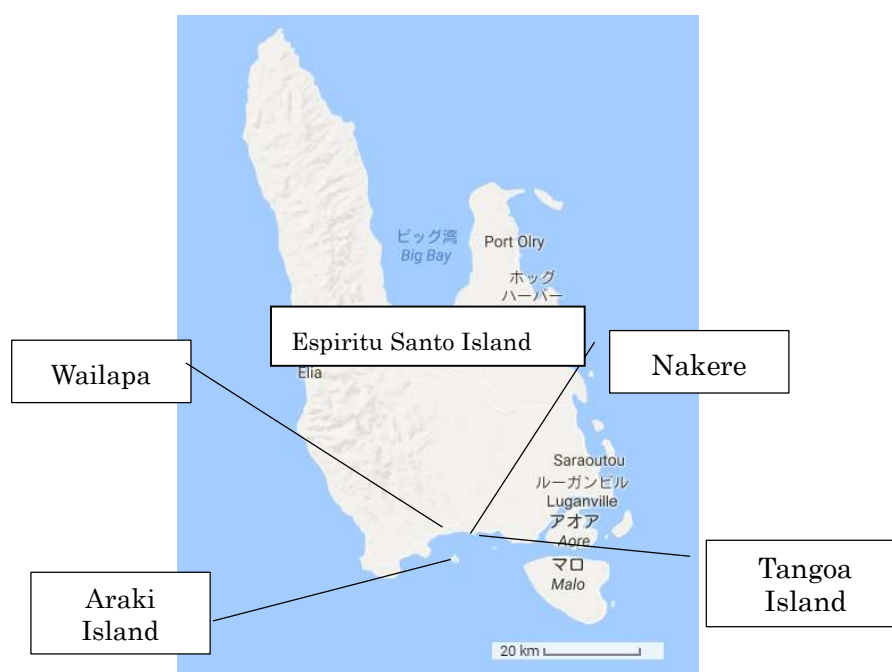


Figure 3: Map of Espiritu Santo

(2) Population

The population of the four communities that the survey was conducted during the period is as Table 11.

Table 11: Population in the four communities in South Santo

Wailapa	Wailapa is a combined name for the three areas of Wailapa Village, Namaho Village and Parisa Village, and sometimes refers to Wailapa Village alone. In Wailapa Village alone, there are 30 households and the population is 175 people. In the whole Wailapa area, there are more than 60 households and the population is more than 300. The population is increasing.
Nakere	Nakere is name of a village and general term of multiple villages in the area. In Nakere village alone, there are about 24 households and the population is about 180 in Nakare community. If neighboring villages are combined, it would be 300 households. The population is increasing. Migration from Tangoa Island is also increasing.
Tangoa	There are 26 households and 262 people in Tangoa Island. Since the usable land is limited in the Island, migration of population to Nakere began in the 1980s. Migration has increased but the population also increasing due to birth.
Araki	There are 245 people in 31 households, and the population is increasing.

(3) Condition of social infrastructures

The main mean of transportation to reach to Nakere and Wailapa is by vehicle, and it passes irregularly. From the provincial capital, Luganville, the road is paved halfway, but then it becomes an unpaved road. There is a plan to pave the road from about 10 years ago, but it has not made any progress. The condition of other social infrastructure in the four communities is as Table 12.

Table 12: Condition of the main social infrastructures in South Santo

Wailapa	As an educational facility, there is Wailapa center primary/secondary school. There is a dispensary ⁴ as a health facility. There is no electricity, but solar panels are in almost all households except two. There was a public water supply, but it is not available now due to water source problem, and people depend on rain water.
Nakere	There is Tata primary school as an educational facility. Health facilities are not located in the village. When people get sick, they will be transported to neighboring villages. The main source of water is rainwater. There is no electricity, and some people have solar panels.
Tangoa Island	There is a kinder garden in the island, but no primary school. Therefore, the children cross the sea and go to Tata primary/secondary school. There is no health facility and it is necessary to go to the mainland by canoe when people get sick. In the past, public water supply was coming from the mainland, but since the water source has become exhausted, people use rain water. In addition, there are times when they do not have sufficient water, they bring it from the mainland. There is no electricity.
Araki Island	As an educational facility, there is Leihleina primary school in the island. Although there is an aid post as a health facility, it has been closed for three years from 2014. The reason is that there is no housing for the nurse. There is no electricity, and some people are using solar. There is one well in the island, but the pump is out of order (operated by solar). Therefore, people depend on rainwater.

(4) Regional culture

In the vicinity of Tangoa Island, about 90% of the local population are believers in the Prebyterian church. This is influenced by the fact that the missionary of Prebyterian church came to Tangoa from 1887 and did missionary work based on this place. In addition, there are a few followers such

⁴ In the referral system of Vanuatu health facilities, there are aid posts or dispensaries as primary health facilities, health centers as secondary health facilities, and provincial hospitals as tertiary health facilities. There is no clear difference in function between aid post and dispensary, but the aid post is smaller. Compared to the primary medical facilities, the health centers have more medical equipment, and nurses are surely assigned.

as SDA, Baptist.

In Nakere, most men are from Tangoa, but many women came from other places (Malekura, Tangoa, etc.) and are married. According to the interview survey, all the important decisions in the household are done by men, and the status of women in each household is nearly unexpectedly lower than men, and women do not consider social positions as equal. However, according to the result of the questionnaire survey (for details, refer to 3. Social and cultural situation in the survey sites in Appendix 16), answers to the question “whether there is gaps due to gender in South Santo” percentage of respondents are 70% or less even if the number of the surveyed households who answered “strongly agree” and “agree” are accumulated, and there are differences in gender but relatively few compared with other survey sites. According to the average income of men and women in the surveyed households, the economic contribution of women is considered to alleviate gender disparity since the gender difference is relatively low in South Santo.

The tribal composition of the surveyed four communities in South Santo is as Table 13.

Since the local population in Nakere was migrated from Tangoa Island, part of the tribes are common. The results of the survey show that tribes of Wailapa and Araki are different from those of Tangoa Island and Nakere.

Table 13: Tribal composition of the surveyed four communities in South Santo

Wailapa	Moiso
Nakere	Piliji, Naoneriri
Tangoa Island	Piliji, Naoneriri, Pelpojiji, Pelmoli Tavera, Pelumorirere, Velolo, Nahopa, Vunapahura
Araki Island	Viji, Love, Livo, Vatu, Lele

The tribal languages used in the four communities of South Santo except common language, Bislama are as Table 14. In Araki Island, there are unique tribal languages, but the language of Tangoa is also used. On the other hand, only in Wailapa, another tribal language is used.

Table 14: Tribal languages in the four communities in South Santo

Wailapa	Moiso
Nakere	Tatangoa
Tangoa Island	Tatangoa
Araki Island	Tatangoa, Araki

According to the questionnaire survey result (For details, refer to 3. Social and cultural situation in

the survey sites in Attached document 16), in response to the question “Do traditional tribal systems (family lines) function?”, 38% answered “Strongly agree” and it was a somewhat lower level. In the project of Grace of the Sea in the Coastal Villages phase II, there were some cases in which consensus formation of the resource management plan advanced rapidly by involving representatives of each tribe, but it seems that the traditional tribal system in these four communities was slightly declining, and it would not always have occurred similar consensus formation as at the site of Phase II. Therefore, it is necessary to pay attention to this result and to consider other means.

1-2-2 Governance situation in South Santo

There is not much difference on the governance system of the target area comparing with other areas in Vanuatu. As a regional administration, Area Council has been established under the provincial government. South Santo is included in South Santo Area Council Area 2. In addition, the governance system of the traditional community centered on the chief and the Village Council is located under this Area Council. (For the organization chart of the Area Council, refer to 3. Governance system in the target provinces in Appendix 1).

According to the results of the questionnaire survey conducted in this socio-economic survey (see 4. Institutional and governance situation in the survey sites in Appendix 16), in response to the question “Does the chief system function?”, the proportion of surveyed households who responded “strongly agree” is as low as 43%. In response to the question as how much will the community members follow the instructions given by the chief, the percentage of surveyed households who answered “follow all instructions” was as low as 40%. Therefore, in these four communities, the chief system is considered to be weakened.

In addition, 71% answered that “Disagree” or “Strongly disagree” in response to the question “Is the Area Council functioning adequately” and it is extremely high. Therefore, it became clear that Area Council is not functioning sufficiently in South Santo.

1-2-3. Economic situation in South Santo

(1) Main household income source

According to the National Population and Housing Census issued in 2009 by the Vanuatu National Statistic Office, there is no data on southern Santo only but there are major sources of income in households of Espiritu Santo, Tangoa Island, and Araki Island and the information on population by type of industry. The situations of the three places are as Table 15 and Table 16.

In Espiritu Santo Island, which has provincial capital, Luganville, 35.7% of the household answered that they had salaries. However, sales of fish, crops, handicrafts or income from their business are 47.6%, which was an important income source for households. In Tangoa Island and Araki Island, sales of fish, crops, handicrafts or income from their business were 62.1% and 73.3%,

respectively, and that was the highest. By industry, households producing goods for self-consumption were 50.8%, 35.8% and 93.3% in Espiritu Santo, Tangoa Island and Araki Island, respectively.

Table 15: Main source of household income in Espiritu Santo Island, Tangoa Island and Araki Island

	Total	None	Wage/ Salary	Land lease	Remitt ances	House rent	Sale of fish/cro ps/hand icrafts	Others	Own busine ss
Santo	7,864	276	2,809	29	52	46	3,743	517	392
Percentage		3.5%	35.7%	0.4%	0.7%	0.6%	47.6%	6.5%	5.0%
Tangoa	87	-	10	-	10	-	54	-	13
Percentage		-	11.5%	-	11.5%	-	62.1%	-	14.9%
Araki	30	-	2	-	-	-	22	1	5
Percentage		-	6.7%	-	-	-	73.3%	3.3%	16.7%

Source: National Population and Housing Census 2009

Table 16: Number of household by industry in Espiritu Santo Island, Tangoa Island and Araki Island

	Total	Gover nment	Private compa ny	Emple yer	Self emplo yed	Volunt ary work	Unpaid family work	Produci ng goods for sale	Producing goods for own consumption
Santo	16,002	1,113	3139	99	560	223	791	1,946	8,131
Percentage		7.0%	19.6%	0.6%	3.5%	1.4%	4.9%	12.2%	50.8%
Tangoa	134	2	17	2	1	21	31	12	48
Percentage		1.5%	12.7%	1.5%	0.7%	15.7%	23.1%	9.0%	35.8%
Araki	60	2	1	-	-	1	-	-	56
Percentage		3.3%	1.7%	-	-	1.7%	-	-	93.3%

Source: National Population and Housing Census 2009

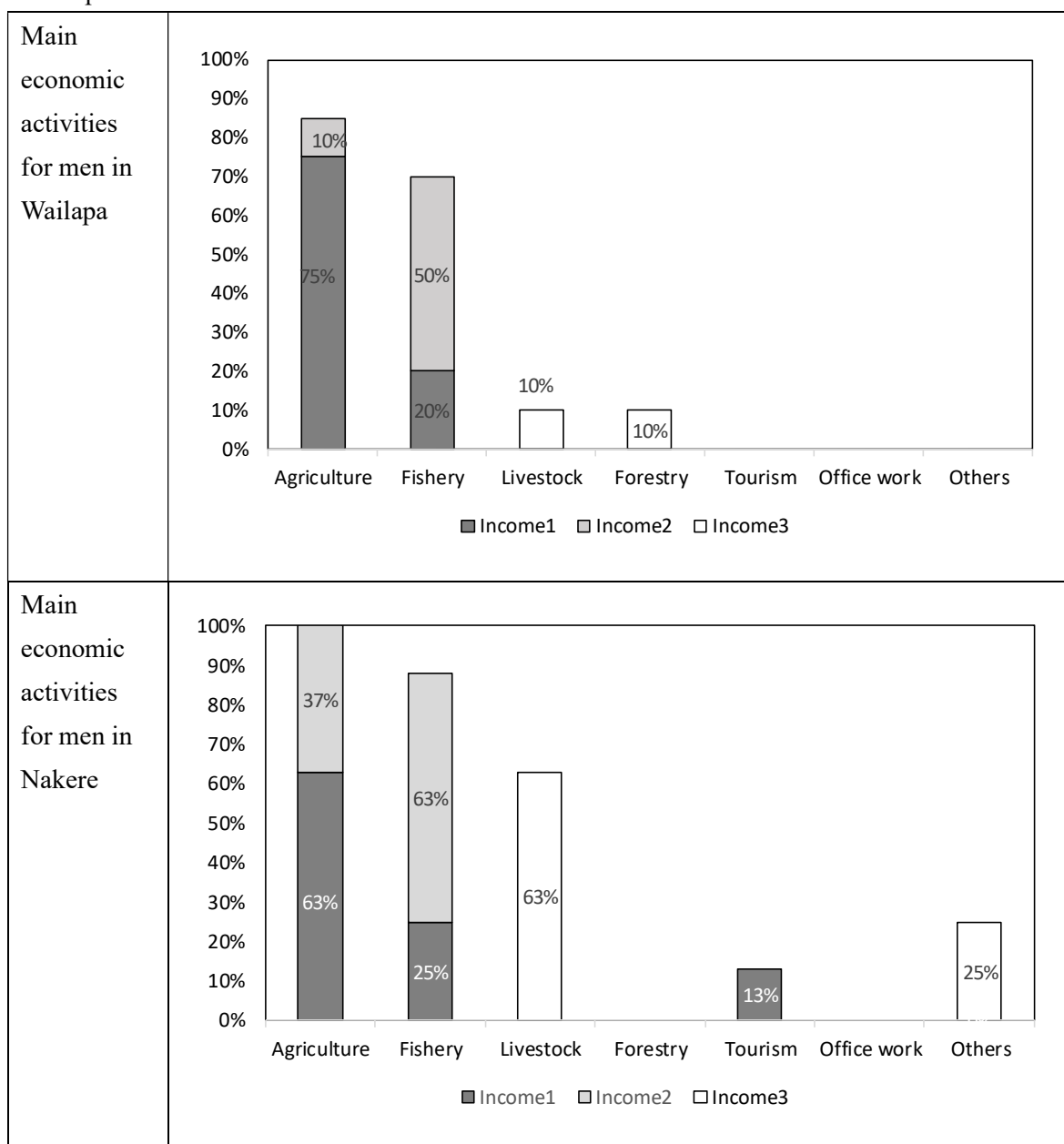
According to interviews, the main economic activities for men in the four Southern Santo communities are as Figure 4.

In Wailapa and Nakere, Agriculture (copla, cacao, kava) is prominent as a main source of income. Fishery is recognized as a secondary source of income. However, in recent years, natural disasters

such as cyclones and droughts have occurred continuously and the ratio of income from fishery tends to increase.

Local population of Tangoa Island have farms in the mainland side and have agriculture because the island has only little usable land. Therefore, fishery is regarded as a first source of income.

In Araki Island, agriculture is regarded as an important source of income, but fishery is the next first important source of income.



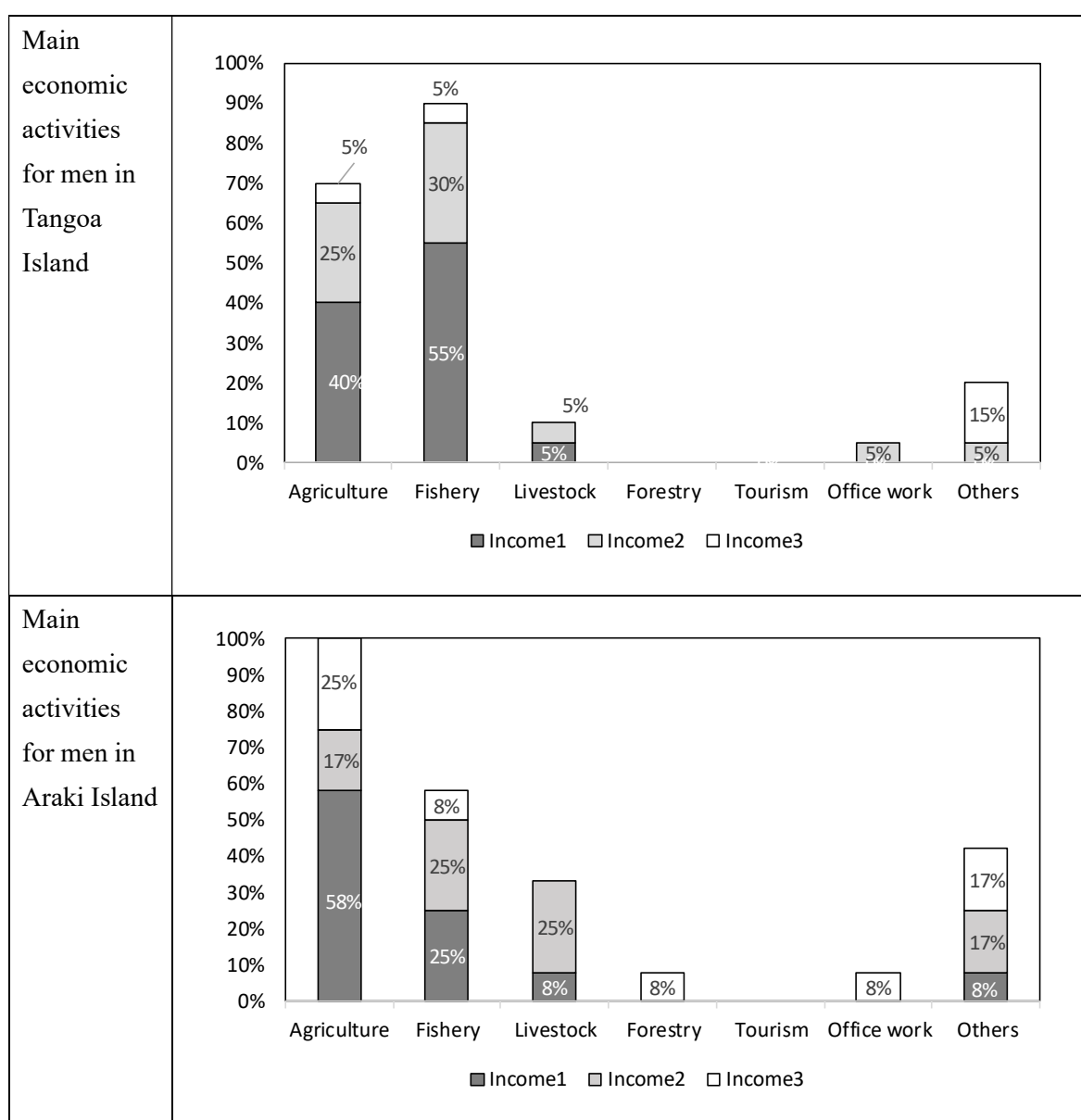


Figure 4: Main economic activities for men in the surveyed households of South Santo
Source: Questionnaire survey

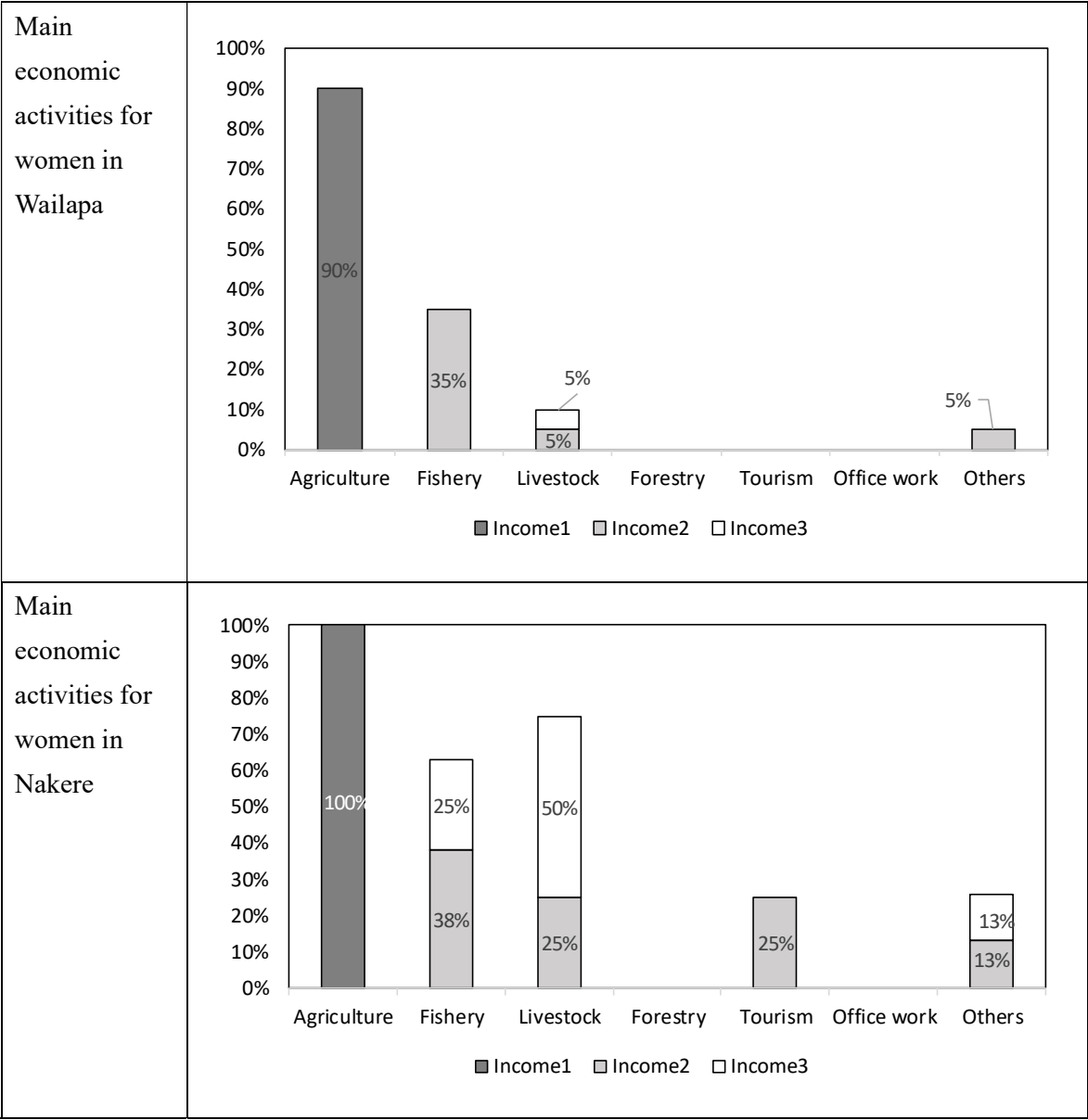
The results of the main economic activities of women in the questionnaire survey on Wailapa, Nakere, Tangoa Island and Araki Island are shown in Figure 5 below.

In Wailapa and Nakere, agriculture accounts for a very high proportion as a major income source as well as men. Fishery is recognized as the secondary source of income. Livestock is also regarded as an important income source in Nakere.

In Tangoa Island, men do fishing and women go to sell them to the market. Therefore, fishery is the primary sources of income for women.

In Araki Island, agriculture and fisheries are regarded as an equally important source of income,

but in total of all income sources, fishery is only the second to agriculture.



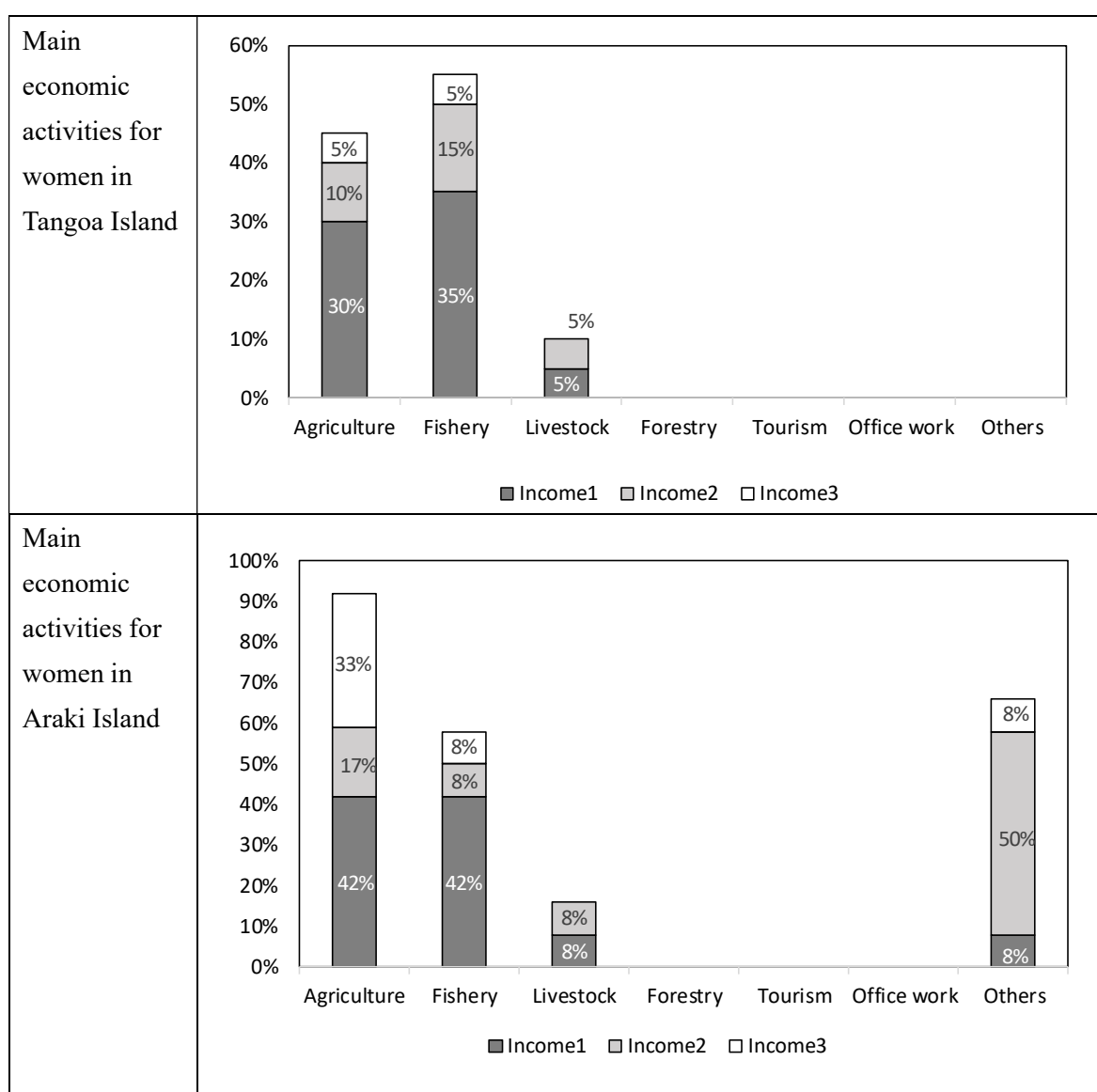


Figure 5: Main economic activities for women in the surveyed households of South Santo

Source: Questionnaire survey

(2) Main fishing activities

According to statistics, the fishing activity types in all the households in Espiritu Santo Island, Tangoa Island and Araki Island are as Table 17.

In Espiritu Santo Island, only 28.0% of the households fished in the past 6 months, and the findings of Wailapa and Nakere in the above survey are endorsed. For Tangoa Island and Araki Island, the households who made fishery in the past six months were 78.2% and 66.7%, respectively, where fishing was an important activity. Households who responded that they sold some or all of the catch were centered on self-consumption at 18.7% and 26.5% in Espiritu Santo Island and Tangoa Island, respectively, while Araki Island responded that 100% of households sold some or

all catches.

Table 17: Households with type of fishing activity in Espiritu Santo Island, Tangoa Island and Araki Island (Marine fishing)

	Total households	No fishing in the last six months	Fishing in the last six months	Subsistence only	Sale only	Both
Santo	7,864	5,664	2,200	1,788	37	375
Percentage		72.0%	28.0%	81.3%	1.7%	17.0%
Tangoa	87	19	68	50	4	14
Percentage		21.8%	78.2%	73.5%	5.9%	20.6%
Araki	30	10	20	-	2	18
Percentage		33.3%	66.7%	-	10.0%	90.0%

Source: National Population and Housing Census 2009

According to the result of the workshop, the main fishing methods in South Santo's four communities are fishing by boats and canoes. In addition, some fishermen have taken up a drop stone fishing (called Kura). Further, due to the support of VFD, Fish Aggregating Device (FAD) is installed in the middle of Wailapa and Araki Island and in the eastern part of Araki Island. Therefore, trolling is also operated (Detail is shown in Appendix 2).

According to the results of the workshop, main fishing grounds for the four communities of South Santo is as Figure 6.

In Nakere, fishing occurs at the coastal area (green dotted line), trolling around the FAD (orange dotted line) and bottom fish fishing by the boat (blue dotted line) are performed. Fishing (green dotted line) and boat fishing (blue dotted line) around the island are mainly performed in Nakere and Tangoa Island as well. Fishermen in Tangoa Island rarely fish to off the coast of Nakere and the vicinity of Tasiriki in the southwest of Espiritu Santo. In Araki Island, the main fishing grounds are around the island, but there are times when they do trolling around the FAD.

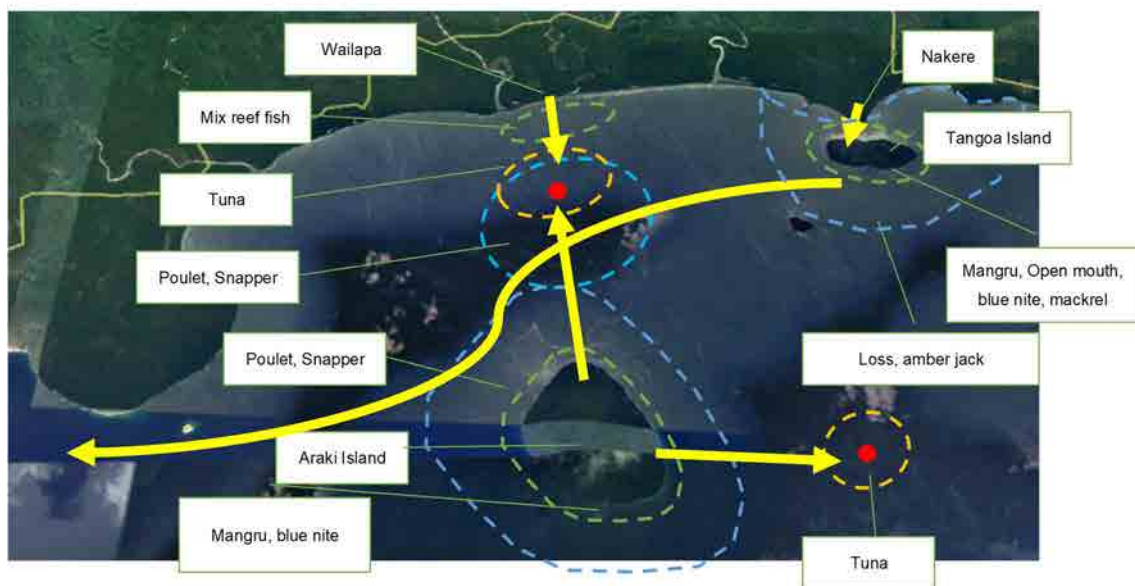


Figure 6: Main fishing ground in South Santo

(3) Main aquaculture activities

German International Cooperation Agency (GIZ) dispatched experts to support aquaculture of tilapia (Genetically Improved Farmed Tilapia (GIFT)) and prawn (*Macrobrachium resenbergi*) as of April 2017 (his remaining contracted period is one and half year). The main activities are farmers' awareness raising and technical support. Since the counterpart's hometown is in South Santo, the main activity is in South Santo. Seven farmers in Namaho village and Parisa village in Wailapa are conducting tilapia aquaculture. Even in traditional villages in the northern part of Espiritu Santo Island, they have conducted aquaculture guidance and dissemination.

For farmers, fry was offered for free for the first time, and it is sold at VT5/animal from second time. Seedling production technology has been already transferred to counterparts in charge of aquaculture. Use of imported feed from Fiji is guided. In addition, it is recommended to kill tilapia remaining in the pond after harvesting and to introduce new fingerlings because of its poor growth rate, but farmers hesitate to disposal and it is not firmly established yet.

The GIZ expert is negative to develop feed locally since the main ingredients such as fish meal are hard to obtain in Vanuatu.

(4) Major agricultural activities

According to the result of the workshop, staple foods such as manioc (cassava) and banana and island cabbage are mostly for self-sufficiency in Wailapa and Araki Island, but it is sold about half in Tangoa Island and Nakere. For cacao, it is 100% for sale (Detail is shown in Appendix 3).

(5) Distribution status of major agricultural and fishery products

The distribution status of major major fishery products is as Table 18.

Table 18: Distribution status of major products in the four communities of South Santo

Wailapa	When the income from copla decreased due to drought, local population put more effort into fishing. At that time, there were several middlemen in the village and they purchased the fish, so local population did not have to go to sell fish to Luganville. Since there are no middlemen now, when there are many catches, fish is sold in the market of Luganville, the capital city or sold to inland people. However, according to interviews, in Wailapa, fishery products are mostly self consumption (for details see Appendix 4).
Nakere	When the income from copla decreased due to drought, local population focused on fishing more. At that time, there were several middlemen in the village and they bought the fish, so they did not have to go to sell fish to Leganville. Now, since there is no middleman, fishermen (men) go to sell them individually to the market of Louganville. When men are busy, women go to sell to the fish market in Luganville. According to an interview survey, Nakere sell most fishery products (see Appendix 4 for details).
Tangoa Island	There is no middleman. Fishermen (men) go to sell them individually to the market of Luganville. If men are busy, the women go to sell to the fish market in Luganville. According to interviews, in Tangoa Island, most fishery products are for sale (see Appendix 4 for details).
Araki Island	There is no middleman. Each fisherman brings them individually to the market of Luganville and sells by themselves. Many people also come to sell from the other villages of Santo in the market, and it is sometimes difficult to sell it. In the past, the fish market of Luganville bought in bulk, but now fish market does not purchase. Also, once in the past, cooperatives purchased catch and sold to in the village, but they did not continue since local population fish individually for self-consumption. According to the interview survey, in Araki Island, most of the fish products are for sale (see Appendix 4 for details).

Regarding agricultural crops, most of them are for self-consumption, but for laplap made of casava (manioc) and fruits, women sometimes go individually to sell them at the market in Luganville.

1-2-4. Current status of fisheries resource management activities in South Santo

The situation of resource management activities of the four communities in South Santo is as Table 19. And the taboo areas in the area are shown in Figure 7.

Table 19: Current status of resource management activities in the four communities in South Santo

Wailapa	The area of 200 - 300 m from the mouth of the two rivers is a taboo area. It was established by the community. In case of a violation, a pig should be offered and Vt10,000 fine.
Nakere	There is no permanent taboo area, but when an event is scheduled in the village, a taboo area will be set up between three and six months before the event. The chief decides it. Since tourists come to see small fish (jungle perch), fishing on the river in the community is prohibited.
Tangoa Island	N/A
Araki Island	There are three taboo areas. One was set by the chief in the northern part of the island (300 m × 100 m), the taboo area on the west coast of the island and the south coast (about 1 km × 100 m each) were established by the land owner. Catch of all shellfish, fishes etc. are prohibited. Tangoa fishermen may come to catch near the island.

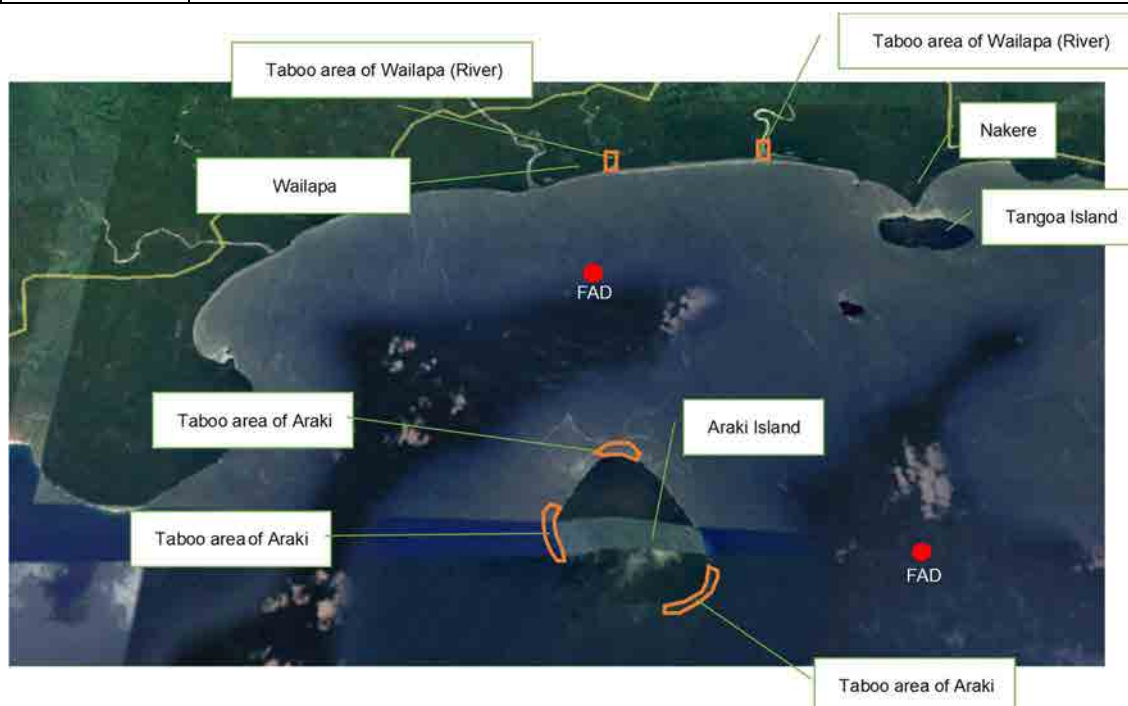


Figure 7: Taboo are in South Santo

Regarding the resource situation in the four communities, fishermen's recognition was confirmed for size of major fish species, catch volume, distance to the fishing ground, etc. comparing with situation of 10 years ago. In Wailapa, sufficient information has not been obtained since people who engage in fishing are very limited. With regard to Nakere and Tangoa Islands, it is recognized that reduction of catches, extension of operation time, shift of fishing grounds to the distance, and extension of operation time for Araki Island. (Please refer to Appendix 5 for details).

Regarding the organization of fishermen, there are fishermen's association except for Nakere, but there are no groups that manage coastal resources.

1-2-5. Resource management measures and supporting measures assumed in south of Espiritu Santo (Wailapa, Nakere), Tangoa Island and Araki Island (South Santo)

(1) Awareness on resource management

South Santo community has little experience of resource management activities so far. According to the results of the questionnaire survey (Figure 8), there are many responses that they do not know the contents of the resource management activities implemented in the community. On the other hand, as shown in the result of the questionnaire survey (Figure 9), even though almost no resource management activities have been implemented, 77% of respondents said “they are participating” to the question whether other members are participating in resource management activities. There is a possibility that they may not recognize the resource management activities themselves. In order to introduce the resource management activities at such sites, it is necessary to start with the awareness of the importance of resource management. At that time, it is necessary to plan the activity contents with paying attention to the following points. As indicated in “1-2-2 Governance situation in Southern Santo” in this area, there is a tendency that the governance in the community is weak such as traditional tribal system, chief system, Area Council etc. Therefore, while involving chiefs, Area Council, etc. through pilot activities, it is necessary to seek ways that the awareness effect directly reaches the local population without excessively relying on these systems.

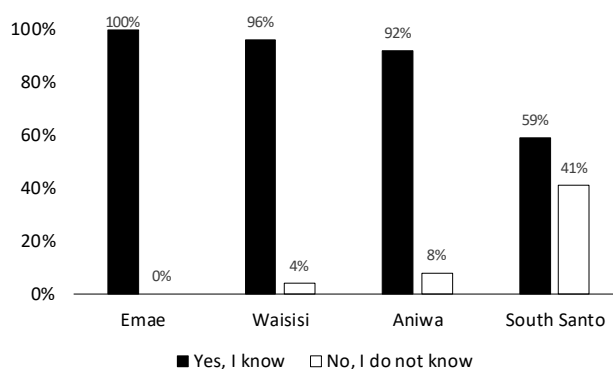


Figure 8: Recognition of resource management activities implemented at survey sites
Source: Survey of questionnaire

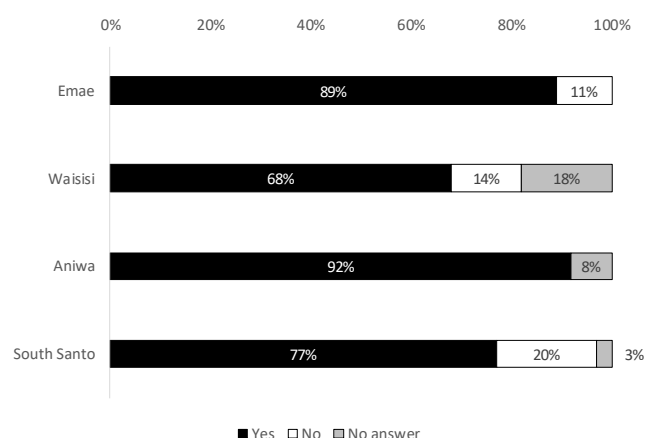


Figure 9: Answers on participation in resource management activities by other community members asked at the target sites
Source: Survey of questionnaire

(2) Establishment of taboo areas

In recent years, South Santo has adverse effects on agricultural crops caused by drought. Normally, copra and cacao are the main income sources in the survey communities such as Wailapa and Nakere but crop failure has occurred continuously due to drought. The population is increasing in the target area, and the importance of the fishery is also increasing in the communities which agriculture is main industry.

As mentioned above, in the four communities, there has not been taboo area set up in the ocean area except for Araki Island. As the coastal resources tend to decrease, it is conceivable to establish taboo areas for each site newly after consultation with the community. In addition, establishment of taboo areas shared by four sites were also proposed from the extension officer of VFD. As a result of the survey, since almost no fishing competition has occurred at present, it is considered that the resource management measures and supporting measures including the establishment taboo areas with the community by each site, and it is important to consider the setting of common resource management measures among sites observing the progress situation as necessary.

(3) Support for improving fish distribution

Since there is a large market, Luganville in Sanma Province, demand for fish products is considered high. However, in South Santo, the distribution system of fishery products is underdeveloped, and fishermen mainly go for sale individually. In addition, in Araki Island and Tangoa Islands, local community must carry it to the main island by boat. The village has been lack of regular transport

means, and it may interfere transport of persons and goods (fish, copra, etc.), there is also to go to sell to the provincial capital Luganville on foot sometime. In addition, since there is no refrigerator or freezing facility to store the fish catch, there are cases where surplus and unsold fish are wasted. By introducing these facilities and improving distribution, there is a high possibility of promoting effective use of resources and promoting introduction of resource management measures without hesitation.

(4) Added value of fish

In this area, FAD was deployed with the support of VFD, and migratory pelagic fish such as yellowfin tuna has been caught. Sites where refrigeration equipment can not be installed, it is conceivable to make these fish products to processed fish such as tuna jerky. If these products can be sold to the market of Luganville or kava bar etc., it will lead to women's income increase. In addition, it is conceivable to adopt this preservation method for surplus catch and make effective use of resources.

(5) Dilution of tilapia extensive aquaculture and its processing method

According to interviews with farmers who are engaged in aquaculture, the merit of aquaculture was to choose the time to sell compared to the fish caught in the ocean. Because there is no need to sell urgently and cost is high as imported feed is used etc., the selling price is Vt500 to Vt600/kg and it is sold at a price equal to or higher than marine fish. For this reason, even though eight years have passed since tilapia farming was introduced, people who know the tilapia were five people out of 16 people (31%) in a survey for consumers in the market of Luganville, and there is not much, and the possibility of dissemination of tilapia culture is still not well understood. In the case of expecting the effect of reducing the pressure on coastal resources by the introduction of cultured fish, it is necessary to reduce the price to make it easy for consumers to obtain. Therefore, it seems to be appropriate to begin with extensive aquaculture which can reduce the cost to promote tilapia culture. It is contrary to the efficient breeding approach of GIZ expert such as preparing excellent seedlings and providing imported feed. It is conceivable to try extensive aquaculture at the pilot sites through coordination of both side.

Similarly, in the survey for consumers, three out of the five persons answered that they like tilapia, and the reason is that there is no risk of ciguatera. On the other hand, as an opinion of not like the taste, it was mentioned that the taste is blander in tastefresher than the marine fish. Therefore, in order to disseminate tilapia, it is also necessary to disseminate appropriate cooking methods.

2. Socioeconomic situation in Marae, Tongamea and Sangava (Emae Island)

2-1 Overview of Shefa Province

Emae Island is located in Shefa Province. Shefa Province has an urban area (capitalcity, Port Vila) in Efate Island, with the largest population. According to the analysis of the statistics of population by age group, population concentration in urban areas has been occurred (For details of statistics, see attached Appendix 1).

As Table 20 and Table 21, only about 30% population in Shefa Province are engaged in the primary industry. In addition, as shown in Table 22, about half of population in the rural area in Shefa Province are engaged in fishery, and there is no tendency to decrease households which engaged in fishery. As shown in Table 23, about 40% of households rarely sell fish caught and they mainly consume by them.

Table 20: Main industries engaged by men in 2009 at Provinces where there are candidates of pilot sites

	Shefa	Total	Urban	Rural
Whole workers	18,055	53,646	12,432	41,214
Agriculture forestry and fishing	5,161 (28.6%)	31,762 (59.2%)	835 (6.7%)	30,927 (75.0%)
Construction	2,695 (14.9%)	4,422 (8.2%)	2,372 (19.1%)	2,061 (5.0%)
Wholesale and retail trade, repair of motor vehicles	1,996 (11.1%)	3,565 (6.6%)	2,077 (16.7%)	1,488 (3.6%)
Transport and storage	1,553 (8.6%)	2,518 (4.7%)	1,476 (11.9%)	1,042 (2.5%)
Public administration	2,108 (11.7%)	4,214 (13.4%)	1,948 (15.7%)	2,266 (5.5%)
Others	4,542 (25.2%)	7,165 (13.4%)	3,724 (30.0%)	3,430 (8.3%)

Source: National Population and Housing Census 2009, Vanuatu National Statistics Office

Table 21: Main industries engaged by women in 2009 at Provinces where there are candidates of pilot sites

	Shefa	Total	Urban	Rural
Whole workers	12,198	40,814	8,320	32,494
Agriculture, forestry and fishing	3,201 (26.2%)	25,429 (62.3%)	540 (6.5%)	24,889 (76.6%)
Wholesale and retail trade, repair of motor vehicles	2,114 (17.3%)	4,181 (10.2%)	1,946 (23.4%)	2,235 (6.9%)

Accommodation	1,104 (9.1%)	1,403 (3.4%)	933 (11.2%)	470 (1.4%)
Public administration	1,312 (10.8%)	2,861 (7.0%)	1,261 (15.2%)	1,600 (4.9%)
Household activities	1,798 (14.7%)	2,328 (5.7%)	1,291 (15.5%)	1,037 (3.2%)
Others	2,669 (21.9%)	4,612 (11.3%)	2,349 (28.2%)	2,263 (7.0%)

Source: National Population and Housing Census 2009, Vanuatu National Statistics Office

Table 22: Number of households engaged in fishery in the rural area in 2007 in the Provinces where there are candidates for the pilot sites

	1992			2007		
	Rural households	Households engaged in fishing	Percentage (%)	Rural households	Households engaged in fishing	Percentage (%)
Vanuatu rural	21,908	10,910	49.8	33,879	15,758	46.5
Shefa	3,262	2,144	65.7	5,516	2,917	52.9

Source: Vanuatu National Statistics Office, Census of Agriculture 2007

Table 23: Number of households engaged in fishing in the last 12 months by purpose and by province (August 2007)

	Total Households	Main Purpose of fishing		
		Mainly consumption	Consumption with occasional selling	Mainly for sale
Vanuatu rural	15,758	11,557 (73.3%)	4,127 (26.2%)	74 (0.5%)
Shefa	2,927	1,715 (58.6%)	1,179 (40.3%)	33 (0.1%)

Source: Vanuatu National Statistics Office, Census of Agriculture 2007

Shefa Province has higher social and economic indicators in general than other provinces. This is due to the fact that there is Port Vila which is the capital city and is large consumption area. For example, in the case of infrastructure that enhances these socio-economic indicators, Port Vila's

development has been visibly progressed compared to implementation period of Phase II of the Project. Therefore, the rural villages and remote islands in Shefa Province can do sustainable fishing activities through utilization of low-utilized resources outside reef and development of aquaculture by utilization of Port Vila's purchasing power while progressing of the coastal resource management.

2-2 Marae, Tongamea and Sangava (Emae Island)

2-2-1 Outline of Emae Island

Outline of Emae Island is as follows.

(1) Access

Air Vanuatu has two flights per week, Bel Air has five flights per week, and it is possible to travel to Emae everyday unless there is cancelation of the flight. The flight time from Port Vila is about 20 minutes. Also, even a ship can reach Emae Island in four hours.



Figure 10: Map for position of major villages in Emae Island

① Fenonge, ② Makatea, ③ Tongamea, ④ Sangava, ⑤ Vaidini, ⑥ Marae, ⑦ Airport

(2) Population

There are 10 communities in Emae Island. Population in the major communities are as Table 24.

Table 24: Population in major communities in Emae Island

	Population
Marae	Population is 137. The population is decreasing.
Makatea	Population is 38 and it is decreasing.
Fenonge	No information

Tongamea	Population is 145. The population is increasing.
Sangava	Population is 300. The population is decreasing.
Tapakoro	Population is 92.
Sasake	Population is 300 but 200 are in Port Vila. The population is increasing.
Vaidini	Half of the population is in Port Vila.
Siwo	Population is six households, 24. Most of the population is in Port Vila.

(3) Condition of social infrastructure

The central part of the island is Fenonge, and administrative functions such as Area Council are there. There is also a newly constructed market in Fenonge. Facilities such as a market, a health center, etc. are concentrated in Fenonge which is the center of the island.

The main means of transport to each community is on foot or by vehicles. There are seven vehicles (trucks) on the island (five are private, two are owned by the school and health center) and are circling irregularly in each village as request of the local population. To go to Fenonge, it is four km from Marae, two km from Tongamea and one-two km from Sangava. All roads are unpaved, and the status of the road from Marae to Fenonge is particularly bad, and vehicles frequently slip in rainy conditions.

In the Emae Islands, there are four shallow well in Marae, and each house has rainwater tanks. In Tongamea, there are two deep wells, four rainwater tanks and ten underground rainwater tanks. There are nine deep wells in Sangava.

As of educational facilities, there are Nofo primary/secondary school (English school) and Walarana primary/secondary school (French school) in Fenonge, and kindergartens are in each village.

As of health facilities, there is a health center in Fenonge and an aid post in Marae.

(4) Social situation in the area

Marae was a large village called Nasukuaki in the 1980s. After that, village people broke up in 1941 and Nasukuaki was divided into Marae and Tapakoro. Water was once poisoned. Today, the two villages have reconciled, and the local population of Malae lend and use some land of the tobakoro from land owner (chief). Foreshore of Marae is managed by land owner (chief and small chief).

In Tongamea, people did not live on the coast, but since the well was on the coast, people came to the coastal area to draw water. As water drawing was hard work, they began to live in the coastal area since 1952. At that time, it was only five households, but then it has increased to 37 households. As of 2017, a land problem with the landowner of neighbouring Makatea has broken out and it is in trial.

According to an interview survey at each village, as for the important decisions in households, women can only comply with men, and the status of women in each household is almost exceptionally lower than that of men, and women do not consider that their social positions are equal. According to the results of the questionnaire survey (for details see 4. Social and culture situation in the survey sites in Appendix 16), in answer to the question on the presence or absence of disparity by sex, the percentage of answer “strongly agree” and “agree” in the surveyed household was as high as 90%, and it supports the results of the interview survey. From this result, it is desirable to examine the new tool in Emae Island, while confirming the effectiveness of introducing women’s livelihood improvement measures etc. to fill this gender gap when women are adopted in resource management activities.

Three different tribal languages across the island (Ngunese, Fakamae, Namakura) are used in Emae Island in addition to Bislama, the common language.

In addition, there are 30 tribes (Nakamaru) on the island, and they are Tisomori, Titondoa, Manuriki in Marae, Lakenanbanga, Satavao, Ngangi in Tongamea, and Makir, Luwao, Vanomau and Siwo in Sangava. However, in modern times, many people are married to other village men or women, and the tribes are mixed up. Therefore, the ties within the tribe are somewhat weak compared with the past.

According to the results of the questionnaire survey (For details, see 3. Social and Culture situation in the survey sites in Appendix 16), in response to the question “whether the traditional tribal system is still functioning”, 94% of surveyed households responded “strongly agree” or “agree”, and the traditional tribal system is considered to be functioning. Therefore, when activities are conducted in Emae Island, it is considered to be effective that chief of each tribe are involved in the activities.

2-2-2 Governance situation in Emae Island

In Emae Island, Area Council is established under the provincial government as well as other areas. In addition, the governance system of the traditional community centered on the chief and the Village Council are located under this Area Council. (For the organization chart of the Area Council, refer to 3. Governance system in the target provinces in Appendix 1).

According to the result of the questionnaire survey (refer to 4. Institutions and governance situation in the survey sites in Appendix 16), for the question “Whether the chief system is functioning in Emae Island”, the proportion of answer of “strongly agree” or “agree” in the surveyed households is as high as 96%. In addition, for the question “How much the community members will follow instructions in response to orders given by the Chief”, 80% of the surveyed households answered “follow all orders” or “follow almost orders” and it is high percentage. Therefore, in Emae Island,

it is considered that the chief system is still functioning sufficiently.

Moreover, in the response to the question “Whether the Area Council is functioning sufficiently?”, 72% answered “strongly agree” or “agree” and it is high percentage. Therefore, it was confirmed that Area Council functions to some extent in Emae Island.

2-2-3. Economic situation in Emae Island

(1) Main income source of household

According to the National Population and Housing Census issued by the Vanuatu National Statistic Office in 2009, the main sources of income in Emae’s households and population by industry in Emae are as Table 25 and Table 26.

In Emae Island, main income sources are sales of fish, crops and handicrafts, which is a major income source for 79.9% of household. In terms by industry, 82.1% of households manufacture goods for their own consumption.

Table 25: Main source of income in households in Emae Island

	Total	None	Wage/Salary	Land lease	Remittances	Sale of fish/crops/handicrafts	Others	Own business
Emae	154	2	6	1	1	123	12	9
Percentage		1.2%	3.9%	0.7%	0.7%	79.9%	7.8%	5.8%

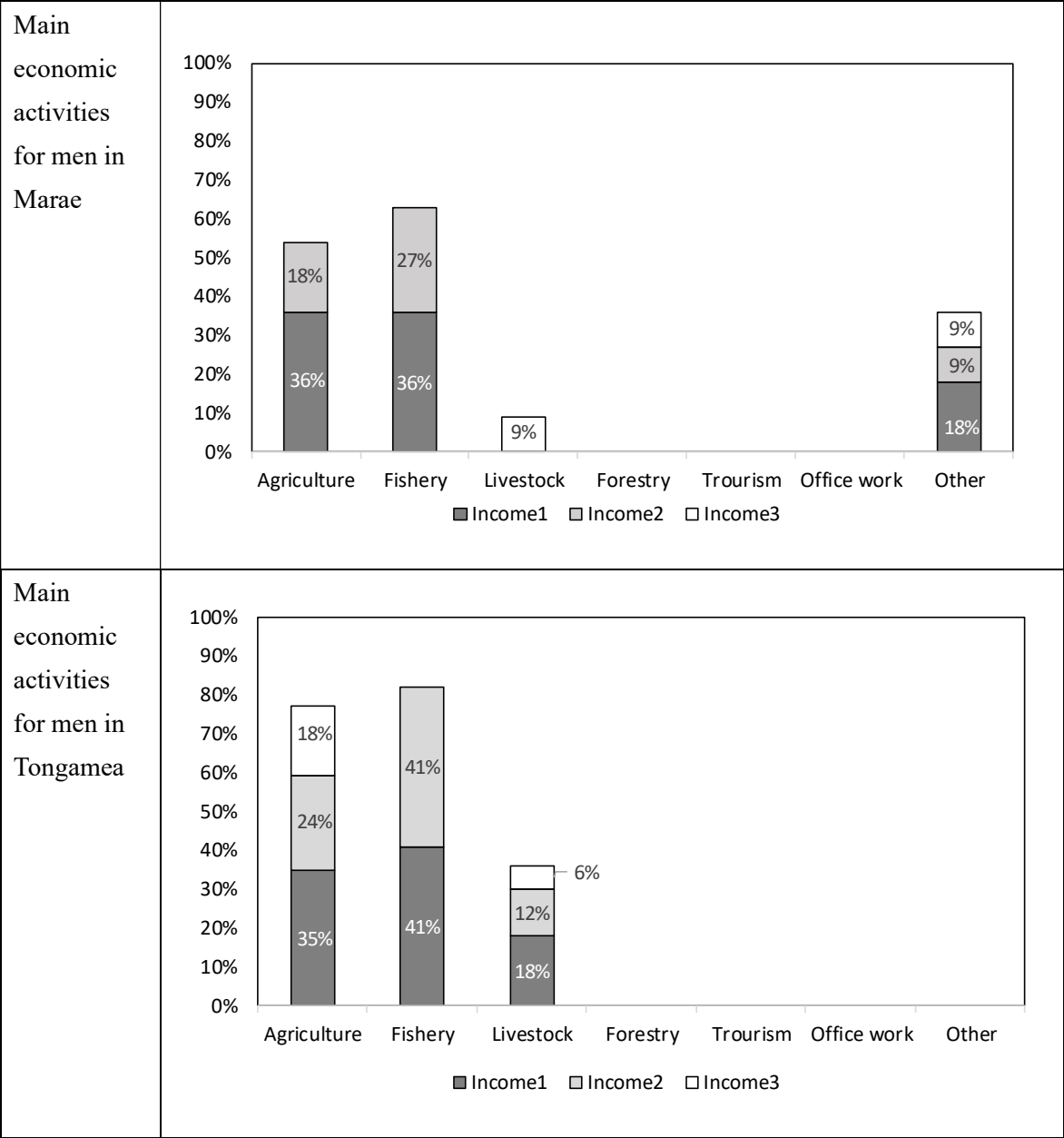
Source: National Population and Housing Census 2009

Table 26: Number of household by industry in Emae Island

	Total	Government	Private company	Self employed	Unpaid family work	Producing goods for sale	Producing goods for own consumption
Emae	336	13	7	2	33	5	276
Percentage		3.9%	2.1%	0.6%	9.8%	1.5%	82.1%

Source: National Population and Housing Census 2009

According to the questionnaire survey in Marae, Tongamea and Sangava, the main economic activities for men in the communities of Emae Island was as shown in Figure 11. In Marae and Tongamea, fishery is regarded as a major source of income. However, agriculture is also an important source of income. On the other hand, in Sangava, fishery is prominent as a major income source. This is regarded that Sangava has not yet recovered from the damage of Cyclone Pam.



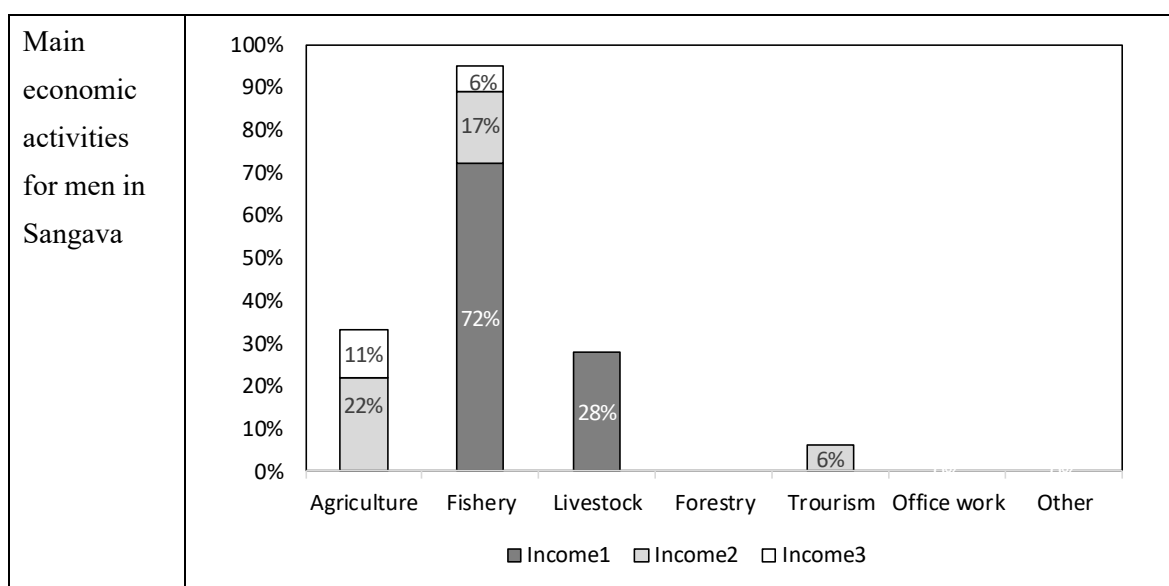
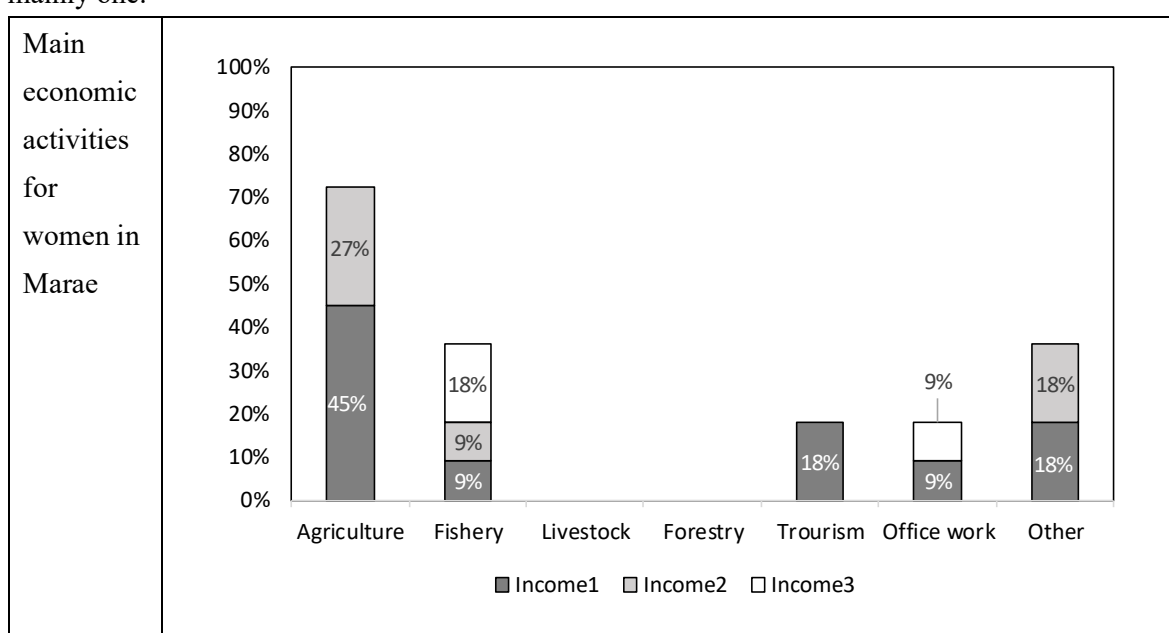


Figure 11: Main economic activities for men in the surveyed households of Emae Island
Source: Questionnaire survey

The main economic activities of women were as shown in Figure 12. Agriculture is the main income source in Marae, and tourism is also high as the first income source. However, in the case of answering tourism, it refers to weaving and selling mats and bags made of pandanus. Mats are sold at Vt1,000/sheet locally, and Vt1,500-2,000/sheet at Port Vila. Fishery is positioned as a secondary income source. Tourism is the highest in Tongamea and Sangava as the first income source. In Sangava, fishery is also an important income source for women. Sales of land crabs are mainly one.



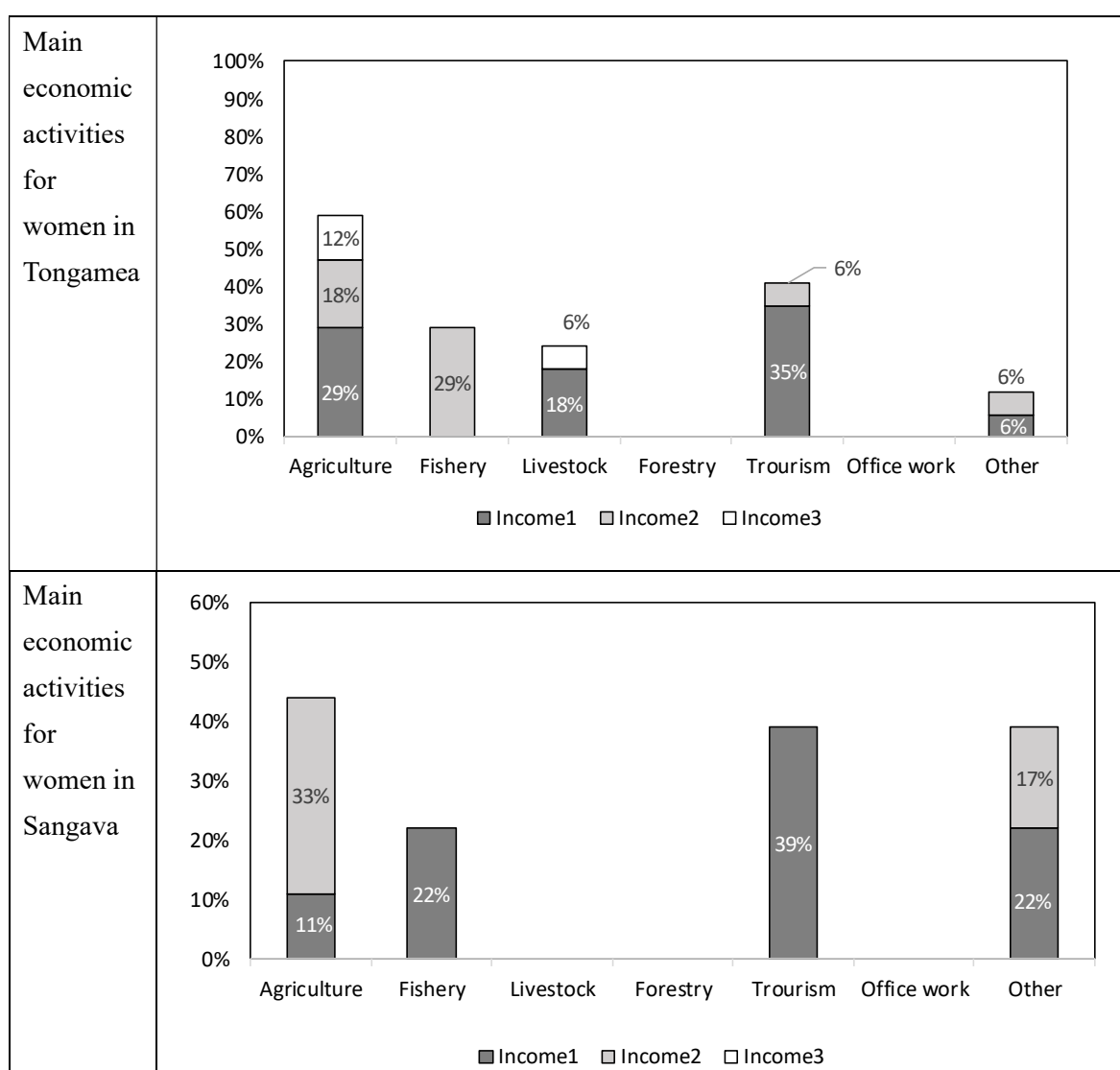


Figure 12: Main economic activities for men in the surveyed households of Emae Island
Source: Questionnaire survey

(2) Main fishery activities

According to the agricultural census, households with type of fishing activity in Emae Island is as Table 27.

56.5% of households responded that they did fisheries within the last 6 months, and it is considered that fishery is an important activity in Emae Island. Only 28.7% of respondents said that they only consume private consumption, and 71.3% have some income from the fishery.

Table 27: Households with type of fishing activity (Marine fishing)

	Total househo	No fishing in the last six	Fishing in the last six months	Detail

	lds	months		Subsistence only	Sale only	Both
Emae	154	67	87	25	5	57
Percentage		43.5%	56.5%	28.7%	5.8%	65.5%

Source: National Population and Housing Census 2009

Main fisheries activities in Emae is as Table 28. In addition, according to the results of the survey in a workshop (Detail is shown in Appendix 6), main fishing methods in three communities in Emae Island are fishing inside the reef, and the main fishing methods are spear fishing, hand line fishing, night diving, etc. In addition, people go to Cook's Reef by boat, but it is about once a week and limited.

Table 28: Fisheries activities in Emae Island

Marae	Land crab collection, diving, net, fishing, collection of sea cucumbers and shellfish, FAD fishery. The main fishing grounds are forests where land crabs exist, within lagoons, and Cook's Reefs.
Tongamea	There is one boat owned by the fishermen's association, and three boats are owned by private persons. Thirty-three fishermen are divide into eight groups in order (one group/week), there are 10 canoes, fishing at foreshore by women with fishing line, gathering of shellfish and octopus, and it is both self-consumption and sales.
Sangava	Community members go to coastal area once to three times per week. Most of the fish are sold. There are three boats. Fishing activities are mainly gathering of trochus and sea cucumber, diving (lobster, spear), fishing, gillnet and gathering of small shellfish, and the main fishing grounds are in the lagoon (70%) and Cook's reef (30%).

As a result of the survey at the workshop, the main fishing grounds of Emae are as Figure 13. As mentioned above, the main fishing methods are spear fishing, hand line fishing and night diving, and coastal areas (green dotted line) excluding the orange taboo area are the main fishing grounds. In addition, fishermen sometimes go to fish at Cook's reef, but it is about once or twice in a week. There are information that fishermen in other Island also come and catch fish around Cook's reef from Buninga Island, Mataso Island, Tongariki Island, Tongoa Island, Makira Island etc.



Figure 13: Main fishing grounds in Emae Island

(3) Main agricultural activities

Crops that serve as staple foods of Vanuatu such as taro, cassava (manioc) and yam are mainly cultivated for self-consumption. While corn, kumala (sweet potatoe), island cabbage etc. are both for sale and self-consumption, and peanuts are grown for sale only in two villages. After damage of Cyclone Pam, there was a tropical ice storm on 10th November 2016. Most crops such as taro, yam, cassava, banana, sweet potatoe, corn, etc. have been damaged and are being restored (Detail is shown in Appendix 7).

(4) Distribution status of main agricultural and fishery products

According to the interviews, distributing situation of main agricultural and fishery products is as Table 29.

Table 29: Distribution status of main agricultural and fishery products in Emae Island

Marae	There are one or two solar freezers owned privately. A solar freezer was used for 4 years, but it was broken in 2015. However, with the support of SPC in 2017, a solar freezer was provided to the community. There is a representative of Emae in Port Vila, and remittance is made through Western Union and fish is ordered. Then people sell fish to Port Vila according to the order.
Fenonge	A fish market was constructed and two solar freezers came in (UNDP's support).
Tongamea	There is one private freezer and fish is sold to Port Vila. In addition, the fishermen's association owns a boat, and upon receiving an order, they go to

	sell fish in Port Vila. The place of sale is Freshwater Primary School in Port Vila, and consumers come and buy there. In addition, fish is also sold after deep-fried. Laplap and crops are sold mainly in the village market, and people sometimes sell them at Fenonge. The farmer himself/herself goes to sell.
Sangava	There are two private freezers. There are middlemen in the village. There are customers in Port Vila, they go to sell after receiving an order which is about once or twice in a week. In addition, it is also sold to other middlemen in their village or middlemen in neighboring villages (two in a neighboring village, three middlemen in total). Women also cook their fish as laplap and sell it in the village market. It is held every weekday afternoons. For agricultural crops, the main market is the community market. Because Sangava has a large population and the demand in the community, and it has not gone to sell in the Fenonge market.

According to the interviews at the workshop, in the main target fish in the main community of Emae Island, Parrotfish and Poulet are for sale in full quantity. Reef fish was about half for sales and half for consumption and the grouper was almost for self-consumed (Detail is shown in Appendix 8).

2-2-4. Current status of fishery coastal resources management in Emae Island

According to interviews conducted among several elderly people, fish abundantly existed in the coastal areas of the Emae Island in the 1950s. Japanese divers came in the 1950s and taught diving fishing methods for sea cucumbers and trochus. There were also many fowl and pig, so people did not use fish so much and coastal resources were plentiful in the 1970s as well. However, spear guns and flashlights were introduced by Tahitians, and night diving has been started to practice. As a result, the amount of resources began to decline in the 1980s until present.

The main resource management activities in Emae Island are setting of taboo areas and setting of Total Allowable Catch (TAC) for sea cucumbers which were carried out in Whole Emae Island. The taboo areas are in Makatea, Tongamea, Marae, and Vaidini. Details are as shown in the table 30.

Concerning reseach of sea cucumber and activities of seting TAC by VFD, it has not been adhered set allowable catch volume. According to interviews, resource management itself was a new concept and community empowerment was not sufficient. However, in the results of the questionnaire survey (refer to 1. Awareness of the resorce management in the target survey sites in

Appendix 16), the results showed that the level of awareness on fisheries resources management is higher in Emae Island than in other survey sites, and it is considered that understanding about the new activity “TAC” is not sufficient.

Table 30: Main resource management activities in major villages in Emae Island

Cook's reef	Cook's reef which is off the northwest coast of the island belongs to Emae. There are restrictions on the following seven fish species at this reef. · Clams, Trochus, Sea cucumber, Lobster (Male only, 22 cm or more), · Conch shell, Green snail, Sea turtle (Applicable to VFD before custom ceremony and up to 2 per village)
Marae	Since agriculture was damaged by Cyclone Pam, fishing pressure to the coastal area began to grow higher than before, and the chief decided to introduce taboo areas (2 km × 500 m) from 2015. Within this taboo area, catch of all fishery products is forbidden.
Makatea	There is a taboo area of 3 km × 500 m that started in 2007. The community opened the taboo area only at the chief's ceremony. It was not opened after the cyclone. Even in the open area, collection of trochus and green snail is prohibited. TAC of the sea cucumber decided by VFD was already harvested. Due to the damage of the cyclone, there is no good income source other than fishery, and it is not well protected. Neighboring villagers are entering the taboo area and it is in trouble.
Tongamea	There is a taboo area of 500 m × 200 m. It was temporarily opened in May 2015 and closed again in September 2015. Within the taboo area, catch of all fishery products is forbidden. Regarding TAC of the sea cucumber, the community open the fishing ground for two days and exceeded TAC.
Sangava	There are four land owners, but two people on the ocean side have established a taboo area of 400 m × 200 m in the meantime. It was set under the agreement of four chiefs. Established in 1990, and was once opened temporarily in 1993. It was closed again in 2005, but it was re-opened due to the damage of the Cyclone Pam in 2015. As of April 2017, the taboo area remains open. In addition, collection of coconut crab, green snail, sea cucumbers and trochus outside the lagoon is prohibited.
Vaidini	The taboo area was set at the coastline about 800m in the 1980's. It was temporarily opened in 1991, but was closed in 2001. It was not opened even when there was the damage of the Cyclone Pam in 2015. However, it is possible to catch fish, lobster, clam, land crab, mangrove crab, and sea turtle

	within the taboo area. There is a forest where crabs are inhabited. Land crabs are managed by capturing only when there are orders from their customers. Regarding land crab, there was a tendency to decrease the resource, but resources were particularly reduced because the mangrove forest was destroyed by the cyclone. In recent years, there are more people coming from neighboring villages to catch land crabs. In addition, eating the eyes of crabs by ants is also increasing.

Figure 14 shows the taboo area currently set in Emae Island.

The village's foreshores are taboo areas, but local population are avoiding the taboo areas and catch fishes in access areas, and they aware that fishing pressure is increasing in the access areas. In addition, the resource management effect by the taboo areas are limited, since the appropriateness of the size of the taboo areas has not examined and it is unclear whether reproduction areas are selected. Therefore, it is necessary to examine the effect of resource management of the taboo areas among local population.



Figure 14: Taboo area in Emae Island

According to the result of the workshop, comparison of the catch situation 10 years ago and the current situation of main target fishes in Emae Island was made. In all the fish caught in the reef, there are signs of resource declining such as catch size, catch reduction and long operation time. Some of the respondents say that there is no change for the resources of grouper and poulet in catch size (Detail is shown in Appendix 9). It is considered that resources of these species have not been used so much yet.

As a fishery related group of Emae Island, there are the Vanua-tai committee members from each village and Fenua-tai committee which oversees all the Vanua-tai committee of the entire island. Vanua-tai means “Vanua (Sea)” and “Tai (Land)”, and they are volunteers for turtle resource monitors arranged in the activities of NGO, Wan Small bag in the 1990s, but the Vanua-tai Committee was officially established in Emae Island as a group of coastal resource management in year 2000. In addition, one of the VFD officer supported the establishment of Feua-tai in order to disseminate the activities of Project for Promotion of Grace of the Sea in the Coastal Village Phase II. The main objective is protection of coastal resources and protection of taboo areas. Ten representatives of 10 Fenua-tai committees are members. However, due to the end of support by assistant of survey by IRD (counterparts can visit Emae frequently since travel allowance was paid), VFD is unable to visit Emae regularly, and activities are somewhat declining after the damage by the Cyclone Pam. Currently, reef cleanings etc. in several villages are the main activities, and meetings etc. are not held and there is no budget for carrying out activities.

Through the above-mentioned support by VFD officer, a resource management plan has been trialed referring the resource management plan of the Project for Promotion of Grace of the Sea in the Coastal Village Phase II but it has been stopped at the draft stage. Consultations in each village has been completed and consent has been obtained from the Chief Council and Area Council, so we only have to wait for finalization.

2-2-5 Resource management measures and supporting measures assumed in Marae, Tongamea, Sangava (Emae Island)

(1) Setting of resource management area in the whole island

In Emae Island, the taboo areas established in each community around the island are very limited, and the effect on resource management is also limited. In addition, according to the result of the questionnaire survey (Figure 15), the percentage of respondents that their income has declined greatly due to the decrease in resources is the highest among the candidate pilot sites. Therefore, it is desirable to set the resource management area and rules for Whole Island in all communities, and to thoroughly inform the contents at the same time. However, not only simply increasing full banning marine area, but it should also observe the social and cultural backgrounds, characteristics of marine areas, and status of resources of each community and need to examine carefully for the arrangement concerning fish species, fishing methods, fishing gears, fishing season, etc.

In Emae Island, it is confirmed that governance in the island and the traditional system such as traditional tribal system, chief system, Area Council, etc. are functioning sufficiently, and it is desirable to conduct highly autonomous activities utilizing the governance of the island.

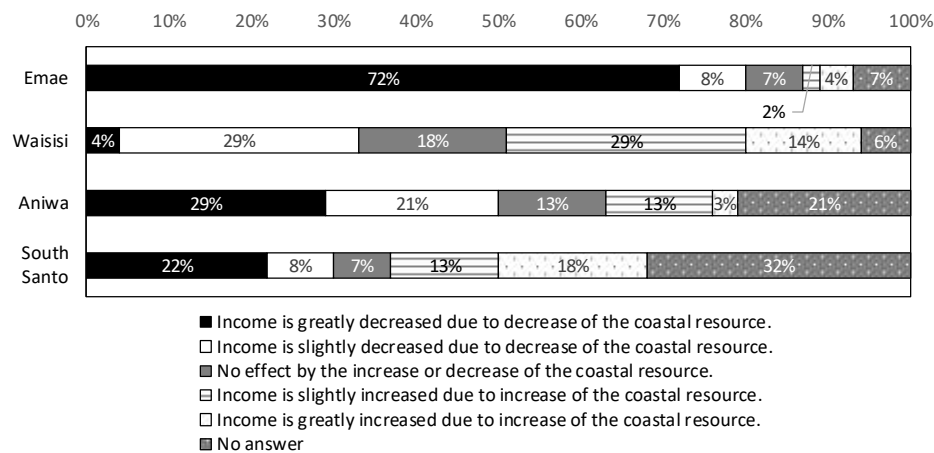


Figure 15: Increase or decrease in income due to increase and decrease of coastal resources in surveyed households

Source: Survey of questionnaire

For example, in the story of several elderly people who knew the previous resource situation in Emae Island, there was information that the situation of resources rapidly worsened after spear guns and underwater lighting for diving were introduced in Emae Island. Even now, night diving is the main fishing method in Emae Island, but it is conceivable that local population will take countermeasures such as limiting the number of night diving voluntarily.

In addition, according to the results of the survey comparing the catch situation 10 years ago of main target fish in Emae Island, on the fish species inhabiting relatively deep water such as poulet and grouper, it is considered that the state of resources is relatively good compared with other reef fish. Currently, the major fishing grounds of Emae Island are within reef, but it would be effective to promote fishing outside the reef and disperse fishing pressures from reef.

In Emae Island, there is Fenua-tai committee as a resource management group, but there is not enough organizational strength, and activities are stagnant. Therefore, it is necessary to conduct awareness raising activities on resource management once again throughout the island. At the same time, it is necessary to support the activities of Fenua-tai committee and to complete the formulation of resource management plan.

(2) Joint management of fishing ground at Cook's reef

Cook's reef in the northwest part of Emae Island is a good fishing ground for fishermen in Emae Island, but in recent years, fishermen from Buninga Island, Mataso Island, Tongariki Island, Tongoa Island and Makira Island came and fish. Since, it is recognized that Cook's reef belongs to Emae Island, there is a possibility to try more effective resource management measures through making

fishermen of other islands understand in the fishing rule in Cook's reef and supporting creation of a system to jointly use this fishing ground with other communities

(3) Tourism Development

In Emae Island, industries that replace agriculture and fishery have not been developed yet, and local population are hoping for tourism development centered on wide white sand beach and offshore Cook's reef. The island has the merit that there are flights every day. Meanwhile, there are many problems such as planes are canceled without notice when there are strong winds and/or grass of the runway becomes taller, number of vehicles in the villages is a little and the means of land transport are limited, the accommodations are poor, popularity of Emae Island is not so high and development of tourism resources other than white sand beach is not progressing

However, local population of Emae Island have great expectations for the tourism development, and there is a possibility that supporting tourism development may be a major incentive for coastal resource management. It is conceivable to support tourism development of Emae Island by improving the popularity through supporting the creation of the homepage, advising on improvement of accommodation facilities and meals to serve as a tourist's point of view, activities that are likely to become new tourism resources (for example trekking, fishing in canoes, catching land crab, Proposing Cook's reef as MPA and the tourism use etc.). In particular, it is desirable to create women's income generation to fill income disparities of gender.

(4) Value addition to fishery products

Regarding agricultural and fishery products, it is difficult to sell them in the island because local population also catch for their own consumption. To obtain cash income, it is necessary to sell it outside. Middlemen in each village and Tongamere fishermen's associations use their ships to sell fish at Port Vila, but they may be inefficient and expensive. Since there are several villages with solar freezers in the island, it is considered establishing distribution routes using these facilities.

Currently, fish has been frozen in just removing gill and internal organs and the distribution is made. As a result of the market survey in hotels and restaurants scheduled to be carried out in future, when the demand for processed fish (fillet etc.) is confirmed, it is conceivable to conduct improvement of fish distribution and value addition such as partially refurbishing newly built the fish market in Fenonge, selling fish through fillet processing and vacuum pack.

3. Socioeconomic situation of Waisisi (Tanna Island), Ikoukau, Isavai and Imatu (Aniwa Island)

3-1 Overview of Tafea Province

Tanna Island and Aniwa Island are located in Tafea Province. The population of Tafea is 32,540

people, which is lower than those of Sanma and Shefa Provinces, and the population growth rate is 1.1% and it is lower than 1.9% of the whole Vanuatu rural area. Analysis of the population by age shows that population of children (less than 15 years old) is the highest (46.4%) but the population of youth (16.5%) and the population of adults (31.6%) are relatively low comparing with Sanma Province and Shefa Province. From this, there is a high possibility that population outflow to other provinces is occurring. (For details of statistics, see Appendix 1).

According to Tables 31 and 32, more than 80% population in Tafea Province engage in the primary industry. In addition, according to Table 33, the number of population engaged in fishing in rural area is also small, and it is decreasing. Furthermore, according to Table 34, about 70% of population are engaged in fishing for self-consumption.

Table 31: Main industries engaged by men in 2009 at Provinces where there are candidates of pilot sites

	Tafea	Total	Urban	Rural
Whole workers	6,461	53,646	12,432	41,214
Agriculture forestry and fishing	5,198 (80.5%)	31,762 (59.2%)	835 (6.7%)	30,927 (75.0%)
Construction	247 (3.8%)	4,422 (8.2%)	2,372 (19.1%)	2,061 (5.0%)
Wholesale and retail trade, repair of motor vehicles	94 (1.5%)	3,565 (6.6%)	2,077 (16.7%)	1,488 (3.6%)
Transport and storage	125 (1.9%)	2,518 (4.7%)	1,476 (11.9%)	1,042 (2.5%)
Public administration	389 (6.0%)	4,214 (13.4%)	1,948 (15.7%)	2,266 (5.5%)
Others	408 (6.3%)	7,165 (13.4%)	3,724 (30.0%)	3,430 (8.3%)

Source: National Population and Housing Census 2009, Vanuatu National Statistics Office

Table 32: Main industries engaged by women in 2009 at Provinces where there are candidates of pilot sites

	Tafea	Total	Urban	Rural
Whole workers	5,238	40,814	8,320	32,494
Agriculture, forestry and fishing	4,492 (85.8%)	25,429 (62.3%)	540 (6.5%)	24,889 (76.6%)
Wholesale and retail trade, repair of	165	4,181	1,946	2,235

motor vehicles	(3.2%)	(10.2%)	(23.4%)	(6.9%)
Accommodation	85 (1.6%)	1,403 (3.4%)	933 (11.2%)	470 (1.4%)
Public administration	217 (4.1%)	2,861 (7.0%)	1,261 (15.2%)	1,600 (4.9%)
Household activities	32 (0.6%)	2,328 (5.7%)	1,291 (15.5%)	1,037 (3.2%)
Others	247 (4.7%)	4,612 (11.3%)	2,349 (28.2%)	2,263 (7.0%)

Source: National Population and Housing Census 2009, Vanuatu National Statistics Office

Table 33: Number of households engaged in fishery in the rural area in 2007 in the Provinces where there are candidates for the pilot sites

	1992			2007		
	Rural households	Households engaged in fishing	Percentage (%)	Rural households	Households engaged in fishing	Percentage (%)
Vanuatu rural	21,908	10,910	49.8	33,879	15,758	46.5
Tafea	4,345	1,632	37.6	6,615	2,188	33.1

Source: Vanuatu National Statistics Office, Census of Agriculture 2007

Table 34: Number of households engaged in fishing in the last 12 months by purpose and by province (August 2007)

	Total Households	Main Purpose of fishing		
		Mainly consumption	Consumption with occasional selling	Mainly for sale
Vanuatu rural	15,758	11,557 (73.3%)	4,127 (26.2%)	74 (0.5%)
Tafea	2,188	1,500 (68.6%)	688 (31.4%)	-

Source: Vanuatu National Statistics Office, Census of Agriculture 2007

Thus, socioeconomic indicators in Tafea Province is lower than the other two provinces. In addition, income is low and the fishery population shows a decreasing trend. On the other hand,

concerning tourism development, although tourists have decreased due to the Cyclone Pam, it is increasing again (Figure 2) and there is room for tourism development. Therefore, from the perspective of sustainable fishery development, it is necessary to consider distribution improvement and value addition etc. so that fishery can be recognized as an attractive industry as means of improving livelihoods.

3-2. Waisisi (Tanna Island)

3-2-1 Social and cultural situation in Waisisi

Social and cultural situation in Waisisi is as follows.

(1) Access

Air Vanuatu is flying every day to Tanna Island. The flight time from Port Vila is about 40 minutes. It is approximately 20 minutes by car from the airport to Lenakel where a fish market exists, and from Lenakel to Waisisi is approximately 40 minutes to one hour by car.

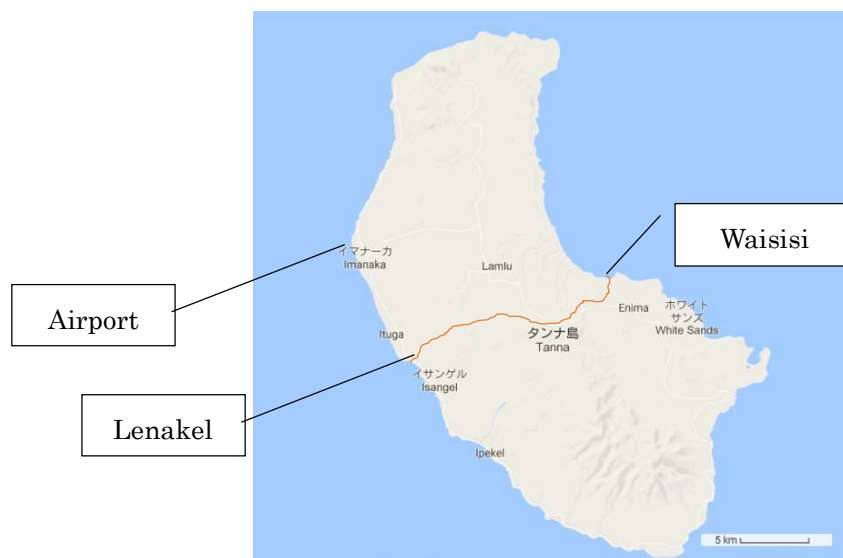


Figure 16: Map for position of Waisisi in Tanna Island

(2) Population

Waisisi is a collective name for the area, and there are two villages at sea side and the inland (Enkofu (or Locapialapen), Laaukipahau) in fact. There are about 500 people in the two villages.

(3) Condition of social infrastructures

The main means of transport to Waisisi is by vehicle. Vehicles are not in the village, so people would phone over and the vehicle will come from Lenakel etc when necessary. However, the condition of the road from the central part of the island to Waisisi is bad, and because of the steep

slope, it is considered difficult to travel in rainy days. There is no water service in the village, and they rely on water delivered by the Department of Water by the tank trucks and rain water. There are no educational facilities, and the children walk to the neighboring village, Depoit. Previously, there was a health facility (dispensary) but now it was closed. Therefore, if people get sick, they walk to the neighboring village as well.

(4) Regional culture

According to an interview survey, regarding the important decisions of households, women can only comply with men, and the status of women in each household is almost exceptionally lower than that of men, and women think that social positions are not equivalent. According to the result of the questionnaire survey (For details, see 3. Social and culture situation in the survey sites in Appendix 16), in answer to the question “Whether or not there are gaps due to gender”, 90% of the surveyed households answered “Strongly agree” or “Agree” and it supports the interview result that there is a gap due to gender. Based on these results, it is considered necessary to consider introducing ways of improving livelihoods for women to fill the gender gap while considering the point of contact with coastal resource management in Waisisi.

There are three tribes (Enkofu, Kwalip, Lowanbai) in Waisisi, White Sands is the local language used in Waisisi’s locality in addition to the common language, Bislama.

According to the result of the questionnaire survey (for detail, see 3. Social and cultural situation in the survey sites in Appendix 16), for answer to the question “Whether traditional tribal systems are functioning”, the surveyed households which responded “Strongly Agree” is 15% and it’s low, but if percentage of “Agree” is accumulated, it is 74% in total and a somewhat high level. Therefore, in Waisisi, the tribal system seems to function to some extent. It is considered effective to involve representatives of each tribe when resource management activities are carried out in Waisisi.

3-2-2 Governance situation in Waisisi

Area Council is established under the provincial government as well as other areas. Waisisi is included in White Sands Area Council. In addition, the governance system of the traditional community centered on the chief and the Village Council are located under this Area Council. (For the organization chart of the Area Council, refer to 3. Governance system in the target provinces in Appendix 1).

According to the questionnaire survey result carried out in this socio-economic survey (For details, see 4. Institution and Governance situation in the survey sites in Appendix 16), in response to the question “Is the chief system functioning?”, the ratio of surveyed households who answered “Strongly Agree” or “Agree” is as high as 86%. However, in response to the question “How much

of the community members will follow instructions given by the chief”, 66% of the surveyed households responded “Follow all instructions” or “Follow most instructions” and it was moderate proportion. For this reason, it is considered that the chief system is functioning to some extent in Waisisi.

Meanwhile, in the response to the question “Are the area councils functioning sufficiently?”, the proportion of response of “Strongly Agree” or “Agree” is as high as 82%. For this reason, in Waisisi, it should be noted that disseminating fishery resource management activities to neighboring areas involving Area Councils as important points though the chief is involved in the activities at the same time.

3-2-3. Economic situation in Waisisi

(1) Main income source of household

According to the National Population and Housing Census issued by the Vanuatu National Statistic Office in 2009, there is no statistics only covering Waisisi. The main sources of income in Tanna’s households and population by industry in Tanna are as Table 35 and Table 36.

In Tanna Island, main sources of income are sales of fish, crops and handicrafts, which is a major source of income for 61.0% of household. In terms by industry, 67.9% of households manufacture goods for their own consumption.

Table 35: Main source of household income in Tanna Island

	Total	None	Wage/ Salary	Land lease	Remi ttanc es	House rent	Sale of fish/crops/h andicrafts	Others	Own busine ss
Tanna	5,153	275	657	5	255	11	3,145	315	490
Percentage		5.3%	12.6%	0.1%	5.0%	0.2%	61.0%	6.1%	9.5%

Source: National Population and Housing Census 2009

Table 36: Number of household by industry in Tanna Island

	Total	Govern ment	Private compa ny	Emplo yer	Self emplo yed	Volunt ary work	Unpaid family work	Produci ng goods for sale	Producing goods for own consumption
Tanna	10,429	523	739	51	413	137	1,126	363	7,077
Percentage		5.0%	7.0%	0.5%	4.0%	1.3%	10.8%	3.5%	67.9%

Source: National Population and Housing Census 2009

According to an interview in Waisisi, the main economic activity for men in Waisisi is almost fishery only. Agriculture is carried out, but production is not so much due to the influence of volcanic ash, and it is only for self-sufficiency. Crops may also be purchased from the market. Although they breed pigs as livestock, it is about to sell when it becomes seasonally necessary for traditional events. In recent years, large scale cruise ships from Australia started to visit Waisisi irregularly. However, the purpose of the tour is for Yasur volcano. Most of the tourists just pass Waisisi even though village people welcome them and some souvenir shops are operated. The berth fee which is paid by the cruise ship is managed by three tribes and saved for future development.

According to interviews, the main economic activity for women is tourism (weaving and sale of mats and baskets). Mats are Vt1, 000 for large ones, Vt500 for small ones, and it is possible to sell four to six per month. Also, baskets are sold at 1,000 VT, selling five to six pieces per month. Women sometimes dive and catch shellfish (family of turban shell (big eye)) and sell it for Vt100 for 10 pieces, and fishery is an income source next to tourism.

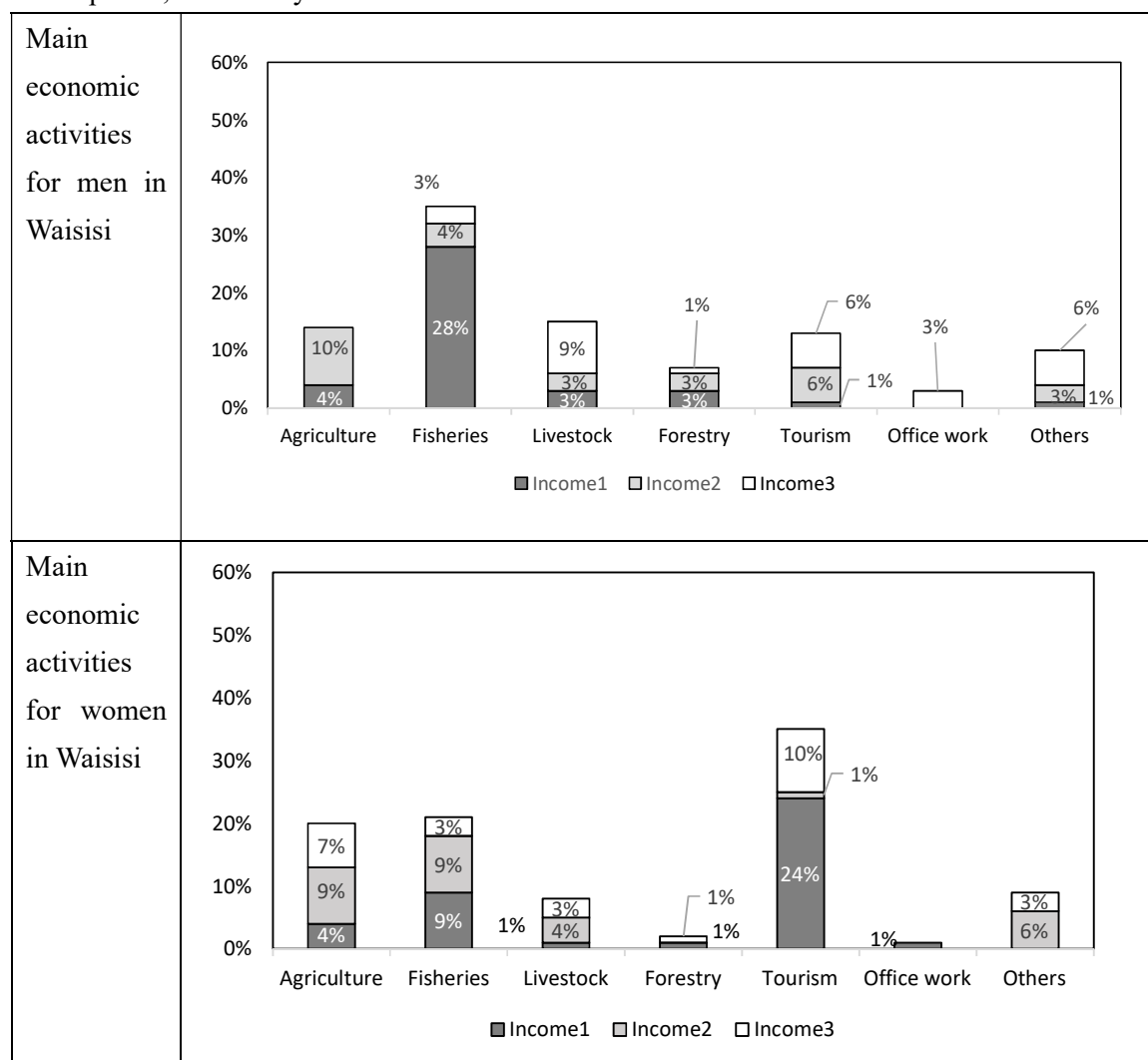


Figure 17: Main economic activities for men and women in the surveyed households of Waisisi

Source: Questionnaire survey

(2) Main fishery activities

Looking at Tanna Island as a whole, the percentage of fishery conducted in the last 6 months is only 33.0% as shown in Table 37. In addition, 85.3% of respondents answered that they only consume it in their own households, and overwhelmingly, fishery is for self-consumption. For this reason, it is considered that Waisisi is a special village in Tanna Island that cannot promote agricultural activities due to volcanic ash.

Table 37: Households with type of fishing activity (Marine fishing) in Tanna Island

	Total households	No fishing in the last six months	Fishing in the last six months	Detail		
				Subsistence only	Sale only	Both
Tanna	5,153	3,451	1,702	1,452	50	200
Percentage		67.0%	33.0%	85.3%	2.9%	11.8%

Source: National Population and Housing Census 2009

In Waisisi, there are four boats in operation and 40 canoes. There were 15 boats and 100 canoes before the damage of cyclone Pam. Fishing methods are changed by wind. In bottom fishing, it is normally used three hooks and caught fishes such as poulet and snapper when wind is not strongly as the boat is hard to carry away. However, when the wind is strong, they cannot do bottom fishing so they catch tuna etc. by the trolling.

For women, at Waisisi, they fish at the coastal area almost every day during the week. They mainly use fishing lines, and they also rarely dive as it is rare in Vanuatu but they collect shell (family of turban shell (big eye)) and octopus. It is very rare that women do diving fishing in Vanuatu.

According to the result of an interview survey at the workshop, the main fishing methods in Waisisi, are as Table 36. Fishery is very popular in Waisisi, and in addition to bottom fish fishing by boat, there are 40 fishermen who are doing canoe fishing.

Table 38: Main fishing methods in Waisisi

Fishing method (Number of fishermen)	Volume of average catch	Frequency of Operation	Cost of fishing operation
Deep-bottom fishing (4 boats×3)	100kg/day	5 days/week	Vt12,000

Canoe fishing (40)	10kg/day	5 days/week	0
Spear diving (10)	6kg/day	3 days/week	0
Gillnet (6) for bait fishing	100kg/day (Oct-Dec))	5 days/week	0
Cast net (4) for bait fishing	10-15kg day (Oct-Dec)	5 days/week	0

According to the result of a survey at the workshop, the main fishing grounds of the fishermen in Waisisi are as Figure 18.

In Waisisi, the bottom fish fishery and trolling are carried out by four boats, and the fishing grounds are widespread, including North Tanna, Aniwa Island, Port Resolution (eastern Tanna) and Imaki (southeast of Tanna Island). In addition, as mentioned above, women do fishing in the foreshore.



Figure 18: Main fishing grounds in Waisisi

(3) Main agricultural activities

According to the result of interviews at a workshop, the situation of agriculture in Waisisi is as Table 39.

Agricultural activities are hampered by the influence of volcanic ash, and crops such as manioc (cassava) and bananas are cultivated for self-sufficiency in Waisisi.

Table 39: Status of agriculture in Waisisi

Name of vegetable and root crops	Volume of harvest per household	Frequency of harvest	Percentage of sale and self-consumption	Price	Seasons
Manioc	5kg/day	5 days/week	Self-consumption only	Not sell	All year around
Kumala	5kg/day	5 days/week	Self-consumption only	Not sell	All year around
Banana	1 bundle (20 fruits)	5 days/week	Self-consumption only	Not sell	All year around
Taro	5kg/day	5 days/week	Self-consumption only	Not sell	All year around

(4) Distribution status of main agricultural and fishery products

In Waisisi, several people go out fishing in order to reduce the cost of transportation costs, put their own catch in each cooler box, arrange one truck for everyone (call Lenakel's transportors if necessary), and often go to sell to Lenakel's fish market, hotels, restaurants and supermarkets. After that, they will receive payment according to the amount of each catch. The purchase price of fish at the fish market in Lenakel is: for reef fish at Vt400/kg, for poulet at Vt600/kg, and for pelagic fish at Vt500/kg and fish market sell them at Vt500/kg, Vt800/kg, and Vt700/kg respectively (Detail is shown in Appendix 10). A solar freezer was provided with the support of SPC, and as of April 2017, a building is under construction to store it. Therefore, distribution of fish may be improved in the future.

3-2-4 Current status of fishery resource management activities in Waisisi

Waisisi has a taboo area in the coastal area. Its area is not so wide and 150 m × 100 m (within the reef). Spear gun and spear fishing are prohibited in the taboo area, and there are no other restrictions. As for the catch of shellfish (family of tuban shell (big eye)), the season of diving is decided for six months as from 1st April to 30th September in every year, and family of tuban shell is caught by diving in that season.

According to the result of interview survey at the workshop, comparing the catch situation between 10 years ago and the current catch situation, on the bottom fish such as poulet and snappers, reduction of fish size and catch volume, longer operation hours and farther fishing ground are seen and there is a tendency of resuction of the resources. Regarding migratory pelagic fish, catch size and catch volume are unchanged. However, the fishing ground seems to be farther. Since it is considered that trolling is done while reaching the fishing ground of the bottom fish, it is considered

that trolling is conducted while reaching the fishing ground of bottom fish, the fishing ground for the migratory pelagic fish is also farther since the distance of bottom fish fishing ground become farther. In addition, the decreasing tendency of resource amount is shown also for shellfish and octopuses that are caught at the foreshore. (For details, see Appendix 11).

There are six primary fishermen's associations in Tanna Island (White Sands (including Waisisi), Southeast, Southwest, West, North East, Northwest (are fishermen's association which are already officially registered as a cooperative). With the support of the Department of Cooperative, there is a movement to officially register every association. There are also secondary fishermen's unions that consolidate six associations. White Sands Fishermen's Association was founded in year 2000, but activities are somewhat stagnant. In addition, fishermen's association do not especially conduct any resource management activities.

3-2-5 Resource management measures and supporting measures assumed in Waisisi (Tanna Island)

(1) Expansion of resource management area

Due to the effects of the Cyclone Pam, dependence on fishery is high due to self-consumption of fish and cash income by sales. For this reason, fishing pressure is increasing to coastal resources within the reef. However, the taboo area is as small as 150 m×100 m, and since only the spear gun in the taboo area is forbidden, the effect of resource multiplication is considered to be limited.

In Waisisi, as resource management activities, closed season of diving fishery is established apart from the small taboo area. However, it is necessary to consider more effective resource management measures. In addition, according to the result of the questionnaire survey (Figure 9), in response to the question "Whether members of other communities are participating in resource management activities", 68% of the respondents answered "I participate" in Waisisi and it is expected a certain level of community participation. However, since there is no group/committee that is dealing with the resource management, it is also important to start awareness activities to gain further understanding of the importance of management of coastal resources. In Waisisi, since the traditional tribal system and the chief system function certain level and the community realizes that Area Council is functioning sufficiently, it is expected to promote fisheries resource management activities inside and outside the community through involving these intra-regional governance systems.

There are fishermen's associations in Waisisi, but there is no resource management group. According to the the questionnaire survey result (Figure 19), percentage of respondents who answer "I do not know the existence of group/committee for coastal resource management" are 46% in

Waisisi. In Figures 1 and 2 of Appendix 16, more than 90% of respondents answered that they know and support resource management activities, but their resource management was conducted under the leadership of the chief. In the future, in order to tackle further resource management by local population, it is necessary to form groups/committees for coastal resource management and to penetrate as community level activities. It is necessary to consider whether existing fishermen's association can be utilized as a resource management group and, if it is difficult, it is necessary to organize a resource management group.

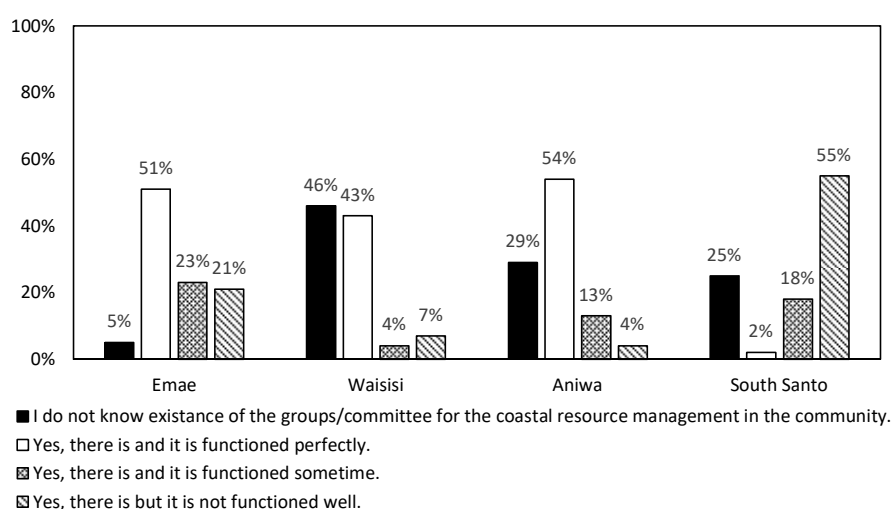


Figure 19: Presence or absence of coastal resource management group/committee at the survey site and the level of the function

Source: Questionnaire Survey

(2) Sharing of fishing ground with neighboring communities

Fishermen in Waisisi go to the northern and southern part of the Tanna Island, and go close to Aniwa Island and fish. Therefore, there is concern that there will be conflicts with the fishermen of other communities concerning the use of fishing grounds in the future. Although serious problem has not occurred at the present time, it is possible to recover from the damage of the Cyclone Pam and the possession rate of boats and canoes will increase in the future, it is conceivable to formulate joint rules for fishing grounds as a preventive approach, and to create a system that allows them to operate without problems in the future.

(3) Tourism Promotion

In Waisisi, there is no substitute industries for the fishery. Agriculture is carried out for the purpose of self-sufficiency and can not be harvested enough to sell under the influence of volcanic ash from Yasur mountain. In Waisisi, cruise ships occasionally call for watching Yasur volcano, and a berth

fee is collected, but because it is managed by the chief, the economic return to the local population is limited. Local population open small souvenir shops for tourists, but most tourists pass through the village.

Since it is recognized that there is a big gender gap in Waisisi, if it is possible to provide snacks using local fishery products and selling handicrafts, it will lead to an increase in women's income.

(4) Improvement of fish distribution

Market for marine products is considered to be a fish market, hotels, restaurants and supermarkets in the center of Tanna Island such as Lenakel. However, with regard to fishery product transportation, there is no truck in the village, and they need to call Lenakel, arrange a truck, pay a high transportation fare (Vt5,000) and transport the fish. In addition, neighboring fishermen in Aniwa Island also send fishery products to Lenakel through Waisisi. Since solar freezers are to be provided to Waisisi with the support of other donors, there is a possibility to motivate resource management through trying to reduce the distribution cost by joint use of trucks as well as utilization of freezers, selling fish to the tourism industry which is recovering rapidly (bungalows etc. in the vicinity of Yasur volcano etc.) after damage of the Cyclone Pam, and improving income by improving the distribution route of fish.

(5) Extensive aquaculture of tilapia

Results of interview survey in the western coast of Tanna Island, as already mentioned, it is conducted to set the taboo area by the community, but a reef resources are reduced as not to be subject to management. From now on, it is necessary to consider resource multiplication by transplantation such as shellfish. On the other hand, supplies of livestock etc. are not sufficient, supply of animal protein to local population is a problem, and expectation for tilapia culture among local population is increasing. For this reason, it is necessary to investigate the situation around the west coast of Tanna Island for a suitable fish farming area and consider the possibility of supporting the activities mainly by VFD.

3-3. Ikoukau, Isavai and Imatu (Aniwa Island)

3-3-1 Social and cultural situation in Aniwa

Social and cultural situation in Aniwa Island is as follows.

(1) Access

From Port Vila to Tanna, Air Vanuatu is flies to and from there every day. The flight time from Port Vila is about 40 minutes. Air Vanuatu has two flights a week from Tanna Island to Aniwa Island. The flight time is 10 minutes (it takes about 2 hours for return trip because the return trip is via Futuna.) In case of emergency, it is possible to go to Tanna Island by charter flight (Vt30,000)

or go to Waisisi by boat (Vt20,000 to Vt24,000) which takes 1 to 2 hours.

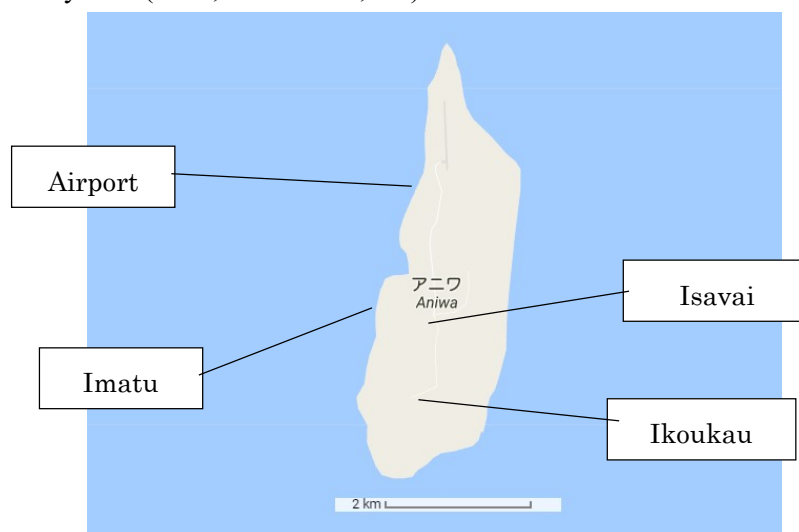


Figure 20: Map of Aniwa Island

(2) Population

In Aniwa Island, there are three communities. Population in each community is as Table 40.

Table 40: Population in three communities in Aniwa Island

Ikoukau	Population is about 300 people, 64 households. The population is increasing. However, seasonally, men are going to work in New Zealand and Australia by harvesting apple etc.
Isavai	Population is 154 people, 44 households. The population is on a downward trend. People work in Tanna and Port Vila to pay for their children's tuitions. In addition, another reason is that the taboo area is wide and it is difficult to earn money from fishery.
Imatu	Population is about 100 people, 22 households. Although the population is on an increasing trend, many people go out to work outside the island.

(3) Condition of social infrastructures

The road is unpaved across the whole island, so the state of the road is bad. There are two vehicles (trucks), but one has been out of order for a long time, and only one is currently operating.

One educational facility is Irumori primary/secondary school. As a health facility, there is an aid post, but the nurse is absent recently (five months as of April 2017).

Electricity is not available. There is only one well in the island but it is malfunctioned and only rainwater is available for water provisions.

(4) Regional culture

According to the interview survey, regarding important decision in households, women have to follow men and women's status in each household is almost exclusively lower than men, and women consider that social positions are not equivalent. According to the result of the questionnaire survey (For details, see 3. Social and culture situation in the survey sites in Appendix 16), on the answer to the question “whether there is a gap due to sex”, the percentage of response of “Strongly Agree” or “Agree” is less than 82% of the surveyed households, and the difference by gender is seen.

There are three communities within the island (Ikoukau, Isavai, Imatu). Each community consists of the following tribes:

Table 41: Tribes in three communities in Aniwa Island

Ikoukau	Isoukane, Isia, Irawaru, Itarisau, Isaweiki, Itarapaki, Ifutuna
Isavai	Fakanguiqugi, Tarua, Nafuji, Kevie
Imatu	Ipake, Larisao, Keheri, Futuna, Itarua

The common language of the island is Bislama and tribal language, Fatasao Iniwa.

Imatu is a combined community of Imare village and Itangtu village.

According to the results of the questionnaire survey (for details, see 3. Social and culture situation in the survey sites in Appendix 16), to the question “whether traditional tribal systems are functioning”, 57% of respondents answered in Aniwa Island that “Strongly Agree”, and it was a somewhat higher level than the other survey sites. In the Project of Grace of the Sea in the Coastal Villages Phase II, agreement formation of the resource management plan advanced rapidly due to the involvement of the representatives of each tribe, and it is considered to be effective to promote activities by using tribal system in Aniwa Island.

3-3-2 Governance situation in Aniwa Island

As the governance system of Aniwa Island, Aniwa Island Area Council has been established. In addition, the governance system of the traditional community centered on the chief and the village council is located under this Area Council. (For the organization chart of the Area Council, refer to 3. Governance system in the target provinces in Appendix 1).

According to the results of the questionnaire survey carried out in this socio-economic survey (for details, see 4. Institution and governance situation at the survey sites in Appendix 16), to the question “Is the chief system functioning?”, 74% of surveyed households who answered “Strongly

Agree” are higher than other survey sites. In addition, 76% of the surveyed households who responded “I follow all instructions” to the question “How many community members will follow instructions in response to instructions given by the chief” and it was the highest rate compared with other survey sites. Therefore, in Aniwa Island, the chief system is still considered to be functioning sufficiently.

On the other hand, 65% of surveyed households answered “Not agree” or “Not agree at all” in the answer to the question “Are Area Council functioning adequately” and it is relatively high. There is no survey household who answers “Strongly agree”, and Area Council is not functioning sufficiently in Aniwa Island.

3-3-3. Economic situation in Aniwa Island

According to the National Population and Housing Census issued by the Vanuatu national Statistic Office in 2009, the main source of income in Aniwa’s household and the population by Aniwa’s industry by industry are as Table 42 and Table 43.

In Aniwa Island, 75% of respondents say that there is no main source of income, and the main work is self-sufficiency. Among the income sources, sales of fish, crops, handicrafts or income from their business is 8.3%, which is important for households. In terms of industry, 89.7% of households produce goods for their own consumption.

Table 42: Main source of income in household in Aniwa Island

	Total	None	Wage/Salary	Remittances	Sale of fish/crops/handicrafts	Own business
Aniwa	84	63	6	1	7	7
Percentage		75.0%	7.2%	1.2%	8.3%	8.3%

Source: National Population and Housing Census 2009

Table 43: Number of household by industry in Aniwa Island

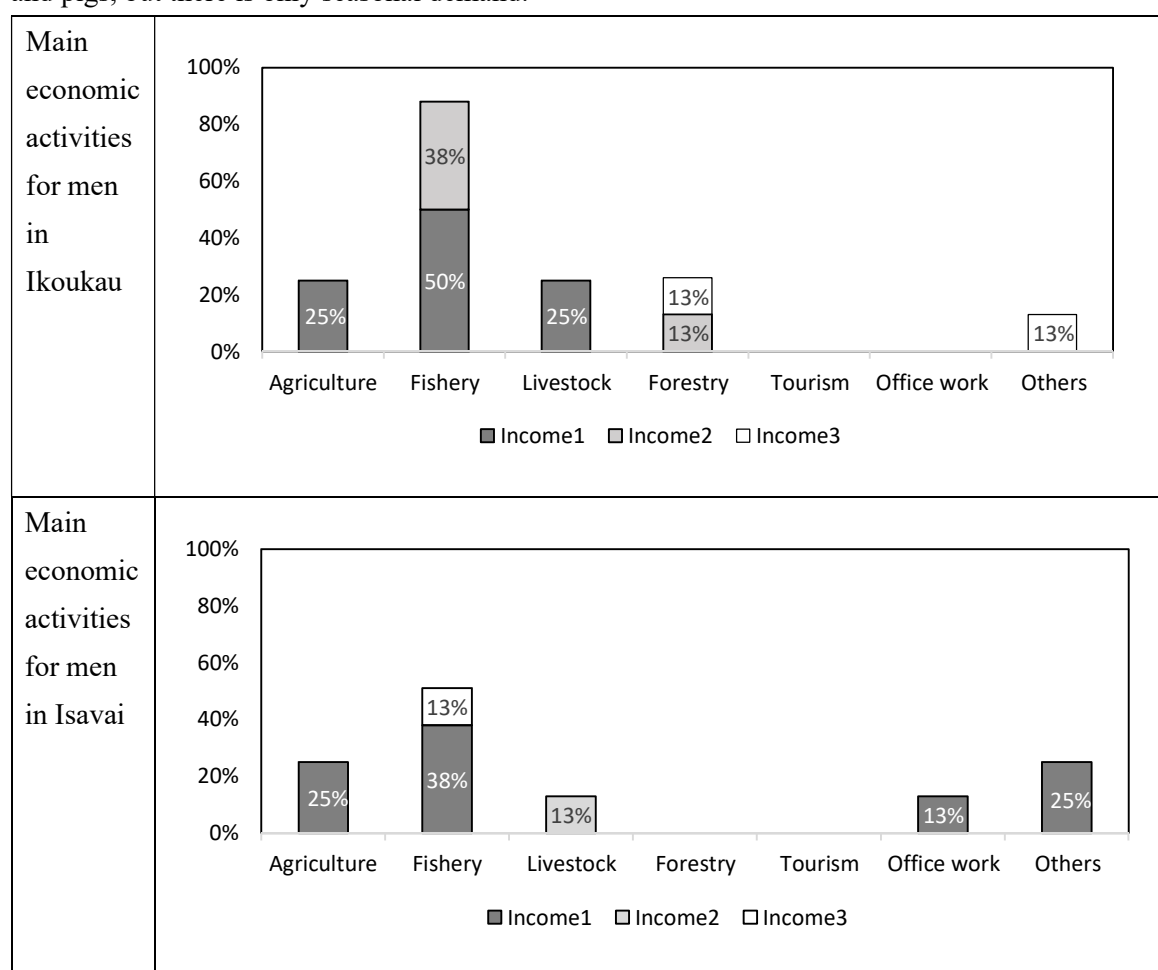
	Total	Govern ment	Private company	Empl oyer	Voluntar y work	Unpaid family work	Produci ng goods for sale	Producing goods for own consumption
Aniwa	126	3	1	1	2	2	4	113
Percentage		2.4%	0.8%	0.8%	1.6%	1.6%	3.1%	89.7%

Source: National Population and Housing Census 2009

According to interviews, the main economic activities for men in Aniwa Island are as Figure 21.

In Ikoukau, fishery is prominent as a major source of income. Fishery is also the first source of income in Isavai and agriculture is following. In Imatu, the main source of income for the first was livestock, but fishery is the second and third income source.

In agriculture, orange and sandalwood were major cash crops, but it has not reached full recovery due to the damage caused by Cyclone Pam. Livestock is about to be sold when it becomes seasonally necessary in traditional events. Regarding livestock, local people look after chickens and pigs, but there is only seasonal demand.



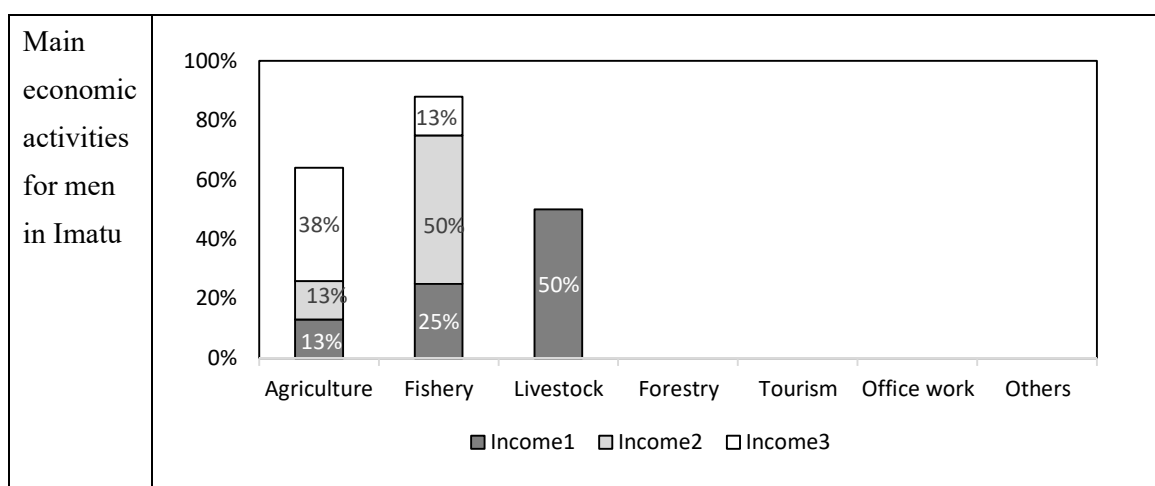


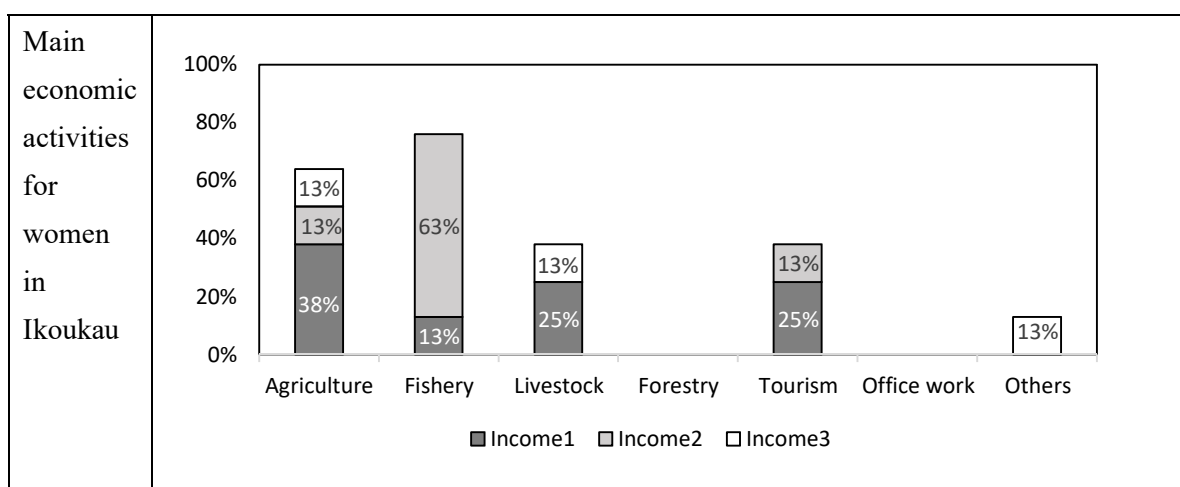
Figure 21: Main economic activities for men in the surveyed households of Aniwa Island
Source: Questionnaire survey

According to the questionnaire survey in Ikoukau, Isavai and Imatu, the main economic activities of women in Aniwa Island are as shown in Figure 22 below.

In Ikoukau, the first income source is agriculture, followed by livestock and tourism. Answers which is said as the tourism is to sell mats and baskets to Port Vila's family and friends (Matt is Vt1,000 to 1,500, Basket is Vt600). Fishery is the second source of income.

In Isavai, clear results were not obtained as three of the respondents got cash income as teachers and sales associates of the co-op. However, according to interviews, many of the female can income from sales of fish caught by line fishing.

In Imatsu, it is mentioned that livestock is the first source of income, followed by agriculture. However, it is also found out that fishery is important as the second source of income.



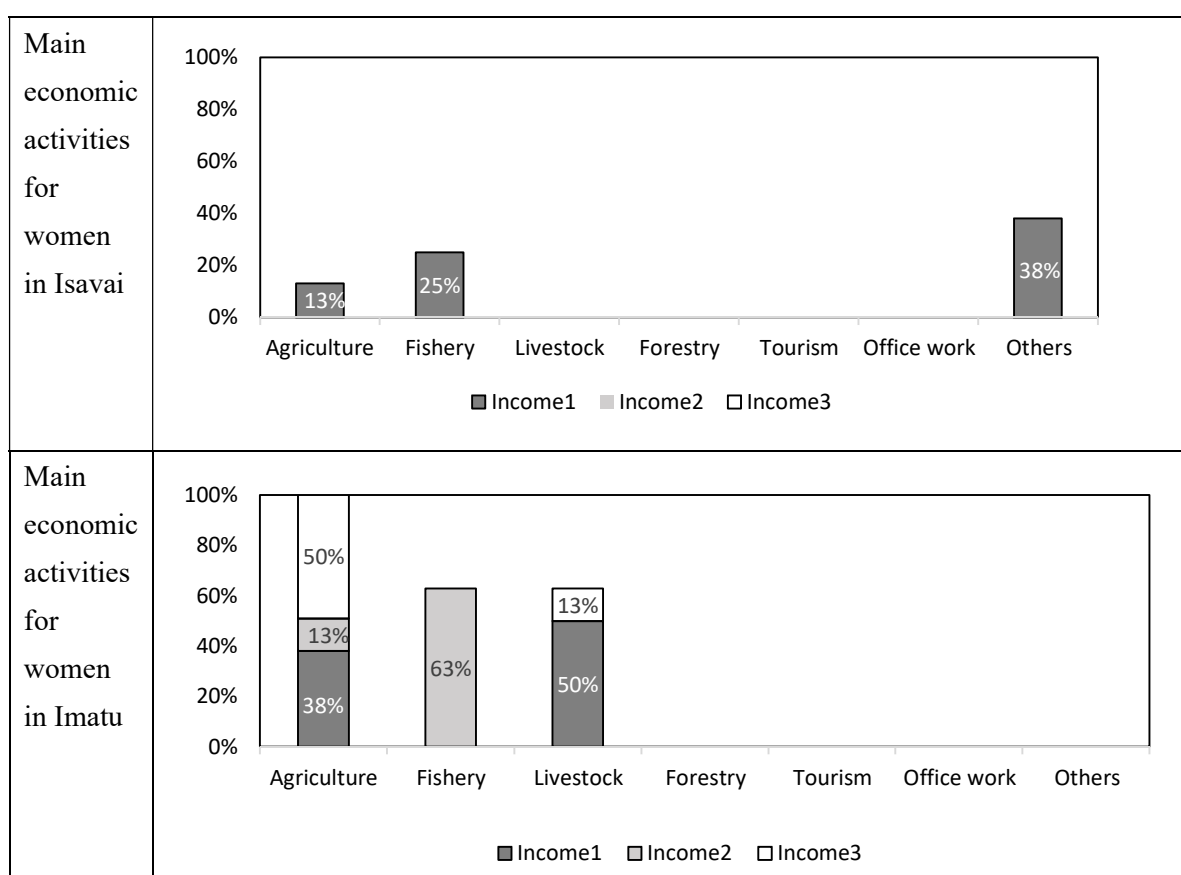


Figure 22: Main economic activities for women in the surveyed households of Aniwa Island

Source: Questionnaire survey

(2) Main fishing activities

According to statistics, the types of fishing activities of household in Aniwa Island are as Table 44.

Percentage answered that they did fishing in the past 6 months was 83.3%. In addition, its aim is that 92.9% of respondents say that most of them are self-consuming, and most of them practise fishery for in-house consumption purposes. However, since it is an old statistic, the percentage of products sold at the time of the survey in 2017 is a little higher.

Table 44: Households with type of fishing activity in Aniwa Island (Marine fishing)

	Total households	No fishing in the last six months	Fishing in the last six month	Detail		
				Subsistence only	Sale only	Both
Aniwa	84	14	70	65	-	5
Percentage		16.7%	83.3%	92.9%	-	7.1%

Source: National Population and Housing Census 2009

According to the result of the survey at the workshop, the main fishing methods in Aniwa are are boat and canoe fishing, spear fishing, spear guns and night diving. As for Isavai, there is a lagoon in the northern part, and there are many fishermen who use gillnet in the lagoon. In addition, fishing with bamboo rods is done throughout the community including women (Detail is shown in Appendix 12).

According to the result of the survey at the workshop, the main fishing grounds of Aniwa fishermen are as Figure 23.

Aniwa's fishery is basically targeted to migratory pelagic fish and bottom fish which requires fishing operation by boats and canoes around the island. The lagoon in the northern part of the island is a taboo area from July to February, mullet, etc. are caught from March to June. According to an interview survey, fishermen from Waisisi come fishing during the night around the reef of Aniwa Island.

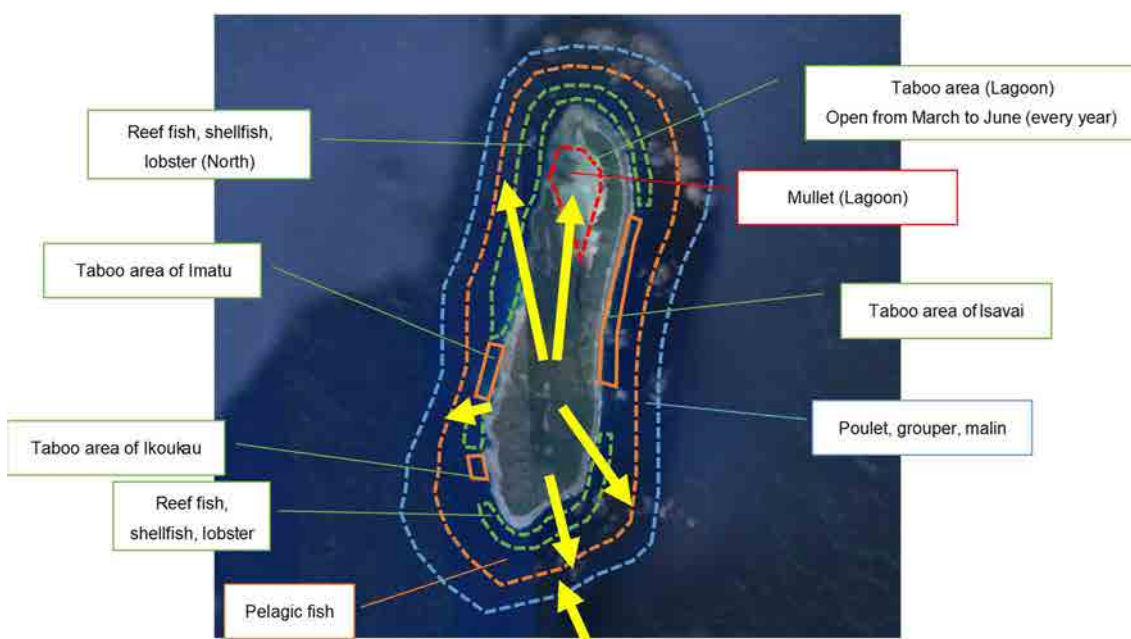


Figure 23: Main fishing ground in Aniwa Island

(3) Major agricultural activities

According to the results of interviews at the workshop, in the situation of agriculture in Aniwa Island, crops that serve as the staple food of Vanuatu such as Fiji taro, cassava (manioc), banana, and bread fruit are cultivated mainly for self-consumption. As for specialty, oranges, most of them

are for sale (Detail is shown in Appendix 13).

(4) Distribution status of major agricultural and fisheries products

Each fisher has sold his own fish. However, in Ikoukau, the fishermen's association established to buy and ship fish to Tanna Island such as fish market, hotels, restaurants, supermarkets etc. via Waisisi by utilizing the solar freezer provided in February 2017. The capital of purchase is funds which is profit from sale of fishing gears provided by SPC Project, PacFish. For Isavai and Imatu, fishermen still sell via Waisisi or go selling to Ikoukau fishermen's association. There are other solar freezers such as 1) cooperative freezers and 2) freezers (Imatu) supported by politicians. 2) is currently out of order. Regarding 1), community members only can deposit fish into it and the cooperative do not buy fish. In order to deposit fish, it is necessary to pay custody fee.

Regarding agricultural products, basically, except for orange, it is for self-sufficiency. Orange is shipped to Port Vila or Lenakel (Tanna Island) for selling.

According to the interview survey at workshop, percentage of self-consumption is higher than sale in major fishing communities in Aniwa for reef fish and migratory pelagic fish. On the other hand, purpose of selling is higher than self consumption on the poulet, bream and grouper (Detail is shown in Appendix 14).

3-3-4. Current status of resource management activities in Aniwa Island

Current status of resource management activities in Aniwa Island is as Table 45. In addition, position of taboo areas are shown in Figure 24.

Table 45: Main resource management activities in Aniwa Island

Ikoukau	There is a taboo area (50 m × 40 m) which started four years ago (2013). Catch of all fish and shellfish is prohibited.
Isavai	Since before, the lagoon in the northwest part of the island became a taboo area except in March - June. In addition, since 2016, a taboo area (2.5 km × 100 m) was established in the eastern part of the island. Within this taboo area catch of all fisheries product was banned. This taboo area was set as a result of support by the Vanuatu Coastal Adaptation Project (VCAP).
Imatu	Previously there was a taboo area on the west coast of Aniwa. However, it is now opened. A taboo area (500 m × 50 m) was set up in the coastal area of Imatu since 2017. Within this taboo area, catch of all fish and shellfish is banned. In the future, it was considered to open and close these two taboo areas alternately.



Figure 24: Taboo areas in Aniwa Island

The catch situation 10 years ago and the current catch situation of main target fish in Aniwa Island was compared through to the result of the workshop, and there were signs of declines in resources on decline of catch size, decrease of catch volume and longer operation time such as many fishes caught in the reefs, mullet and emperor caught in the lagoon, bottom fish such as poulet and grouper. On the other hand, respondent answered that migratory pelagic fishes such as yellow fin tuna and wahoo have not been decreased (Detail is shown in Appendix 15).

There are fishermen's associations, but they have not done activities related to resource management. Though there is one Vanua-tai (turtle monitors by NGO Wan Smol Bag) in the island, there has been no point of contact with the Fishermen's Association.

3-3-5 Resource management measures and supporting measures assumed in Ikoukau, Isavai and Imatu (Aniwa Island)

(1) Setting of resource management area in the whole island

There are already several taboo areas in Aniwa Island, but there are cases where local population cannot get enough income from fishery and go out to work outside the island due to the recently set wide taboo area in Isavai. On the other hand, since the chief of Imatu have a plan to open two taboo areas alternately, it is conceivable to introduce more intensive management methods such as expanding places to be managed to the whole island level and at the same time, rotating the taboo area or regulate the certain fish species or certain fishing methods etc., and consider measures to

mitigate economic losses. Regarding the lagoon, it is opened from March to June every year, but as signs of resource reduction are seen, it is also necessary to consider alternatives such as opening up every other year.

As a result of this socio-economic survey, since surveyed households recognize that traditional tribal systems and chief systems are functioning in Aniwa Island, it is believed that consensus formation within the communities are promoted by fully utilizing the systems of these community systems.

(2) Sharing of fishing ground with neighboring communities

As mentioned above, the fishermen of Wasisi come near the reef of Aniwa Island and fish. As a result of the survey, the fishing grounds of fishermen in Aniwa Island are farther from the island compared with 10 years ago, and there is a possibility that use of fishing grounds of both communities will compete in the future.

Although it has not occurred serious problems at the present time, it is conceivable to formulate a joint rule of the fishery with the Waisisi community and to create a system that can operate without problems in the future.

(3) Support for Improving Distribution of Fish

Market for fishery products is considered to be a fish market, hotels, restaurants and supermarkets in the center of Tanna Island such as Lenakel. However, since Aniwa is a remote island near Tanna Island which is the main island, fishermen firstly need to transport their catch by boat from the island to Waisisi, arrange trucks from Waisisi, pay high transportation fee (Vt5,000), and transport the fish. Solar freezer is provided to Ikoukau under the aid of donor and distribution was improved in some villages of the island. Therefore, it is necessary to support further improvement of distribution route such as reducing transportation cost to Tanna Island.

In addition, as mentioned above, since solar freezers are to be provided to Waisisi with the support of donors, and there is a possibility of motivating resource management through improvement of income by improving fish distribution route such as development of a joint distribution route utilizing the solar freezer and sale of fish to bungalows etc. located near the Yasur volcano.

(4) Value addition of fish

In Aniwa Island, fish such as yellowfin tuna are caught. If these fish can be processed such as tuna jerky which is possible to preserve and sold to bungalows for tourists for Tanna Island, public market, kava bar etc., it will lead to the improvement of income for women. In addition, even in areas where there is no solar freezer, it is possible to disseminate processing as a preservation method for fish that can not be eaten.

C. Selection of candidate pilot sites

As the result of considering the possibility of new tool trials in the candidate pilot sites on the basis of the result of the previous analysis, Nakere and Wailapa in Espiritu Santo Island, Araki Island, all communities of Emae Island including Marae, Tongamea, Sangava, and Waisisi in Tanna Island and Aniwa Island are selected. The reasons for the selection will be described below.

(1) Nakere and Wailapa in Espiritu Santo Island and Araki Island (South Santo)

In South Santo, governance systems such as chief systems and area councils are weakening. Therefore, there is significance to study, plan, and try on awareness raising methods that will work even at such sites. The possibility of developing new tools for supporting measures is shown below. In Araki Island, migratory pelagic fish is caught around FAD and it is desirable to try value addition of fish products using pelagic fish. It is also possible to collaborate with JOCV dispatched to Espiritu Santo Island. Furthermore, as the large consuming area called Luganville is close, it is suitable as a site to try new tools of improving distribution of fishery products, such as examining Nakere as a relay point of fish products from Araki Island and Tangoa Islands.

Tilapia' extensive culture, which is being carried out in Wailapa, is one of the tools of an important supporting measures. However, there are challenges to secure fresh water. Moreover, in Espiritu Santo Island, a tilapia culture expert of GIZ has started semi-extensive tilapia culture activities, and there remains a question whether the Project can cooperate with him well or not. At this moment, it is assumed to implement it in Wailapa where the possibility of securing freshwater is left, but other sites such as Tanna Island will be continuously studied while it is also considered to apply other available techniques.

(2) All communities of Emae Island including Marae, Tongamea, Sangava

In this socio-economic survey, three communities of 10 major communities especially Marea, Tongamea and Sangava, which are populous were surveyed. As the result, there was a decrease in the coastal resources in Emae Island, and it became clear that it is difficult to generate sufficient effect only each community conducts fishery resource management individually (See 2-2-4 Current status of fishery resource management in Emae Island). As a result, it was concluded that it is desirable to conduct resource management activities in the whole Emae Island. Assuming coastal resource management of many small isolated islands in Vanuatu, it is valuable likely to become a popularization model to other remote islands by trying resource management area in whole Emae Island and developing tourism as supporting measures etc. In addition, Emae Island has Cook's reef which the fishing ground are shared with other Islands, and there is a possibility to try joint management fishing ground management.

(3) Waisisi, Tanna Island and Ikoukau, Isavai and Imatu (Aniwa Island)

Fishermen in Waisisi go to fish not only the foreshore managed by the community but also the northern and southern part of Tanna Island and Aniwa Island, and catch pelagic fish and bottom fish. Therefore, it is judged that there is a value to implement “trial of joint management of bottom fish resources” in multiple communities that had not been addressed in the previous phases (see Figures 18 and 3-2-4 Current status of fisheries resources management activities in Waisisi). In addition, since fishermen in Waisisi and Ikoukau, Isavai and Imatu in Aniwa Island sell fishery products through the same distribution channel, it is necessary to select these sites in view of trying joint resource management of bottom fish resources and at the same time, trying measures to support fish distribution.

End

Apprndix 1: Outline of the target provinces

1. Social situation in the target provinces

1) Population

Summary of the population statistics in 2009 for the provinces where the candidate pilot sites of the Project are as Table 1.

Sanma Province is the lowest in terms of population density. It is analyzed that the area has a little less than three times area of other provinces and there are mountainous regions with low population density in the northwestern part.

The population of Shefa Province with the capital Port Vila is 78,723, and the highest among them. The population growth rate is also the highest at 3.7%, over 3.5% of urban areas as a whole urban area. In terms of population by age, number of children (under 15 years old) is the smallest (33.1%) while the youth population (22.5%) and the population aged (39.46%) are high comparing with the other two provinces. From this, it seems that population concentration in Port Vila, the capital, is occurring.

On the other hand, the population of Tafea Province is the lowest among these, and the population growth rate is 1.1% and it is lower than 1.9% of the whole rural area. In terms of population by age, number of children (under 15 years old) is the biggest (46.4%) while the youth population (16.5%) and the population aged (31.6%) are low comparing with the other two provinces. From this, it seems that depopulation capital to other provinces is occurring.

Table 1: Population statistics in the Provinces where there are candidates of the pilot sites

	Total	Urban	Rural	Sanma	Shefa	Tafea
Total area	12,281km ²	-	-	4,262km ²	1,507km ²	1,632km ²
Total population	234,023	57,195	176,828	45,855	78,723	32,540
Male	119,091	29,618	89,473	23,623	40,550	16,202
Female	114,932	27,577	87,355	22,232	38,173	16,338
Average annual population growth rate (%)	2.3	3.5	1.9	2.4	3.7	1.1
Population density	19			11	52	20
Number of private households	47,373	11,606	35,767	9,213	15,930	5,853
Average household size	4.8	4.8	4.8	4.8	4.8	5.5
Number of children	90,973	18,065	72,908	18,376	26,092	15,104

(<15 years)	(38.9%)	(31.6%)	(41.2%)	(40.1%)	(33.1%)	(46.4%)
Youth population (15-24 years)	45,423 (19.4%)	13,646 (23.9%)	31,777 (18.0%)	9,058 (19.8%)	17,734 (22.5%)	5,354 (16.5%)
Population aged (25-59 years)	83,821 (35.8%)	23,380 (40.9%)	60,441 (34.2%)	16,071 (35.0%)	31,082 (39.4%)	10,270 (31.6%)
Older population (60 year and older)	13,806 (5.9%)	2,104 (3.7%)	11,702 (6.6%)	2,350 (5.1%)	3,814 (4.8%)	1,812 (5.6%)

Source: National Population and Housing Census 2009, Vanuatu National Statistics Office

2) Education

Summary of statistics related to education in the Provinces in 2009 the candidate for the pilot site of the Project are as Table 2.

School enrollment rates are high in order of Shefa, Sanma, and Tafea. Tafea Province is as large as 42.1% on the proportion of population aged 15 and older with no education, and Sanma Province is less than half of it. The lowest percentage of the proportion of population aged 15 and older with no education is of Shefa Province. In addition, primary education and literacy rate in Tafea Province is the lowest.

Differences in the enrollment rate by each region are points to keep in mind when conducting awareness activities on the resource management activities. In particular, it becomes a hint to select materials when conducting awareness-raising activities by target such as women who conduct shellfish collection activities at reef, young people to divide and others, and to choose teaching materials such as picture center, character center, knowledge of living things etc.

Table 2: Education statistics in the Provinces where there are candidates of the pilot sites

Unit: %

	Total	Urban	Rural	Sanma	Shefa	Tafea
School enrolment rates of 6-13 year-olds	85.9	90.8	84.8	86.5	88.5	75.8
Male	85.7	90.8	84.6	86.5	88.3	75.5
Female	86.2	90.7	85.2	86.6	88.7	76.1
Proportion of population aged 15 and older with no education	17.2	5.0	21.7	17.2	8.6	42.1
Male	15.4	4.7	19.5	15.8	8.0	37.7

Female	19.0	5.3	23.9	18.6	9.2	46.1
Primary education	51.5	38.8	56.2	53.9	45.8	40.6
Male	51.3	37.6	56.7	54.2	44.5	43.0
Female	51.6	40.1	55.7	53.7	47.0	38.4
Literacy rate (more than 15 years old)	84.8	97.7	80.5	84.6	95.0	63.9
Male	85.7	97.8	81.6	85.1	95.2	66.3
Female	83.9	97.6	79.4	84.0	94.8	61.6

Source: National Population and Housing Census 2009, Vanuatu National Statistics Office

In addition, the population of school attendance age per school which divided the number of primary, primary/secondary and secondary schools in each target province by the population of school attendance age is as Table 3.

In terms of the number of students per school, Sanma province is the lowest with 154 people/school. Meanwhile, Tafea province is the highest with 332 people / schools, and it is more than twice of Sanma province. From this result, it is considered that the number of schools is short in Tafea Province, and education is not received in the appropriate environment.

Table 3: Number of school in the target provinces

		Primary	Primary/Secondary	Secondary
Sanma	Number of school	57	6	13
	Population of school attendance(5~14 year old)	11,690		
	Population of school attendance per school (5~14 year old)	154/school		
Shefa	Number of school	47	15	16
	Population of school attendance(5~14 year old)	16,011		
	Population of school attendance per school (5~14 year old)	205/school		
Tafea	Number of school	23	-	6
	Population of school attendance(5~14 year old)	9,636		
	Population of school attendance per school (5~14 year old)	332/school		

Source: Vanuatu National Statistics Office

4) Health and Hygiene

The main sources of water in 2009 in the Provinces where there are candidates of the pilot sites are as Table 4. It is lower in order of Shefa Province, Sanma Province, and Tafea Province.

Table 4: The main sources of water in the Provinces where there are candidates of the pilot sites

Unit: %

	Total	Urban	Rural	Sanma	Shefa	Tafea
Improved ⁵	85.2	94.7	82.1	79.3	94.8	63.3
Not improved	14.8	5.3	17.9	20.7	5.2	36.7

Source: National Population and Housing Census 2009, Vanuatu National Statistics Office

In addition, the number of hospitals, health centers, dispensaries in each target Province is as Table 5.

In terms of the number of health facilities per capita in the rural area, Sanma Province has the smallest number of people per facility, whereas the largest number is in the Shefa province. Efate Island seems to have the largest population among the provinces, but because access to Port Vila is good, it is also possible to go to hospitals and private hospitals. There is one health center in the island and two dispensaries. This may be the reason of high number of health facilities per capita.

In Vanuatu, though there is an aid post between the health center and the dispensary, this document did not deal with it.

Table 5: Number of health facilities in the Provinces where there are candidates of the pilot sites

	Hospital	Health center	Dispensary
Sanma	1	7	14
Population	-	32,699 (without population of urban area)	
Health facility per person	-	1,557/ health facility	
Shefa	1	2	6
Population	-	34,684 (without population of urban area)	
Health facility per person	-	4,335/ health facility	
Tafea	1	5	11
Population	-	32,540)	

⁵ Improved water refers mainly to access to public water and deep wells, but definitions are not stated in this statistic. Mineral water may also be included. Conversely, water that has not been improved refers to river water, shallow wells, rainwater, etc.

Health facility per person	-	2,033/ health facility

Source: National Population and Housing Census 2009, Vanuatu National Statistics Office

5) Disability

The percentage of people with disabilities per capita in 2009 for the provinces where there are candidates of the pilot sites is as Table 6.

There is no big difference among the target provinces, but the Shefa Province is the most frequented person with mild and moderate disability, and conversely, severely disabled person is relatively few.

Table 6: Percentage of people with disabilities per capita for the provinces where there are candidates of the pilot sites

	Male		Female	
	Mild and moderate (%)	Severe (%)	Mild and moderate (%)	Severe (%)
Sanma	7.81	0.6	7.76	0.73
Shefa	8.48	0.53	9.38	0.71
Tafea	7.2	0.96	6.82	0.68

Source: National Population and Housing Census 2009, Vanuatu National Statistics Office

2. Main industry and the current situation in the target provinces

Statistics on the employment status of the Provinces in 2009 where the candidates for the pilot sites of the Project are as Table 7.

In the national total, the number of employed population and subsistent workers are almost equal. For Sanma Province, subsistent workers are slightly larger, and number of subsistent workers are nearly four times of the number of employed workers in Tafea Province. Meanwhile, Shefa Province has its capital Port Vila, and number of the employed workers is more than three times than subsistent workers.

Table 7: Employment status in the Provinces where there are candidates of the pilot sites

	Total	Urban	Rural	Sanma	Shefa	Tafea
Employed population	42,295	18,016	24,279	7,596	22,091	2,295
Male	25,916	10,883	15,033	4,833	13,302	1,450
Female	16,379	7,133	9,246	2,763	8,789	845
Subsistence workers	41,877	1,966	39,881	9,788	6,090	8,053
Male	21,942	1,131	20,811	4,979	3,569	4,233

Female	19,935	865	19,070	4,809	2,521	3,820
Unemployed	4,518	2,798	1,720	791	2,516	825
Male	2,301	1,363	938	415	1,246	445
Female	2,217	1,435	782	376	1,270	380
Unemployment rate	4.6	11.9	2.3	4.1	7.7	6.6
Male	4.1	9.9	2.2	3.8	6.5	6.4
Female	5.2	14.7	2.4	4.4	9.4	6.8

Source: National Population and Housing Census 2009, Vanuatu National Statistics Office

The average income and average expenditure per household 2009 for the Provinces where there are the candidates for the pilot sites of the Project is as Table 8.

In Shefa Province, the capital Port Vila, the average income per household is large, due to the large population of cash income. Meanwhile, the average income in Tafea Province where self-sufficiency is major is less than half of that of Shefa. In addition, since average expenditure per household exceeds the average expenditure, it is considered difficult to save money.

Table 8: The average income and average expenditure per household 2009 for the Provinces where there are the candidates for the pilot sites

	Average monthly household income (VT)	Average monthly expenditure per household (VT)
Whole Vanuatu	83,800	76,200
Urban	97,500	97,300
Rural	79,500	69,300
Sanma	94,000	70,700
Shefa	131,800	86,300
Tafea	53,500	65,100

Source: Vanuatu National Statistics Office, Household Income and Expenditure Survey 2010

3. Governance system in the target provinces

(1) Governance system in the target Provinces (Area council system)

The administrative division of Vanuatu is divided into six provinces (Torba, Sanma, Penama, Malampa, Shefa and Tafea). In addition, since 2014, Municipality and Area council are placed based on the Decentralization Act.

In Santo, Shefa, and Tafea Provinces, which are listed as candidates for pilot sites in the Project, there are municipalities and area councils as Table 9. The main task of the Area Council is to

develop the target area through communication with the Province, and guidance and consultation in the target area. Representatives of various stakeholders such as representatives elected (Area Councilors and Area Secretary), representatives of chiefs and representatives of each industry in the region gathered in the Area Council. It is expected to recognize the Project and share the information not only to the target site but also to the surrounding area if Area Council is involved. In addition, by being recognized as part of regional development, it may lead to sustainability of the project activities through allocation of their development budget.

Table 9: Municipality and Area Council in Sanma Province, Shefa Province and Tafea Province

Name of Province	Municipality or Area council
Sanma	<u>Municipality</u> Luganville <u>Area council</u> Canal-Fanafo, East Malo, East Santo, Ifira, North Santo, North West Santo, South East Santo, South Santo, West Malo and West Santo
Shefa	<u>Municipality</u> Port Vila <u>Area council</u> Emau, Erakor, Eratap, Eton, Ifira, Makimae, Maloruam Nguna, Emae, North Efate, North Tongoa, Tongariki, Pangom Tongariki, Varisu, Vermali, Vermaul and Yarsu
Tafea	<u>Area council</u> Aneityum, Aniwa Futuna, Middle Bush Tanna, North Erromango, North Tanna, South Erromango, South Tanna, South West Tanna, West Tanna, West Tanna and Whitesands Tanna

As an example of structure of the Area Council, Aniwa's Area Council as shown in the figure 2.

It is the Aniwa Island Area Council that governs Aniwa Island. Councilor and area secretary are elected by election. It is the area secretary that handles the practice of the area council. Under the area secretary, there are area council members, representatives of local village chiefs and industries are selected.

In each village, there is a village council composed of representatives of each tribe (Nakamaru), and there is a village economic and socioeconomic group under it. The village consensus formation is mainly done by the Village Council, and the representatives of the Area Council Members communicate this to the Area Council. According to interviews, there are female delegates in the

area council, as well as opportunities for women to express their opinions in the meetings etc. to village councils, so that both men and women will have a chance to reflect their opinions on the development of villages.

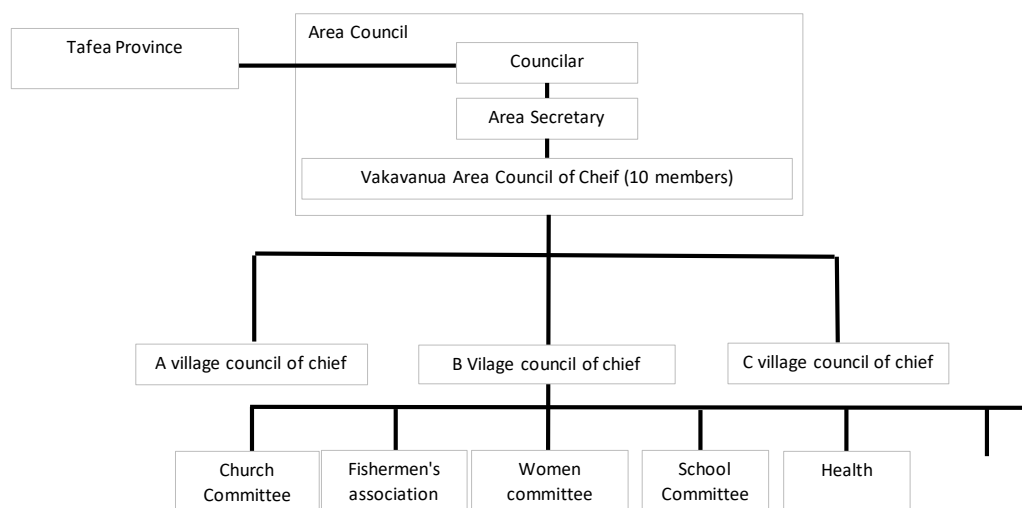


Figure 2: Governance System in Aniwa Island

(2) Fishery administration in the target province

The number of fisheries officers for VFD and authorized officers in Santo, Shefa and Tafea Provinces which are listed as candidates for pilot sites in this project is as Table 10.

Table 10: Number of fisheries officers for VFD and authorized officers in the target provinces

Name of Province	Number of fisheries officers	Authorized officers
Sanma	4	0
Shefa	2	1(Lelepa), 1(Mangaliliu), 2 (Emae)
Tafea	1	1(Aneityum)

Appendix 2: Main fishing methods in South Santo's four communities

	Fishing method (Number of fishermen)	Volume of average catch	Frequency of Operation	Cost of fishing operation
Wailapa	Canoe fishing (21 canoes, 25 fishermen)	5-20kg/day	3-4 times/week	Vt500-2000
	Hand line	1-5kg/day	3-4 times/week	Vt100-200
	Gill net			
	Diving			
Nakere	Canoe fishing (12 fishermen (12 canoes))	20-30kg/day	4-5 days/week	Hook Vt200, line Vt90
	Trolling (12 fishermen (12 canoes))	20-30kg/day	4-5 days/week	Hook Vt200, line Vt90, lure Vt200
	Drop stone (Kura) (12 fishermen, 12 canoes))	10-15kg/day (Canoe)	4-5 days/week	Hook Vt200, line Vt90, lure Vt200
	Hand line (Every community)		4-5 days/week	
	Gill net			
	Diving			
Tangoa Island	Deep-water drop line (14 fishermen (2 boats, 8 canoes))	100-140kg/day (Boat) 30-60kg/day (Canoe)	4-5 days/week	Vt8,990 (hooks Vt200, ice block Vt1,200, fuel Vt7,500, line VT90)
	Trolling (28 fishermen (2 boats, 22 canoes))	20-70kg/day (Boat) 20-30kg/day (Canoe)	4-5 days/week	Hook, line, lure (Vt500)
	Drop stone (Kura) (18)	10-40kg/day (Boat)	4-5 days/week	Hook, line, lure (Vt500)

	fishermen, 1 boat, 14 canoes))	10-15kg/day (Canoe)		
	Hand line (Every community)		4-5 days/week	
Araki Island	Bottom fishing (4 boats, 15 canoes, 50 fishermen)	20kg	Everyday	Vt11,860 (Ice Vt1,200, hooks Vt500, pet bottle Vt600, transport Vt7,500, municipal tax Vt1,000, plastic bag Vt360, line Vt700)
	Trolling	40kg	Everyday	Same as above
	Diving			
	Gill net			
	Line			

Appendix 3: Agriculture status at four communities in South Santo

	Name of vegetable and root crops	Volume of harvest per household	Frequency of harvest	Percentage of sale and self-consumption		Price	Seasons
				Sale	Self-consumption		
Wailapa	Banana	15kg/day	3 times/week	10%	90%	Vt500-1000	All through the year
	Taro	2kg/day	3-4 times/week	10%	90%	Vt500-800/bundle	All through the year
	Manioc	15kg/day	3-4 times/week	10%	90%	Vt400/bundle	All through the year
	Island cabbage	1kg/day	Everyday	10%	90%	Vt100/bundle	All through the year
	Kumala	2kg/day	3-4 times/week	10%	90%	Vt500/basket	All through the year
Nakere	Manioc (Cassava)	One bundle (5kg)/day	Every day	50%	50%	Vt100-500	All through the year
	Banana	One bundle (10kg)/day	Every day	50%	50%	Vt100-500	All through the year
	Island cabbage	One bundle (2kg)/day	Every day	50%	50%	Vt100-500	All through the year
	Tomatoe	One bundle (3kg)/day	Every day	30%	70%	Vt50-100	All through the year
	Water taro	One bundle (5kg)/day	Every day	30%	70%	Vt500/bundle	All through the year
	Coconut	One	Five	50-	0-50%	Vt60/kg,	All

		bundle (10kg)/day	days/week	100%		Vt20/ fruit	through the year
Tangoa	Manioc	One bundle (5kg)/day	Every day	50%	50%	Vt100-500	All through the year
	Banana	One bundle (10kg)/day	Every day	50%	50%	Vt100-500	All through the year
	Island cabbage	One bundle (2kg)/day	Every day	50%	50%	Vt100-500	All through the year
	Tomatoe	1 bundle (3kg)/day	Every day	30%	70%	Vt50-100	All through the year
	Water taro	One bundle (5kg)/day	Every day	30%	70%	Vt500/bundle	All through the year
	Coconut	One bundle (10kg)/day	Five days/week	50- 100%	0-50%	Vt60/kg, Vt20/ fruit	All through the year
Araki	Island cabbage	1 bundle (2kg)/day	Every day	30%	70%	Vt100	All through the year
	Taro	1 bundle (5kg)/day	Every day	30%	70%	Vt500	All through the year
	Manioc	1 bundle (5kg)/day	Every day	30%	70%	Vt300	All through the year
	Capsicum	10 fruits (2kg)/day	Every day	20%	80%	Vt100	All through the year
	Kumala	1 basket (10kg)/day	Every day	30%	70%	Vt300	All through the year
	Yam	1 basket	Every day	30%	70%	Vt300	All

		(10kg)/kg					through the year
	Tomato	10 fruits (3kg)/day	Every day	20%	80%	Vt100	All through the year
	Cocoa	1 bag (15kg)/day	Every day	100%	0%		April- July
	Coconut	6 fruits (10kg)/day	Every day	0%	100%		All through the year r

Appendix 4: Main target fish in the four communities of Southern Santo

	Main target fish	Percentage of sale and self-consumption		Seasons of fishing	Average price	
		Sale	S/Consumption		Beach price (/kg)	Market price (/kg)
Wailapa	Yellow fin tuna	30%	70%	March-April	Vt200	
	Poulet	100%	0%	All through the year	Vt500	
	Mix reef fish	0%	100%	All through the year		
	Snapper	0%	100%	All through the year	Vt500	
	Bigeye scad (Mangru)	10%	90%	March-April	Vt200	
Nakere	Yellow fin tuna	50%	50%	January-April	Vt700	Vt700
	Bigeye scad (Mangru)	80%	20%	March-July	Vt600	Vt700
	Open mouth	92%	8%	January-October	Vt600	Vt600
	Blue nite	90%	10%	All through the year	Vt600	Vt600
	Mackerel, Scad	80%	20%	November-March	Vt800	Vt800
	Grouper (Los)	98%	2%	All through the year	Vt700	Vt700
	Amber jack	100%	0%	All through the year	Vt900	Vt900
Tangoa	Poulet	96%	4%	All through the year		Vt800
	Red	99%	1%	All through	Vt700	Vt800

	snapper			the year		
	Bream	100%	0%	All through the year	Vt700	Vt700
	Bigeye scad (Mangru)	80%	20%	March-July	Vt600	Vt700
	Open mouth	92%	8%	January-October	Vt600	Vt600
	Blue nite	90%	10%	All through the year	Vt600	Vt600
	Mackerel, Scad	80%	20%	November-March	Vt800	Vt800
	Grouper (Los)	98%	2%	All through the year	Vt700	Vt700
	Amber jack	100%	0%	All through the year	Vt900	Vt900
Araki	Yellow fin tuna	80%	20%	March-April	Vt300	Vt600
	Poulet	80%	20%	All through the year	Vt400	Vt800
	Snapper	70%	30%	All through the year	Vt400	Vt800
	Bream	70%	30%	All through the year	Vt300	Vt600
	Grouper (Los)	70%	30%	All through the year	Vt300	Vt600
	Bigeye scad (Mangru)	50%	50%	March-May, July-August	Vt300	Vt600
	Blue night	50%	50%	All through the year	Vt300	Vt600

Appendix 5: Comparison of catch situation 10 years ago and the current situation for the main target fish in the four communities of Southern Santo

	Main target fish	Change in fish size between 10 years ago and now	Change in catch volume between 10 years ago and now	Change in operation hours between 10 years ago and now		Change in distance to fishing ground between 10 years ago and now	
				10 years ago	Now	10 years ago	Now
Wailapa	Yellow fin tuna	→	Not enough information (Fishing is a new activity)		2-3 hours		100-200m
	Poulet	→	Not enough information (Fishing is a new activity)		Overnight		300m-2km
	Mix reef fish	↓	↓	4-5 hours	4-5 hours		4-10m3
	Snapper	→	Not enough information (Fishing is a new activity)		Overnight		300m-2km
	Bigeye scad (Mangru)	→	Not enough information (Fishing is a new activity)		-		100-200m
Nakere	Yellow fin tuna	→	→	1 hour	2-3 hour	3km	5km
	Bigeye scad (Mangru)	→	→	1 hour	1 hour	10m	10m
	Open month	↓	→	1 hour	2-3 hour	10m	10m
	Banana fusllier (Blue nite)	→	↓	1 hour	2-3 hour	50m	50m
	Mackerel, Scad	→	→	1 hour	2-3 hour	50m	50m

	Grouper (Los)	→	↓	1-2 hour	2 hour	1km	2-6km
	Amber jack	→	↓	1-2 hour	2 hour	1km	2-6km
Tangoa Island	Poulet	→	↓	2 hour	4 hour	1km	3km
	Red snapper	→	↓	1 hour	7-8 hour	1km	3km
	Bream	→	→	1 hour	1-3 hour	1km	1-4km
	Bigeye scad (Mangru)	→	→	1 hour	1 hour	10m	10m
	Scad (Big mouth)	↓	→	1 hour	2-3 hour	10m	10m
	Banana fusllier (Blue nite)	→	↓	1 hour	2-3 hour	50m	50m
	Mackerel, Scad	→	→	1 hour	2-3 hour	50m	50m
	Grouper (Los)	→	↓	1-2 hour	2 hour	1km	2-6km
	Amber jack	→	↓	1-2 hour	2 hour	1km	2-6km
Araki Island	Yellow fin tuna	→	→	3 hour	5 hour	2km	2km
	Poulet	→	→	3 hour	5 hour	300m	300m
	Snapper	→	→	3 hour	5 hour	300m	300m
	Bream	→	→	3 hour	5 hour	300m	300m
	Grouper (Los)	→	→	2 hour	4 hour	200m	200m
	Bigeye scad (Mangru)	→	→	1 hour	3 hour	100m	100m
	Banana fusllier (Blue nite)	→	→	1 hour	3 hour	100m	100m

Appendix 6: Major fishing methods in the main communities of Emae Island

	Fishing method (Number of fishermen)	Volume of average catch	Frequency of Operation	Cost of fishing operation
Marae	Spear fishing (22)	10kg/day	4 times/week	0
	Hook line (9)	2 kg/day	Once/week	Vt100
	Reef cleaning (full community)	3 kg/ day	Twice/week	0
	Gill net (9)	5 kg/day	One/week	0
	Cast net (2)	5 kg/day	3 times/week	0
	Night diving (22)	20 kg/day	Everyday	Vt1,000
	Canoe fishing (8)	6 kg/day	Twice/week	Vt1,500
	Boat fishing (3)	100 kg/day	Once/week	Vt16,000
	Trolling (3)	30 kg/day	Once/week	Vt10,000
Tongamea	Spear fishing (28)	5 kg/day	Twice/week	Vt0
	Hook line (41)	2 kg/day	4 times/week	Vt50
	Gill net (5)	10 kg/day	Twice/week	Vt0
	Cast net (2)	1.5 kg/day	Twice/week	Vt0
	Night diving (28)	10 kg/day	4 times/week	Vt500
	Boat fishing (4)	0 (Not operate yet)	0	Vt0
	Trolling (3)	6 kg/day	Once/week	Vt8,000
	Canoe fishing (10)	12 kg/day	Once/week	Vt40,00
	Reef cleaning (every community)	4 kg/day	When weather condition is good	Vt240 (battery)
Sangava	Spear fishing (61)	8 kg/day	2 times/week	Vt0
	Hook line (30)	3 kg/day	4 times/week	Vt150
	Reef cleaning (full community)	2 kg/ day	2-3 times/week	Vt0
	Gill net (7)	10 kg/day	3-4 times/week	Vt0
	Cast net (4)	4 kg/day	3-4 times/week	Vt0
	Night diving (61)	20 kg/day	4-5 times/week	Vt500
	Canoe fishing (14)	12 kg/day	3 times/week	Vt1,500
	Boat fishing (5)	15 kg/day	Once/week	Vt10,000

	Trolling (5)	20 kg/day	Once/week	Vt15,000

Appendix 7: Agricultural situation in major villages in Emae Island

	Name of vegetable and root crops	Volume of harvest per household	Frequency of harvest	Percentage of sale and self-consumption		Price	Seasons
				Sale	Self-consumption		
Marae	Manioc	80kg/week	Every day	0%	100%	Vt300/bag	All through the year
	Taro	1.2 kg/week	Once/week	0%	100%	Vt300/bag	All through the year
	Banana	4 kg/week	Three times/week	2%	98%	Vt500/bundle	All through the year
	Kumala	12.5 kg/week	four times/week	15%	85%	Vt500/basket	April to July
	Yam	5 kg/week	Twice/week	30%	70%	Vt1000/basket	March to September
	Corn	2.5 kg/week	Twice/week	40%	60%	Vt200/bag	All through the year
	Island Cabbage	2.5 kg/week	Everyday	60%	40%	Vt100/bunch	All through the year
	Peanut	1 kg/week	Once/week	100%	0%	Vt20/cup	March to September
	Pawpaw	2.5 kg/week	Every day	0%	100%	Vt100	All through the year
	Water melon	4 kg/week	Once/week	80%	20%	Vt300	November to January
Tongam ea	Banana	3 kg/week	Twice/week	0%	100%	0	All through the year
	Taro	1.5 kg/week	Once/week	0%	100%	0	All through the year
	Yam	1.25 kg/week	Once/week	2%	98%	Vt400/Basket	April to July
	Kumala	1.25 kg/week	Everyday	40%	60%	Vt300/Basket	All through the year
	Manioc	45 kg/week	Everyday	40%	60%	Vt60 (1 laplap)	All through the year

	Corn	2.5 kg/week	Depends on seasons	30%	70%	Vt100	All through the year
	Water melon	5 kg/week	Depends on seasons	50%	50%	Vt500	August to December
	Peanut	7.5 kg/week	Depends on seasons	100%	0%	Vt20 (cup), Vt50 (bundle)	March to September
	Pawpaw	0.25 kg/week	Everyday	0%	100%	0	All through the year
	Island cabbage	1.25 kg/week	Everyday	40%	60%	Vt200/roll	All through the year
Sangava	Taro	2 kg/week	Three times/week	5%	95%	Vt300	April to May
	Yam	2.5 kg/week	Twice/week	40%	60%	Vt400	All through the year
	Manioc	3 kg/week	Every day	30%	70%	Vt60	All through the year
	Banana	5 kg/week	Every day	50%	50%	Vt500	March to August
	Kumala	5 kg/week	Twice/week	50%	50%	Vt300	All through the year
	Corn	2.5 kg/week	Three time/week	50%	50%	Vt20	All through the year
	Pawpaw	0.8 kg/week	Every day	0%	100%	Vt0	All through the year
	Peanut	7.5 kg/week	Three time/week	50%	50%	Vt20 (cup), Vt50(bundle)	All through the year
	Water melon	5 kg/week	Once/week	70%	30%	Vt500	March to December
	Island cabbage	1 kg/week	Every day	50%	50%	Vt50	All through the year
	Chinese cabbage	1 kg/week	Twice/week	50%	50%	Vt50	March to September

	Tomatoe	1 kg/week	Twice/week	50%	50%	Vt100	March to September

Appendix 8: Main target fish in main communities of Emae Island

	Main target fish	Percentage of sale and self-consumption		Seasons of fishing	Average price	
		Sale	S/Consumption		Beach price (/kg)	Market price (/kg)
Marae	Parrotfish	100%	0%	All through the year		
	Unicorn fish (Sandpepa)	70%	30%	All through the year	Vt200	Vt750
	Surgeonfish (Renbo fis)	50%	50%	All through the year	Vt300	Vt750
	Surgeon fish (Black fish)	50%	50%	All through the year	Vt300	Vt750
	Grouper (Los)	20%	80%	October-March	Vt500	Vt900
	Poulet	100%	0%	All through the year	Vt500	Vt900
	Crab	80%	20%	November-January	Vt300	Vt300
	Octopus	50%	50%	April-July	Vt100	Vt300
	Eel	0%	100%	All through the year	-	-
	Shark	0%	100%	All through the year	-	-
	Goat fish (Mustas fish)	100%	0%	All through the year	Vt300	Vt750
Tongamea	Parrotfish	100%	0%	All through the year	Vt300	Vt600
	Goat fish (Mustas fish)	95%	5%	All through the year	Vt300	Vt600
	Soldiar fish (Red fish)	50%	50%	All through the year	Vt300	Vt600
	Poulet	100%	0%	All through the year	Vt500	Vt900

	Emperor (Redmaot)	50%	50%	All through the year	Vt300	Vt600
	Unicorn fish (Sandpepa)	25%	75%	June-July	Vt250	Vt600
	Surgeonfish (Poketnaef)	50%	50%	November- December	Vt300	Vt600
	Grouper (Los)	5%	95%	All through the year	Vt300	Vt600
	Octopus	20%	80%	July- August	Vt200	Vt500
	Lobster	100%	0%	All through the year	Vt700	Vt1,000
Sangava	Parrotfish	100%	0%	All through the year	Vt300	Vt650
	Unicorn fish (Sandpepa)	5%	95%	All through the year	Vt200	Vt650
	Rabbit fish (Pico)	95%	5%	All through the year	Vt300	Vt650
	Poulet	100%	0%	All through the year	Vt500	Vt1,000
	Soldiar fish (Red fish)	50%	50%	All through the year	Vt300	Vt650
	Goat fish (Mustas fish)	70%	30%	All through the year	Vt300	Vt650
	Grouper (Los)	5%	95%	All through the year	-	-
	Squid	0%	100%	June-July	Vt380	Vt1,000

Appendix 9: Comparison of the catch situation 10 years ago and the current situation of main target fish in the surveyed sites at Emae Island

	Main target fish	Change in fish size between 10 years ago and now	Change in catch volume between 10 years ago and now	Change in operation hours between 10 years ago and now		Change in distance to fishing ground between 10 years ago and now	
				10 years ago	Now	10 years ago	Now
Marae	Parrotfish	↓	↓	30 min	1 hour	200m	1km (due to establishment of new taboo area)
	Unicorn fish (Sandpepa)	↓	↓				
	Surgeonfish (Renbo fis)	↓	↓				
	Surgeon fish (Black fish)	↓	↓				
	Grouper (Los)	↓	↓				
	Poulet	↓	↓				
	Crab	↓	↓				
	Octopus	↓	↓				
	Eel	↓	↓				
	Shark	↓	↓				
	Goat fish (Mustas fish)	↓	↓				
Tongamea	Parrotfish	↓	↓	15 min	30 min	100m	100m
	Goat fish (Mustas fish)	↓	↓				
	Soldiar fish (Red fish)	↓	↓				
	Poulet	↓	↓				
	Emperor (Redmaot)	↓	↓				
	Unicorn fish (Sandpepa)	↓	↓				
	Surgeonfish	↓	↓				

	(Poketnaef)						
	Grouper (Los)	→	↓				
	Octopus	↓	↓				
	Lobster	↓	↓				
Sangava	Parrotfish	↓	↓	20 min	30 min	200m	200m
	Unicorn fish (Sandpepa)	→	↓				
	Rabbit fish (Pico)	↓	↓				
	Poulet	→	↓				
	Soldiar fish (Red fish)	↓	↓				
	Goat fish (Mustas fish)	↓	↓				
	Grouper (Los)	→	↓				
	Squid	↓	↓				

Appendix 10: Main target fish in Waisisi

Main target fish	Percentage of sale and self-consumption		Seasons of fishing	Average price	
	Sale	S/Consumption		Beach price (/kg)	Market price (/kg)
Poulet	90%	10%	All year around	Vt500/kg	Vt600-700/kg
Bream	90%	10%	All year around	Vt500/kg	Vt600-700/kg
Yellow fin tuna	90%	10%	Dec-March	Vt400/kg	Vt500/kg
Skipjack tuna	90%	10%	Dec-March	Vt400/kg	Vt500/kg
Grouper (Los)	90%	10%	All year around	Vt500/kg	Vt600/kg
Amberjack	90%	10%	All year around	Vt500/kg	Vt600/kg
Shark	0%	100%	All year around	-	-
Job fish (Salmon)	90%	10%	All year around	Vt500/kg	Vt600/kg
Emperor (Redmaot)	90%	10%	All year around	Vt500/kg	Vt600/kg
Mahi-mahi	90%	10%	All year around	Vt400/kg	Vt500/kg
Wahoo	90%	10%	June-August	Vt400/kg	Vt500/kg
Marlin	90%	10%	Dec-March	Vt400/kg	Vt500/kg
Mackerel	90%	10%	April-August	Vt400/kg	Vt500/kg
Rainbow runner	90%	10%	All year around	Vt400/kg	Vt500/kg
Barracuda	90%	10%	All year around	Vt400/kg	Vt500/kg
Bigeye scad (Mangru)	90%	10%	All year around	Vt300/kg	Vt400/kg
Sardine	90%	10%	All year around	Vt300/kg	Vt400/kg
Carangue	90%	10%	All year around	Vt300/kg	Vt400/kg
Big eye	50%	50%	All year around	Vt100 (10 pieces)	Vt100 (10 pieces)
Clam	50%	50%	All year around		
Octopus	50%	50%	All year around		

Appendix 11: Comparison of the catch situation 10 years ago and the current situation of main target fish in Waisisi

Target species	Change in fish size between 10 years ago and now	Change in catch volume between 10 years ago and now	Change in operation hours between 10 years ago and now		Change in distance to fishing ground between 10 years ago and now	
			10 years ago	Now	10 years ago	Now
Poulet	↘	↘	4 hours	8 hours	5-6 nautical mile	14 nautical mile
Bream	↘	↓	4 hours	8 hours	5-6 nautical mile	14 nautical mile
Yellow fin tuna	→	→	6 hours	6 hours	5-6 nautical mile	14 nautical mile
Skipjack tuna	→	→	6hours	6hours	5-6 nautical mile	14 nautical mile
Grouper (Los)	→	→	4 hours	8hours	5-6 nautical mile	14 nautical mile
Amberjack	↓	↓	4 hours	8 hours	5-6 nautical mile	14 nautical mile
Shark	↓	→	4 hours	8 hours	5-6 nautical mile	14 nautical mile
Job fish (Salmon)	↓	↓	4 hours	8 hours	5-6 nautical mile	14 nautical mile
Emperor (Redmaot)	↓	↓	4 hours	8 hours	5-6 nautical mile	14 nautical mile
Mahi-mahi	→	→	6 hours	6 hours	5-6 nautical	14 nautical

					mile	mile
Wahoo	→	→	6 hours	6 hours	5-6 nautical mile	14 nautical mile
Marlin	→	→	6 hours	6 hours	5-6 nautical mile	14 nautical mile
Mackerel	→	→	6 hours	6 hours	5-6 nautical mile	14 nautical mile
Rainbow runner	→	→	6 hours	6 hours	5-6 nautical mile	14 nautical mile
Barracuda	→	→	6 hours	6 hours	5-6 nautical mile	14 nautical mile
Bigeye scad (Mangru)	→	→	1-2 hours	1-2 hours	Harbor	No change
Sardine	→	→	1-2hours	1-2 hours	Harbor	No change
Carangue	↓	↓	4 hours	6 hours	Harbor	No change
Famiy of turban shell (Big eye)	↓	↓	1-2 hours	8 hours	Harbor	No change
Clam	↓	↓	1-2 hours	8 hours	Harbor	No change
Octopus	↓	↓	1-2 hours	8 hours	Harbor	No change

Appendix 12: Main fishing methods in Aniwa Island

	Fishing method (Number of fishermen)	Volume of average catch	Frequency of Operation	Cost of fishing operation
Ikoukau	Boat fishing (3 boats, 9 fishermen)	34kg/day	Three time /week	Vt1,600
	Canoe (15 canoes, 20 fishermen)	9kg/day	Everyday	0
	Spear gun (15)	23kg/day	Everyday	0
	Bamboo fishing (Whole community)	6kg/day	Everyday	0
	Fishing net (2 fishermen)	10kg/day	Once/week	0
Isavai	Gill net (More than 30 fishermen)	7kg/day	5 times/week	0
	Spear gun (35 fishermen)	10kg/day	3-4 times/week	0
	Canoe fishing (3 canoes, 31 fishermen)	15-20kg/day	3-4 times/week	0
	Spear (10 fishermen)	10-15kg/day	2-3 times/week	0
	Boat (12 fishermen, 4 boats) for deep bottom fishing	50-60kg/day	2-3 times/week	Vt6,000/day
	Boat (12 fishermen, 4 boats) for trolling	100-150kg/day	2-4 times/week	Vt12,000/day
	Diving (Lobster) (12 fishermen)	20-30kg/day	2-3 times/week (depends on weather)	Vt200/day
	Reef walking (Whole	15-20kg/ day	2-3 times/week (depends on	

	community)		weather)	
Imatu	Night dive (13 fishermen)	6kg/day	5-6 times/week	Vt200 (battery)
	Canoe (22 canoes, 12 fishermen)	10kg/day	5-6 times/week	Vt220 (fishing gear)
	Boat (3 fishermen, 1 boat)	20-30kg/day	2 times/week	Vt4,000 (trolling and deep bottom fishing)
	Bamboo fishing (Whole community)	3-4kg/day	5-6 times/week	Vt100 (fishing gear)

Appendix 13: Status of agriculture in Aniwa Island

	Name of vegetable and root crops	Volume of harvest per household	Frequency of harvest	Percentage of sale and self-consumption		Price	Seasons
				Sale	Self-consumption		
Ikoukau	Orange	8kg/day (40 fruits)	Once in a year	90%	10%	Vt500	June-July
	Manioc	5kg/day	Five time in a week	0%	100%	-	All year around
	Fiji taro	2kg/day	One time in a week	0%	100%	-	All year around
	Banana	1 bundle/week	One time in a week	0%	100%	-	All year around
	Yam	2kg/day	One time in a week	80%	20%	Vt500	March-April
	Kumala	2kg/day	Twice in a week	0%	100%	-	All year around
	Bread fruit	3kg/day	Once in a week	0%	100%	-	All year around
	Coconut	2kg/day	Everyday	0%	100%	-	All year around
	Mango	3kg/day	Once in a year	0%	100%	-	December-February
	Island cabbage	2kg/day	Everyday	0%	100%	-	All year around
Isavai	Manioc	8kg/day	5 times/week	0%	100%	-	All year around
	Banana	15kg/day	Twice/week	0%	100%	-	All year around
	Fiji Taro	10kg/day	Once/week	0%	100%	-	All year around
	Kumala	5kg/day	Once/week	0%	100%	-	All year around
	Orange	40-50kg/day	Once/week	60%	40%	Vt1,000	4 ~ 7 月 April-July

	Island cabbage	1kg/day	Once/week	0%	100%	-	All year around
	Coconut	5kg/day	2-3 times/day	0%	100%	-	All year around
	Pawpaw	2-3kg/day		0%	100%	-	All year around
Imatu	Manioc	10kg/day	2-3 times/week	0%	100%	-	All year around
	Banana	3kg/day	Once/week	0%	100%	-	All year around
	Yam	5kg/day	Once/week	0%	100%	-	April-August
	Orange	10-15kg/day	5 times/week	80%	20%	Vt1,000/Basket Vt50/fruit	June-August
	Coconut	3-4 fruits/day	6 times/week	0%	100%	-	All year around
	Bred fruit	4-5 fruits/day	3-4 times/week	0%	100%	-	November-March
	Mango	15-20 fruits	6 times/week	0%	100%	-	November-January
	Fiji Taro	1-2kg/day	Twice/week	0%	100%	-	All year around
	Corn	10-1/day	5 times/week	0%	100%	-	All year around

Appendix 14: Main target fish in each community of Aniwa Island

	Main target fish	Percentage of sale and self-consumption		Seasons of fishing	Average price	
		Sale	S/Consumption		Beach price (/kg)	Market price (/kg)
Ikoukau	Parrotfish	40%	60%	All through the year	Vt250/kg	Vt600/kg
	Yellow fin tuna	60%	40%	November to December	Vt250/kg	Vt600/kg
	Wahoo	60%	40%	June to August	Vt250/kg	Vt600/kg
	Mahi-mahi	60%	40%	June to August	Vt250/kg	Vt600/kg
	Barracuda	60%	40%	All year around	Vt250/kg	Vt600/kg
	Skipjack	80%	20%	November to January	Vt250/kg	Vt600/kg
	Poulet	90%	10%	All through the year	Vt300/kg	Vt600/kg
	Bream	90%	10%	All through the year	Vt300/kg	Vt600/kg
	Grouper (Los)	90%	10%	All through the year	Vt300/kg	Vt600/kg
	Mullet	40%	60%	March to June	Vt200/kg	Vt400/kg
	Unicorn fish (Sandpepa)	40%	60%	All through the year	Vt200/kg	-
	Surgeonfish (Renbo fis)	40%	60%	All through the year	Vt200/kg	-
	Rabbit fish (Pico)	0%	100%	All through the year	Vt150/kg	-
	Goat fish (Mustas fish)	40%	60%	March to June	Vt200/kg	Vt400/kg
	Surgeon fish	40%	60%	All through	Vt200/kg	Vt400/kg

	(Black fish)			the year		
	Chocolate Surgeon fish (Aby (Aniwa))	20%	80%	All through the year	Vt150/kg	-
	Jungle perch (Wali (Aniwa))	0%	100%	All through the year	Vt150/kg	Vt400/kg
	Drummer fish (Big bell)	60%	40%	All through the year	Vt150/kg	-
	Demsei fish (Mutu (Aniwa))	0%	100%	All through the year	Vt150/kg	-
	Soldiar fish (Red fish)	40%	60%	All through the year	Vt250/kg	-
	Wrasse (Marari (Aniwa))	0%	100%	All through the year	Vt150/kg	Vt400/kg
	Surgeon fish (Minini (Aniwa))	10%	90%	All through the year	Vt150/kg	-
	Marlin	80%	20%	April to December	Vt250/kg	Vt600/kg
	Thick lips (Sasuwa (Aniwa))	60%	40%	All through the year	Vt200/kg	Vt400/kg
	Deep sea scad (Rowo (Aniwa))	60%	40%	All through the year	Vt200/kg	Vt400/kg
	Trevally (Kashi (Aniwa))	60%	40%	November to December	Vt250/kg	Vt600/kg
	White trevally (Outu	60%	40%	November to December	Vt250/kg	Vt600/kg

	(Aniwa))					
	King fish	0%	100%	October to December	-	Vt600/kg
	Octopus	0%	100%	All through the year	-	Unknown
	Lobster	90%	10%	All through the year	-	Vt1,500/kg
	Family of turban shell (Big eye)	0%	100%	April to July	-	-
	Trochus	90%	10%	April to July	-	-
	Chiton	0%	100%	All through the year	-	-
	Sea urchin (Watuke (Aniwa))	0%	100%	August to November	-	-
	Scallop (Munamuna (Aniwa))	0%	100%	April to July	-	-
Isavai	Mullet	20%	80%	March-June (Lagoon)	Vt200/kg	Vt600/kg
	Poulet	80%	20%	All through the year	Vt300/kg	Vt600/kg
	Wahoo	90%	10%	March-September	Vt250/kg	Vt500/kg
	Yellow fin tuna	60%	40%	September-January	Vt250/kg	Vt500/kg
	Skipjack	60%	40%	September-February	Vt250/kg	Vt500/kg
	Grouper (Los)	70%	30%	All through the year	Vt200/kg	Vt500/kg
	Flying fish	50%	50%	July-February	Vt100/kg	Vt200/kg
	Marlin	80%	20%	July-February	Vt250/kg	Vt600/kg
	Dog tooth	0%	100%	July-		

tuna			December		
Barracuda	50%	50%	All through the year	Vt250/kg	Vt500/kg
Mahi-mahi	60%	40%	All through the year	Vt250/kg	Vt500/kg
Rainbow runner	20%	80%	All through the year	Vt250/kg	Vt500/kg
Emperor (Redmaot)	0%	100%	March-June (Lagoon)		
Carange	30%	70%	All through the year	Vt250/kg	Vt500/kg
Parrotfish	50%	50%	All through the year	Vt250/kg	Vt500/kg
Surgeonfish (Renbo fis)	10%	90%	All through the year	Vt250/kg	Vt500/kg
Unicorn fish (Sandpepa)	20%	80%	All through the year	Vt250/kg	Vt500/kg
Rabbit fish (Pico)	20%	80%	All through the year	Vt250/kg	Vt500/kg
Drummer fish (Big bell)	20%	80%	All through the year	Vt250/kg	Vt500/kg
Soldiar fish (Red fish, Marau (Aniwa))	10%	90%	All through the year	Vt250/kg	Vt500/kg
Goat fish (mustas fish)	20%	80%	All through the year	Vt250/kg	Vt500/kg
Milk fish (Bun fish)	0%	100%	All through the year	Vt250/kg	Vt500/kg
Lobster	90%	10%	All through the year	Vt500/kg	Vt1,000/kg
Famly of turban shell (Rriri)	0%	100%	All through the year	-	-

	Octopus	0%	100%	All through the year	-	-
	Clam	%	100%	All through the year	-	-
	Tupa (Land crab)	0%	100%	All through the year	-	-
Imatu	Surgeonfish (Renbo fis)	20%	80%	All through the year	Vt200/kg	Vt250/kg
	Mullet	60%	40%	May-June	Vt300/kg	Vt400/kg
	Unicorn fish (Sandpepa)	70%	30%	April	Vt300/kg	Vt450/kg
	Parrotfish	80%	20%	All through the year	Vt200/kg	Vt500/kg
	Wahoo	70%	30%	June-September	Vt400/kg	Vt700/kg
	Yellow fin tuna	50%	50%	All through the year	Vt300/kg	Vt700/kg
	Poulet	50%	50%	All through the year	Vt400/kg	Vt700/kg
	Grouper (Los)	70%	30%	All through the year	Vt200/kg	Vt500/kg
	Lobster	90%	10%	All through the year	Vt500/kg	Vt1,000/kg

Appendix 15: Comparison of the catch situation 10 years ago and the current catch situation of main target fish in Aniwa Island

	Main target fish	Change in fish size between 10 years ago and now	Change in catch volume between 10 years ago and now	Change in operation hours between 10 years ago and now		Change in distance to fishing ground between 10 years ago and now	
				10 years ago	Now	10 years ago	Now
Ikoukau	Parrotfish	↓	↓	30 min	2 hours	50m	100-200m
	Yellow fin tuna	→	→	30 min	30 min-1 hour	500m	500m
	Wahoo	→	→	30 min	30 min-1 hour	500m	500m
	Mahi-mahi	→	→	30 min	30 min-1 hour	500m	500m
	Barracuda	→	→	30 min	30 min-1 hour	500m	500m
	Skipjack	→	→	30 min	30 min-1 hour	500m	500m
	Poulet	↓	↓	15 min	30 min	1km	1km
	Bream	→	↓	15 min	30 min	200m	200m
	Grouper (Los)	→	→	10 min	15 min	200m	200m
	Mullet	↓	↓	Less than 30 min	15 min	50m	100-200m
	Unicorn fish (Sandpepa)	→	↓	2 min	2 min	30m	30m
	Surgeonfish (Renbo fis)	→	→	10 min	30 min-1 hour	30m	30m
	Rabbit fish (Pico)	→	→	10 min	30 min-1 hour	10m	10m
	Goat fish (Mustas fish)	↓	↓	10 min	30 min-1 hour	30m	30m
	Surgeon	↓	↓	10 min	30 min-1	30m	30m

	fish (Black fish)				hour		
	Chocolate Surgeon fish (Aby (Aniwa))	→	→	10 min	30 min-1 hour	10m	10m
	Jungle perch (Wali (Aniwa))	→	→	10 min	30 min	10m	10m
	Drummer fish (Big bell)	↓	↓	10 min	30 min	10m	10m
	Demsei fish (Mutu (Aniwa))	→	→	10 min	30 min	10m	10m
	Soldiar fish (Red fish)	→	→	10 min	40 min	10m	10m
	Wrasse (Marari (Aniwa))	↓	→	10 min	10 min	10m	10m
	Surgeon fish (Minini (Aniwa))	↓	→	10 min	30 min	10m	10m
	Marlin	→	→	30 min	30 min-1 hour	1km	1km
	Thick lips (Sasuwa (Aniwa))	→	→	10 min	20 min	30m	30m
	Deep sea scad (Rowo (Aniwa))	↓	→	1 hour	2 hour	30m	30m
	Trevally (Kashi (Aniwa))	→	→	30 min	30 min	100m	100m
	White trevally	→	→	20 min	20 min	100m	100m

	(Outu (Aniwa))						
	King fish	↓	→	15 min	20 min	200m	200m
	Octopus	↓	→	30 min	2 hour	30m	40m
	Lobster	↓	↓	20 min	2 hour	20m	20m
	Family of turban shell (Big eye)	↓	↓	20 min	1 hour	10m	20m
	Trochus	↓	↓	20 min	1 hour	10m	20m
	Chiton	↓	↓	10 min	15 min	5m	5m
	Sea urchin (Watuke (Aniwa))	↓	↓	3 min	3 min	10m	10m
	Scallop (Munamuna (Aniwa))	↓	↓	4 min	4 min	10m	10m
Isavai	Mullet	↓	↓	15 min	1 hour	20m	100m
	Poulet	→	→	1 hour	30 min (There was a training for deep bottom fishing)	500m	500m
	Wahoo	→	→	2 hour	3-4 hour	200m	200m
	Yellow fin tuna	→	↓	2 hour	3-4 hour	200m	200m
	Skipjack	→	↓	2 hour	2 hour	200m	200m
	Grouper (Los)	→	→	1 hour	2 hour	500m	500m
	Flying fish	→	→	2-4 hour	6 hour	200- 400m	200-400m
	Marlin	→	→	2-4 hour	2-4 hour	300- 500m	300-500m
	Dog tooth tuna	→	→	2-3 hour	3-4 hour	100- 200m	100-200m

	Barracuda	→	→	1 hour	2-3 hour	100-200m	100-200m
	Mahi-mahi	→	→	1 hour	2-3 hour	400-500m	400-500m
	Rainbow runner	→	→	2-3 hour	2-3 hour	100-200m	100-200m
	Emperor (Redmaot)	↓	→	1-2 hour	1-2 hour	3-10m	3-10m
	Carange	↓	→	2-3 hour	2-3 hour	100-150m	100-150m
	Parrotfish	↘	↘	30 min	2-3 hour	50-100m	50-100m
	Surgeonfish (Renbo fis)	↓	↓	1 hour	2-3 hour	40-100m	40-100m
	Unicorn fish (Sandpepa)	→	↘	1 hour	2-3 hour	40-100m	40-100m
	Rabbit fish (Pico)	→	↘	20 min	3-4 hour	20-100m	30-100m
	Drummer fish (Big bell)	↘	→	10 min	2-3 hour	10-100m	20-100m
	Soldiar fish (Red fish, Marau (Aniwa))	→	↘	5 min	1-4 hour	10-100m	30-100m
	Goat fish (mustas fish)	↓	↘	30 min	1-6 hour	5-90m	10-100m
	Milf fish (Bun fish)	↘	↓	2 min	1-7 hour	1-50m	10-150m
	Lobster	↘	↓	20 min	2-4 hour	10-50m	20-50m
	Family of turban shell (Rriri)	↓	↓	20 min	3-5 hour	5-10m	10-30m
	Octopus	↘	↓	10 min	1-7 hour	1-50m	2-50m
	Clam	↓	↓	20 min	1-2 hour	1-50m	2-50m

	Tupa (Land crab)	↓	↓	5 min	10-30 min	1-50m	1m-1km
Imatu	Surgeonfish (Renbo fis)	↓	↓	1.5 hour	3 hour	100-150m	500m
	Mullet	↓	↓	1-2 hour	4 hour	50m	200m
	Unicorn fish (Sandpepa)	↓	↓	1-2 hour	4 hour	50m	200m
	Parrotfish	↓	↓	1-2 hour	4 hour	50m	200m
	Wahoo	→	→	3 hour	4-5 hour	Around the Island	
	Yellow fin tuna	→	→	3 hour	4-5 hour	Around the Island	
	Poulet	↓	↓	2-3 hour	6 hour	200m	400-500m
	Grouper (Los)	↓	↓	2-3 hour	6 hour	200m	400-500m
	Lobster	↓	↘	3 hour	4-5 hour	50m	100-200m

Appendix 16: Result of Baseline Survey in the Surveyed sites

Questionnaires for baseline survey were distributed as follows.

Table 1: Distribution status of questionnaire in the target survey sites

Name of community	Emae Island	Tanna Island (Waisisi)	Aniwa Island	South Santo
Number of household surveyed	46	28	24	60
Number of total household	168	108	91	191
Percentage of household surveyed in total households	27.4%	26%	26%	31%

The ratio of sex and age of respondents in surveyed households are as follows.

Table 2: Ratio of sex and age of respondents in surveyed households

	Age	20-29 years old	30-39 years old	40-49 years old	50-59 years old	More than 60 years old	No response
Emae Island	Male	7	6	4	9	3	1
		23%	20%	13%	30%	10%	4%
	Female	3	3	2	6	2	
		19%	19%	12%	38%	12%	0%
Waisisi	Male	3	4	6	1	2	2
		17%	22%	33%	6%	11%	11%
	Female	4	2	4	0	0	0
		40%	20%	40%	0%	0%	0%
Aniwa Island	Male	3	2	4	1	2	
		25%	17%	33%	8%	17%	0%
	Female	1	5	4	0	1	1
		8%	42%	34%	0%	8%	8%
South Santo	Male	10	12	6	5	4	0
		27%	32%	16%	14%	11%	0%
	Female	5	11	2	5	0	0
		22%	48%	8%	22%	0%	0%

Total	Male	23	24	20	16	11	3
		24%	25%	21%	16%	11%	3%
	Female	13	21	12	11	3	1
		21%	34%	20%	18%	5%	2%

Source: Questionnaire survey

The sex and educational background of respondents in the surveyed households are as follows.

Table 3: Sex and educational background of respondents in the surveyed households

Educational background	Emae Island		Waisisi		Aniwa Island		South Santo	
	Male	Female	Male	Female	Male	Female	Male	Female
No attendance of school	0	0	3	2	2	2	2	1
	0%	0%	17%	20%	18%	17%	5%	4%
Primary school	19	10	10	4	4	7	20	18
	66%	63%	55%	40%	33%	58%	54%	78%
Secondary school	10	5	5	2	4	2	12	3
	34%	31%	28%	20%	33%	17%	33%	14%
High school	0	1	0	0	0	0		1
	0%	6%	0%	0%	0%	0%	0%	4%
University	0	0	0	0	0	0		
	0%	0%	0%	0%	0%	0%	0%	0%
Others	0	0	0	1	1	1	3	0
	0%	0%	0%	10%	8%	8%	8%	0%
No response	0	0	0	1	1		0	0
	0%	0%	0%	10%	8%	0%	0%	0%
Total	29	16	18	10	12	12	37	23
	100%	100%	100%	100%	100%	100%	100%	100%

Source: Questionnaire survey

1. Awareness of the resource management in the target survey sites

(1) Recognition for the resource management activities implemented in the community

The percentage of responses to the question whether they know the contents of resource management activities implemented at the survey target sites are as follows.

In Emae Island, 100% of surveyed households responded that they knew the contents of the resource management activities implemented. In Waisisi and Aniwa Island, not all households but most of the surveyed households answered that they knew the contents of the resource management activities implemented. On the other hand, in South Santo, 59% of surveyed households answered that they knew and it was less than other sites. According to the report on the primary survey of socio-economic survey, resource management activities have not especially been conducted in Nakere and Tangoa Island. Therefore, it is considered that many respondents answered that they do not know.

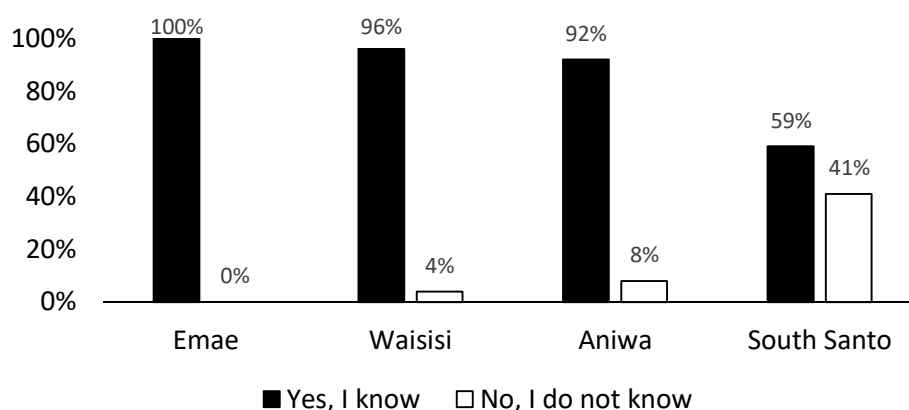


Figure 1: Recognition of the resource management activities implemented in the survey sites

Source: Questionnaire survey

(2) Support for resource management activities implemented in the target survey sites

The percentage of responses to the question whether you support the coastal resource management activities in the target survey sites is as follows.

In Emae Island and Aniwa Island, 100% of surveyed households answered that they are supporting, and it can be considered that the resource management such as taboo area which is currently implemented has become well established. In addition, in Waisisi, 97% of the surveyed households answered that they are supporting. On the other hand, in South Santo, the proportion of responding that they are supporting is relatively lower, and it was 85% of surveyed households. It is contradictory that the response that “I know the resource management activities implemented above (1) was 59%, but percentage of respondents who support the resource management activities

implemented is higher than it. It is inferred that there is a meaning that there is an intention to implement it.

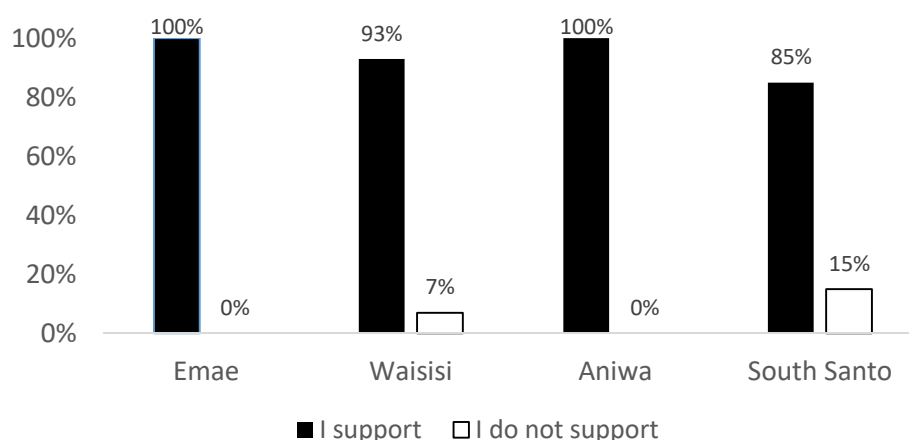


Figure 2: Percentage of supporting resource management activities in the survey sites

Source: Questionnaire survey

Answers (multiple answers allowed) to the question what is the motive for the resource management to surveyed households who responded that they support the resource management activities in figure 2, is as follows.

In Emae Island, four reasons exceeded 80%, such as “Resources are decreasing” while “If I protect the resource, I may get economic benefit in the future”, “Advice from Fisheries Department” etc. and four reasons were over 80%.

In Waisisi, it resulted that the surveyed households consider economical merits to resource management activities, such as “If I protect the resource, I may get economic benefit in the future”, even though there is also concerns on the reduction of resources.

In Aniwa Island and South Santo, the reason that resources are decreasing is motivating resource management.

On the other hand, it was asked to small number of surveyed households which do not participate in the resource management about the reason. The reasons were that they do not participate in the resource management activities such as there is no alternative income source, income will be decreased, they do not know regulation/law, and other community members do not follows regulations/law.

Table 4: Motivation to support resource management in the survey target sites

	Emae	Waisisi	Aniwa	South Santo

A C T I V E	Resources are decreasing	85%	4%	79%	67%
	I aware the situation of the coastal resource and I want do something.	85%	32%	38%	57%
	If I protect the resource, I may get economic benefit in the future.	85%	29%	46%	58%
	I want to help tourism development.	78%	0%	13%	38%
	I do not have good market for fish/shellfish and not need to catch fish a lot.	43%	4%	13%	3%
	Since resource management was agreed in the groups or the management committee.	61%	0%	21%	2%
	Since other community members follows the rule/regulation.	52%	0%	8%	2%
	Since our chief ordered, I support the activities.	10%	18%	33%	6%
	Since there is some regulations/laws, I support the activities.	59%	4%	13%	8%
	Advice from Fisheries Department	83%	18%	46%	25%
P A S S I V E	Others	0%	0%	13%	0%

■ The most frequently answered option, ■ the second mostly selected option

Source: Questionnaire survey

The answers to the question whether the other community members are involved in the resource management activities at the survey target site are as follows.

In Emae Island and Aniwa Island, the proportion of the surveyed households that other community members are participating in the resource management was about 90%. On the other hand, in South Santo where the resource management is rarely conducted, only 77% of surveyed households who responded that they are participating, and 20% of surveyed households answered that other community members are not participating in the resource management. In addition, 18% of surveyed households who did not answer in Waisisi, and only 68% of surveyed households

answered that other community members are participating in the resource management. Thus, in Waisisi and South Santo, participation in resource management activities are relatively lower.

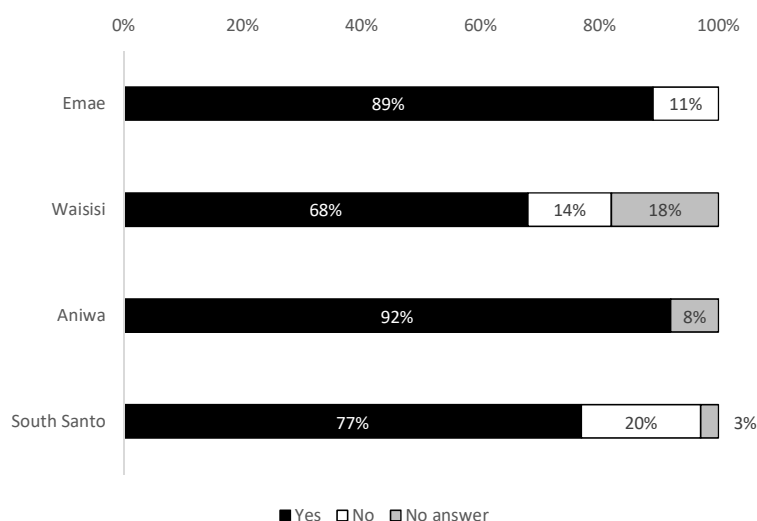


Figure 3: Answer to the question at target sites on participation in the resource management activities by other community members

Source: Questionnaire survey

(3) Continuation of the resource management activities implemented in the community

The results of answers to the question whether it is better to continue resource management activities at the target survey sites are as follows.

In Emae Island and Waisisi, most of the surveyed households answered that they should continue the resource management activities. In Aniwa Island and South Santo, though there are 7-8% of surveyed households which mentioned that it is better not to continue the resource management activities, it was confirmed that they have intention to continue it generally.

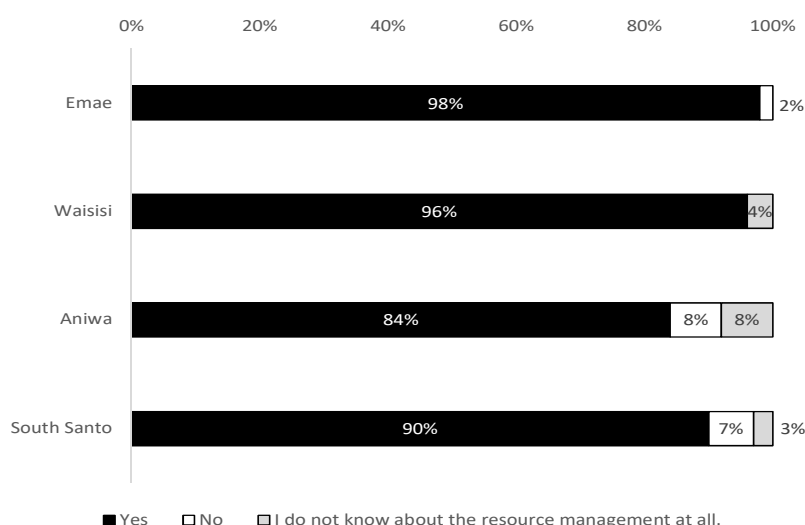


Figure 4: Answer to the question at target sites on intention to continue resource management activities in the community

Source: Questionnaire survey

In the target survey sites, for the question whether or not the resource management activities can be continued, 78% of surveyed households in Emae Island responded that it is possible at same level, while in the surveyed households in Waisisi, Aniwa Island and South Santo, about 50% of surveyed households answered “it is possible but smaller level than current level” or “It is difficult to continue”. According to the primary survey of the socio-economic survey, it is considered that the taboo area is small and only spear guns and spears are prohibited, and it is not a heavy burden. Therefore, there is a possibility that seven-month prohibited period for diving fishing is burdens for them. In Aniwa Island, new taboo areas were established in two villages after Cyclone Pam and it is inferred that there is dissatisfaction of it. According to the primary survey of the socio-economic survey in South Santo, the resource management activities are rarely conducted. Therefore, the reason that 50% of surveyed households which answered “it is difficult to continue” is unknown.

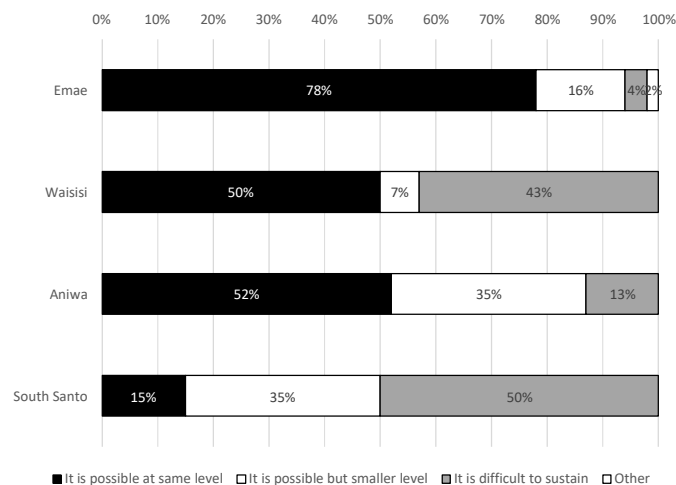


Figure 5: Answer to the question at target sites on whether the resource management activities can sustain at current level

Source: Questionnaire survey

2. Economic situation in the survey site

(1) Average income, expenditure and the breakdown in the target survey sites

The survey results on the average income by gender in the surveyed households at the target survey sites and the breakdown of the income sources are as follows. Regarding the average income of surveyed households, the one in South Santo was high both for male and female, and the amount was nearly same. However, with regard to the average income of surveyed households in South Santo, among the four areas (Araki, Tangoa, Nakere, Wailapa) in which the survey was conducted, Nakere and Wailapa did not cooperate to answer this question, and the result was for Araki Island and Tangoa Island only. Following South Santo, Aniwa Island and Emae Island continued, and the lowest average income of surveyed was Waisisi. However, with regard to Wai sisi, as for average income, the number of surveyed households which responded was limited to six households (21%) out of 28 households, and it is also significantly lower than the amount of expenditure described below. It is considered that the reliability of the survey results is limited.

As for the average income in the surveyed households of female, the one in South Santo was about the same as male. However, the result shows that the disparity is about 70% in Aniwa Island, about half in Emae Island, and 10% in Waisisi.

Unit: Vatu

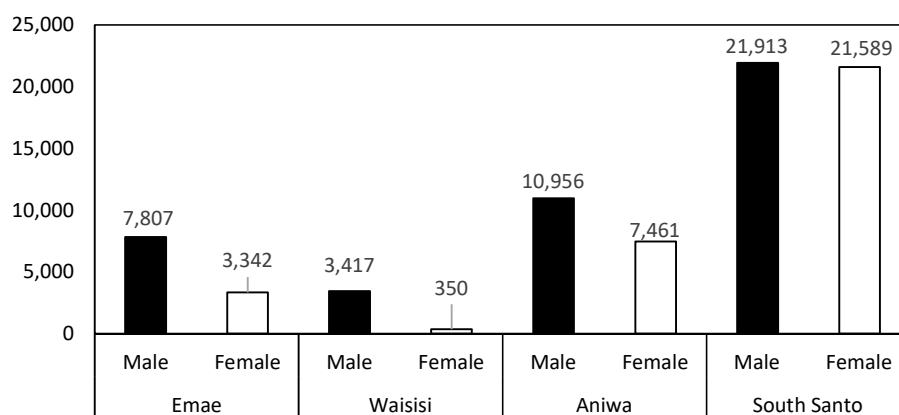


Figure 6: Average income by gender at the surveyed target site

Source: Questionnaire survey

The percentage of the average income of surveyed households at the target survey sites by income source is as follows.

In Emae Island, the income source of fishery is the highest in male and the agriculture is the second highest similar to the survey result of the main income sources of male at the surveyed households in the survey site. On the other hand, agriculture is the highest as well as the survey results of the main income sources of female in the surveyed households. In terms of the percentage of income sources, the tourism was second only to agriculture, but income from agriculture was higher than tourism. The average income of female from fishery was nearly the same as tourism.

Unit: Vatu

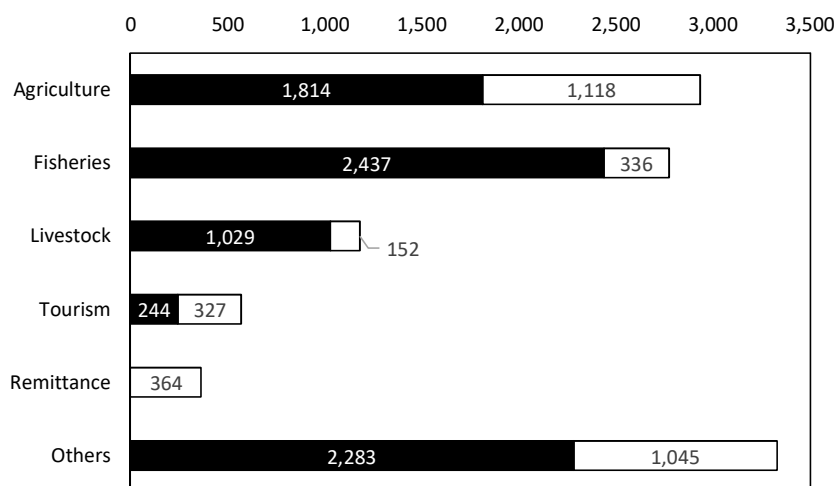


Figure 7: Average income by industry and by gender in survey households at Emae Island
Source: Questionnaire survey

In Waisisi, most of the surveyed household did not answered the income amount and the data was limited. As a result, in the answer to the questionne on the main income of male in the surveyed households, they gained income from livestock, forestry, tourism, etc. However, with regard to the question of income, surveyed households gained income only from fishery and agriculture, and fishery is the main source of income. On the other hand, for female as well, in the question asking the income source, the surveyed households answered that they received income from agriculture, fishery, and livestock in addition to tourism. However, in the question about average income, there was an answer in the surveyed households that they earn income only from the tourism.

Unit: Vatu

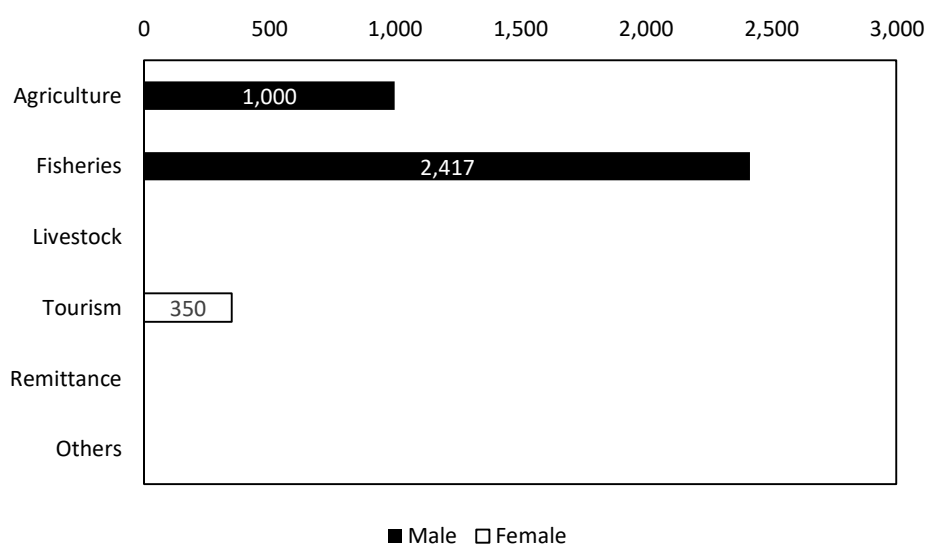


Figure 8: Average income by industry and by gender in survey households at Waisisi

Source: Questionnaire survey

In Aniwa Island, average income by industry in the surveyed households was that first income source of male was fishery and agriculture was the second largest as well as the survey results on main sources of income. For female, the survey results on main income sources in the surveyed households showed that livestock was third largest. However livestock is the largest in term of average income amount. Regarding the average income of female, proportion of “others” is high as income of some female related to office work was high.

Unit: Vatu

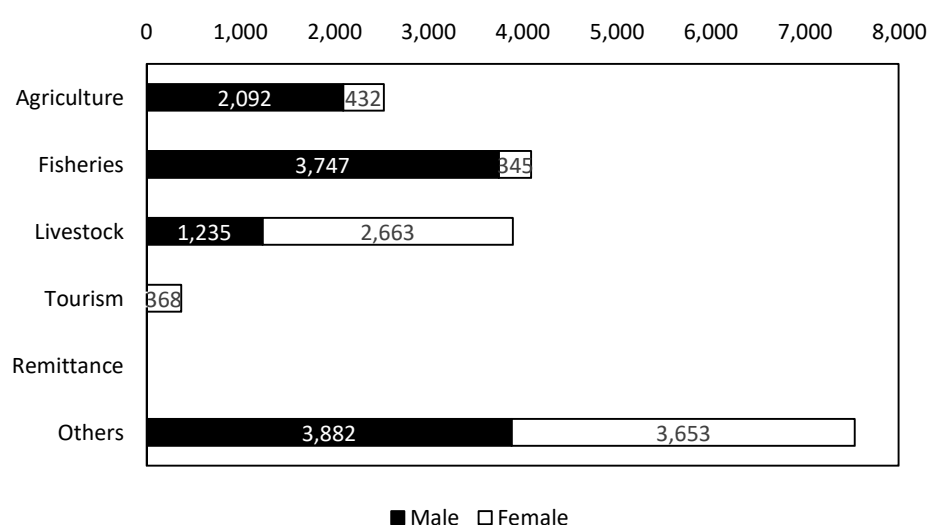


Figure 9: Average income by industry and by gender in survey households at Aniwa Island

Source: Questionnaire survey

In South Santo, the average income by industry in the surveyed households, as mentioned above, answers were not obtained from surveyed households in Nakere and Wailapa for income, this proportion was the result of Araki Island and Tangoa Islands. For male, income from agriculture and fishery was nearly same. In addition, for female, agriculture was the most important income source in the surveyed households.

Unit: Vatu

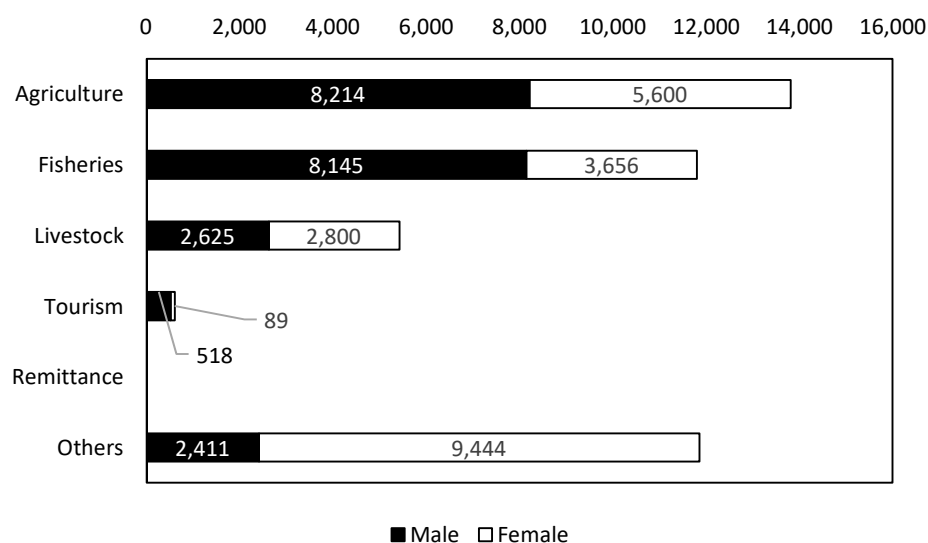


Figure 10: Average income by industry and by gender in survey households at South Santo
Source: Questionnaire survey

The average expenditure by category in the surveyed households at the surveyed target site is as follows. The surveyed households account for a very high proportion of educational expenses at the four surveyed sites. In Vanuatu, education was charged from primary school, and it was confirmed that the burden of educational expenses was large everywhere. The next highest rate in the surveyed household was food expenses. In addition, regarding the difference between the average income and the average expenditure of the survey, income and expenditure in the surveyed households was surplus at three sites excluding Waisisi among the target survey sites.

Unit: Vatu

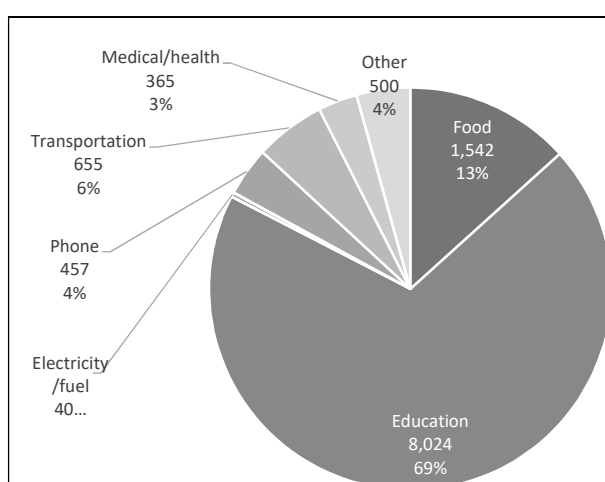


Figure 11: average expenditure by category in the surveyed households in Emae Island

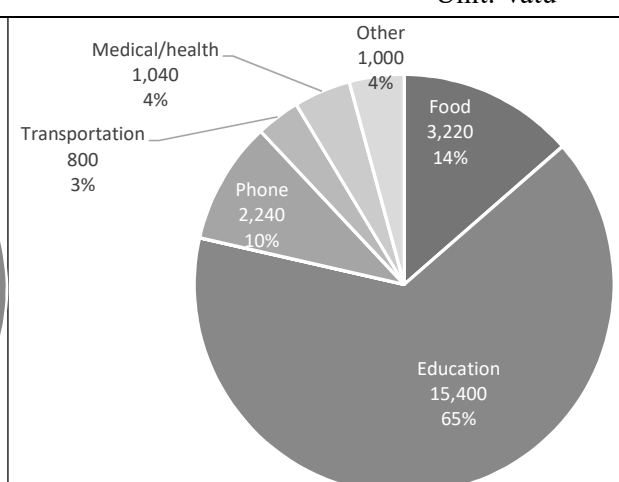
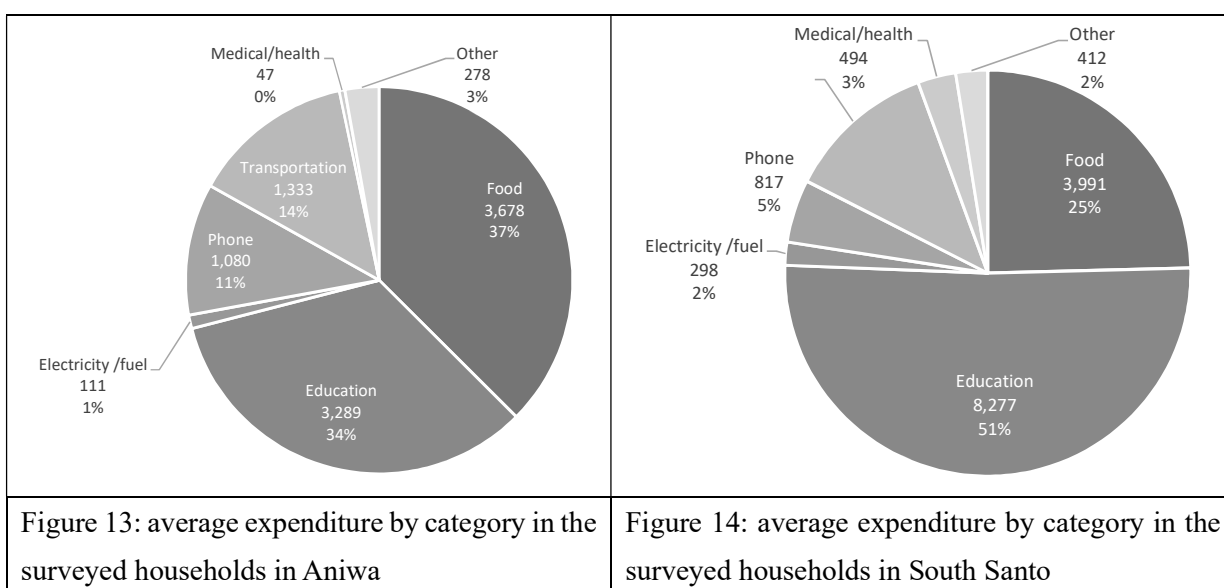


Figure 12: average expenditure by category in the surveyed households in Waisisi



Source: Questionnaire survey

As for the income of the surveyed households at the target survey sites, the answers to the question whether the income is decreasing compared to before, and if the income is decreasing, it is due to the decrease of coastal resources are as follows. In Emae Island, the percentage of surveyed households which income was decreased due to the reduction of coastal resources was the highest at 72%. If it is together with the surveyed households which answered that income was slightly decrease due to decrease in the coastal resources, 80% of the surveyed households answered that the income was decreased. Also in Aniwa Island, the total percentage of surveyed households which income was decreased largely or a slight decrease due to reduction of the coastal resources was is relatively high at 50%. On the other hand, in Waisisi and South Santo, number of surveyed households which answered that incomes have decreased due to decrease of the coastal resource and number of surveyed households which answered that income was increased are about to same percentage. In Emae Island and Aniwa Island where the proportion of surveyed households which income have decreased due to decrease in the coastal resources, the situation of the coastal resources was considered more serious than other two sites, and it is considered that resource management activities are more active than the other two sites as awareness of the situation became the motivation.

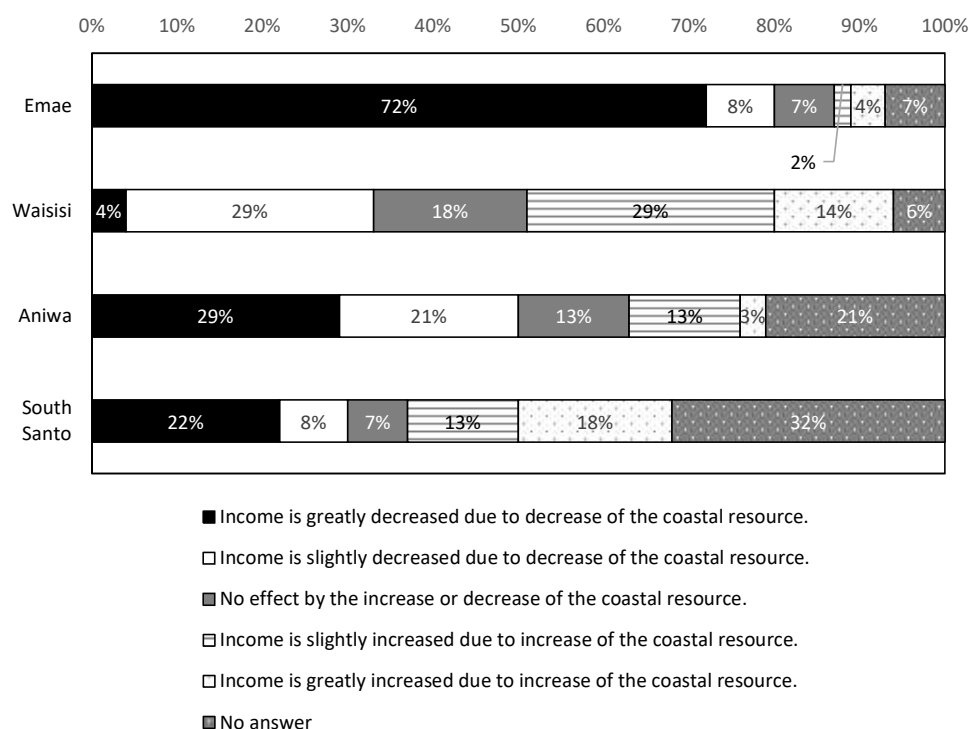


Figure 15: Presence or absence of increase or decrease in income due to increase/decrease of the coastal resources in surveyed household

Source: Questionnaire survey

3. Social and cultural conditions at the survey sites

(1) Social capital

The answers to the question on how to contribute when projects are implemented in the community at the survey target site (multiple answers) are as follows. In Emae Island, about 80% of the surveyed households answered to cooperate such as participating fund-raising, providing labor force, etc. In addition, in the surveyed households in Waisisi, they answered that they are cooperating in fund raising (donation) in the households but not actively participating in other activities. In Aniwa Island, although surveyed households attend the meeting but attitudes in other activities were not very aggressive. In South Santo, less than 50% of households responded that they participate in some activities, and they are not to participate in the project actively.

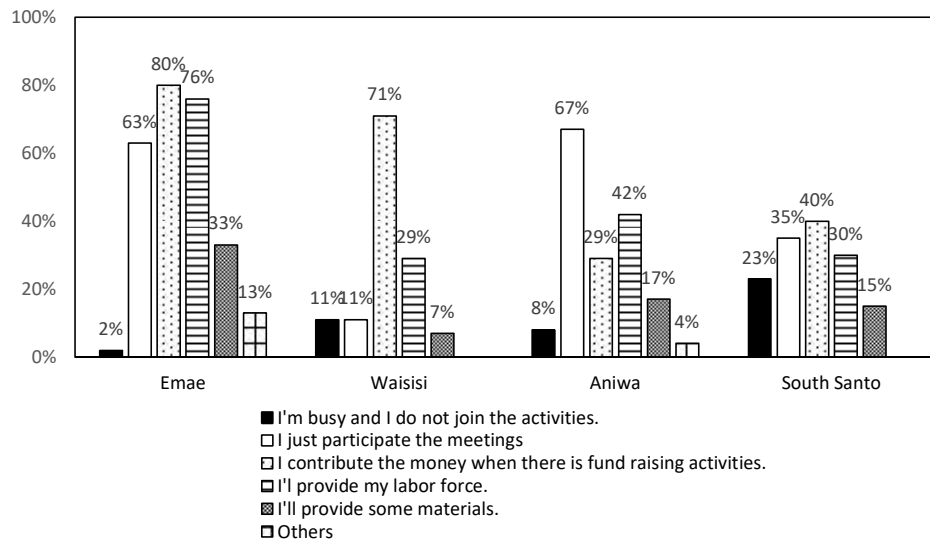


Figure 16: Degree of participation when project is implemented in the surveyed households

Source: Questionnaire survey

The answers to the question whether they trust the other people when lending or borrowing the things in the community or not at the surveyed target sites are as follows. In Emae Island and Waisisi, about 70% of surveyed households answered that they do not trust lending or borrowing the things. In Aniwa Island, it is divided into two parts that almost 50% of the surveyed households answered that they do not trust or they trust. On the other hand, in South Santo, about 70% answered that they trust. It is obvious that South Santo has a strong relationship between communities.

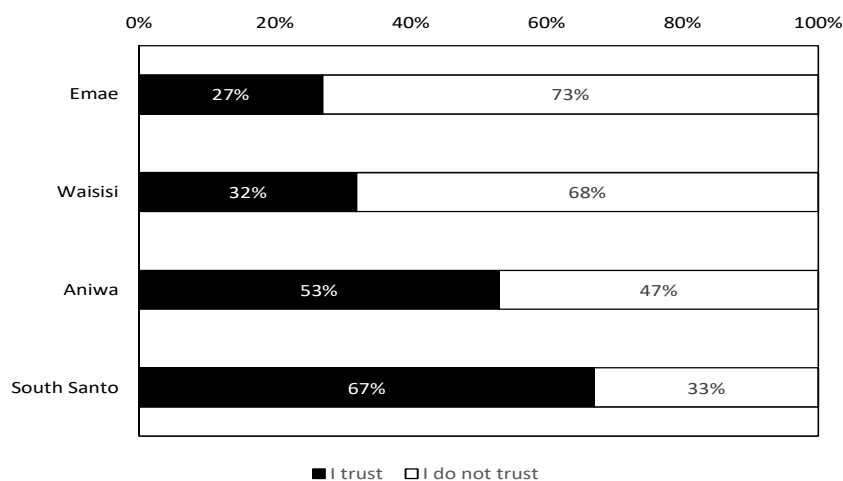


Figure 17: Level of trust on lending or borrowing the things in the community in the surveyed households

Source: Questionnaire survey

Answers to the question whether they or their neighbors will spare time to cooperate to projects even it is unknown whether there is a direct benefits or not are as follows. In Emae Island, 90% of surveyed households answered that they will spare some time. Also in Aniwa Island, 80% of surveyed households responded that they will cooperate. On the other hand, in Waisisi and South Santo, about half of the surveyed households answered that they spent time and about half of households answered that they did not spend time, and half of the community did not have an intension to spend their time if they did not have benefit from the project .

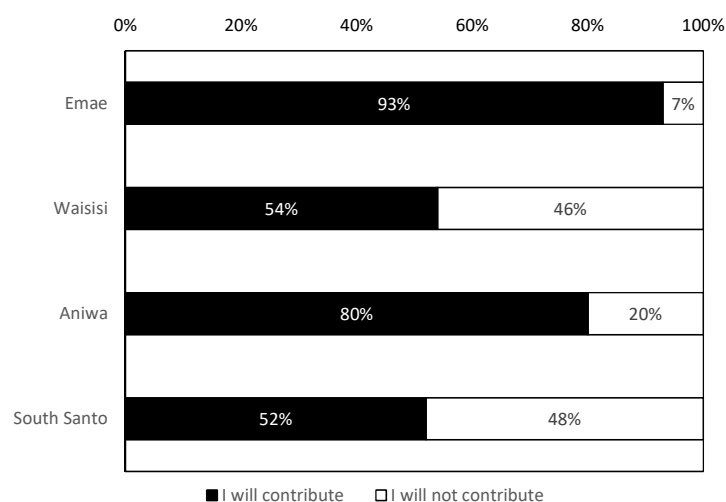


Figure 18: Intention to cooperate with projects whether they that do not know they can directly benefit from the community in the surveyed households

Source: Questionnaire survey

The answer to the question whether the opinion of the community including respondents is reflected in the activities of coastal resource management group/committee in the survey target site is as follows. In Emae Island, they have already been in the process of formulating the resource management plan and percentage of surveyed households which responded that they strongly agree was 73% and high. If “Agree” was included, 96% of surveyed households considered that they or other community member’s opinions it reflected in the coastal resource management. For the three other places, if “strongly agree” and “agree” are accumulated, it was 85 to 100%, and it was confirmed that many surveyed households considered that they or other community member’s opinion was reflected in the activities implemented bu the coastal resource management group/committee.

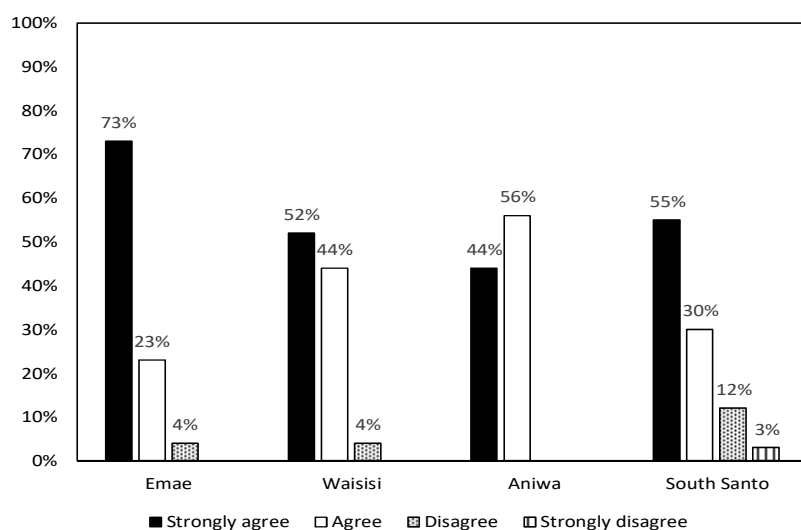


Figure 19: Reflection of the opinion of the community on the activities carried out by the group/committee of the coastal resource management in the surveyed households

Source: Questionnaire survey

(2) Functional status of traditional tribal system

The answers to the question whether the traditional tribal system is still functioning at the target survey sites are as follows. In Emae Island, 76% of surveyed households strongly believed that the traditional tribal system was still functioning, and when agreeing, the combined percentage of “strongly agree” and “agree” is very high at 94% of the surveyed households. Even in Aniwa Island, 57% of surveyed households which answered “strongly agree” that the traditional tribal system is functioning, and the the combined percentage of “strongly agree” and “agree” was high at 95% of the surveyed households. In Waisisi, households which answered “strongly agreed” was 15% and it is low, but if surveyed households which responded “agree”, it is relatively high at 74%. In South Santo, the surveyed households which answered “strongly agree” and “agree” strongly agree are 70%, and it is relatively low compared with the other three sites.

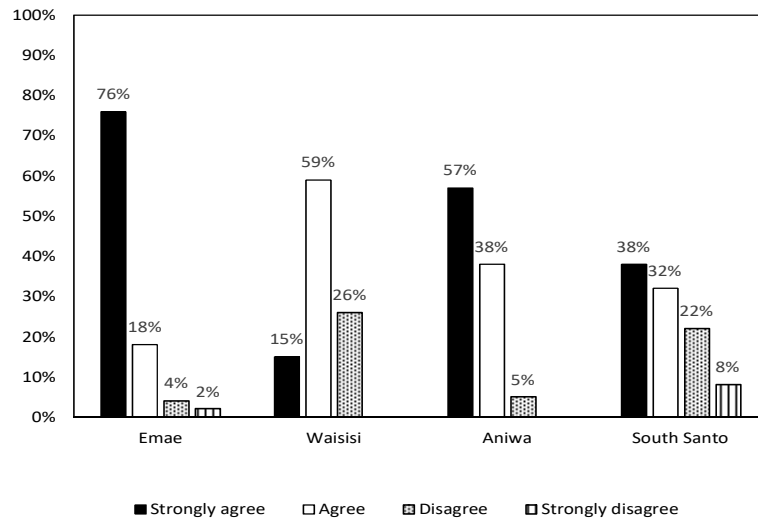


Figure 20: Degree of function of the traditional tribal system at the target survey sites
Source: Questionnaire survey

(3) Social Equality, Gender

The answers to the question whether social equality is lacking in the community or not at the target survey sites are as follows. In Emae Island, the proportion of the surveyed households which responded that “Strongly agree” is high, and if “Agree” is accumulated, 91% of the surveyed households considered that social equality is lacking in the community. In Waisisi and Aniwa Island, although the proportion of responding that “Strongly agree” was not so high comparing with Emae Island, but about 80% of the surveyed households considered that social equality is lacking in the community. Meanwhile, in South Santo, the proportion of response of “Strongly agree” and “Agree” is 62% of the surveyed households and it is low compared to the other three sites. It seems that social equality is relatively secured.

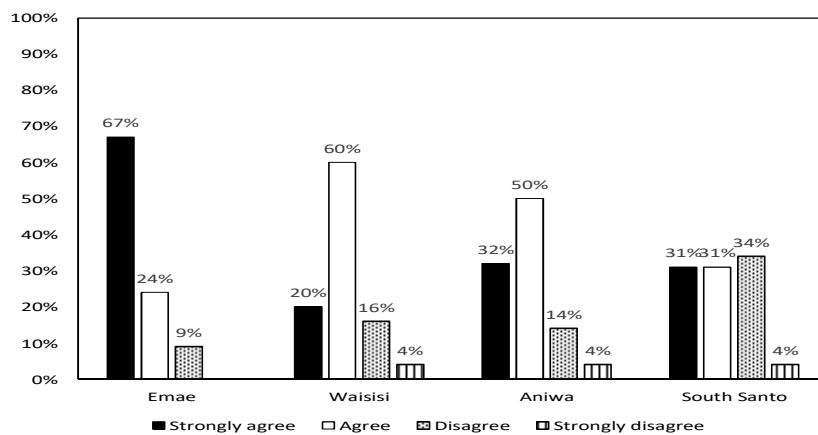


Figure 21: Recognition whether social equality lacks in the community at the target survey sites

Source: Questionnaire survey

The answer to the question whether there is a disparity by gender in the surveyed target site is as follows. In Emae Island, the percentage of answer of “Strongly agree” is 64% of the surveyed households and it was the highest compared with the other three sites. In addition, if percentage of “Agree” was accumulated, 95% of the surveyed households answered that there is gaps due to gender. In addition, In Waisisi, answer of “Strongly agree” was less than Emae Island, if percentage of “agree” is accumulated, it was 90% of the surveyed households answered that there is a disparity due to gender. In Aniwa Island and South Santo, even if percentage of “Strongly agree” and “Agree” are accumulated, it is less than 70% of the surveyed households and it is considered that difference in gender is relatively less compared with other two sites. Even the average incomes of male and female in the surveyed households in Figure 15, the difference between male and female is relatively small in Aniwa Island and South Santo, and it is conceivable that female’s economic contribution eases the disparity.

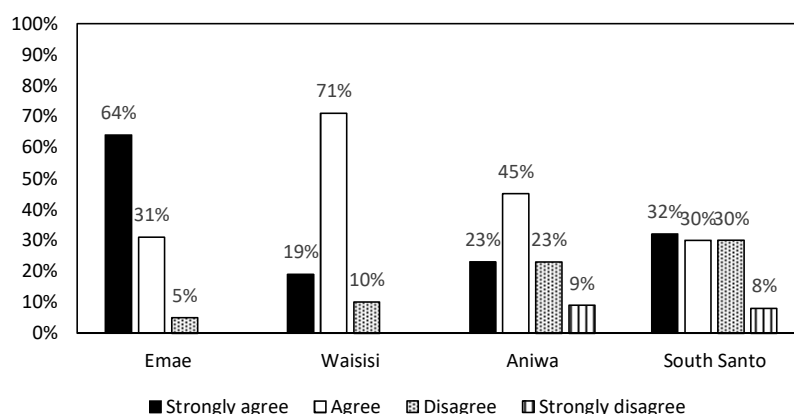


Figure 22: Presence or absence of gender gaps in the target survey sites

Source: Questionnaire survey

(4) Functional level of coastal resource management group/committee

The answers to the question on the presence or absence of coastal resource management group/committee and the function level at the target survey sites are as follows. In Waisisi, Aniwa Island and South Santo, where the presence of coastal resource management group/committee could not be confirmed in the primary survey of the socio-economic survey, there are many surveyed households which do not know the existence of the coastal resource management group/committee. However, In Waisisi and Aniwa Island, nearly 50% of the surveyed households answered that he coastal resource management group/committee are functioning well, and it is unknown which organization refers to the he coastal resource management group/committee. In

South Santo, 55% of the surveyed households which responded that the coastal resource management group/committee are not functioning well are the highest as the resource management activities themselves are not conducted much. On the other hand, in Emae Island where there are coastal resource management organizations, only 5% of the surveyed households replied that they do not know the coastal resources management group/committee. Moreover, 51% of the surveyed household considered that the coastal resource management group/committee is functioning well.

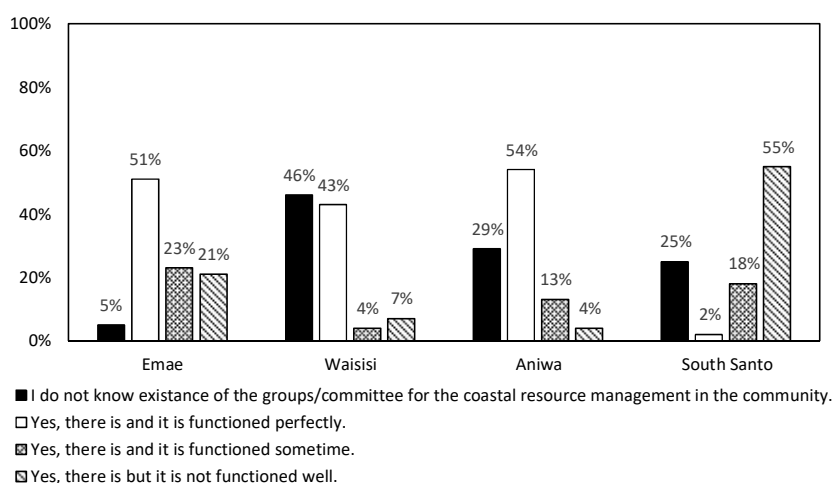


Figure 23: Presence or absence of coastal resource management group/committee and the function level at the target survey sites

Source: Questionnaire survey

4. Institution and governance situation in the target survey sites

(1) Chief system

The answer to the question whether the chief system in the community is functioning compared with the other community at the target survey sites is as follows. In Emae Island and Aniwa Island, the answer “Strongly agree” is the highest. In Waisisi and South Santo, surveyed households that responded “Strongly agree” are lower in comparison with other two sites, but in combination of the percentage of responses of “Strongly agree” and “Agree”, it was confirmed that more than 80% of the surveyed households answered that the chief system is still functioning.

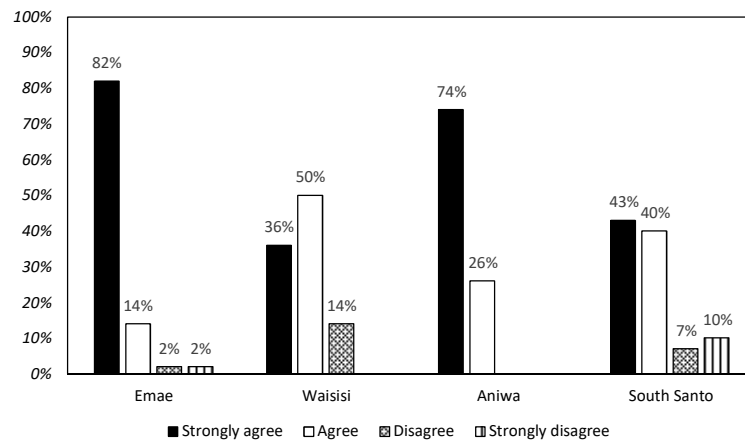


Figure 24: Functional level of the chief system at the target survey sites

Source: Questionnaire survey

Answer to the questionne “when the chief gives instructions to the community, how much level the members of the community follow the instructions at the target survey sites” are as follows. In Aniwa Island, 76% of the surveyed households answered that they would follow all instructions, and it seems that the power of the chief is still strong. In Emae Island, though the lvel is not high as Aniwa Island, more than half of the surveyed households answered that they would follow all directions, and if percentage of “Follow every order” and ”Follow most of the order” are accumulated, 80% of the surveyed households responded they would follow most orders of the chief. On the other hand, in Waisisi and South Santo, percentage of “Follow ever order”is less compared with other two sites and conversely, percentage of the surveyed households which answered “Follow half of the order” is many. In Waysisi and South Santo, the chief system is considered to be rather weak.

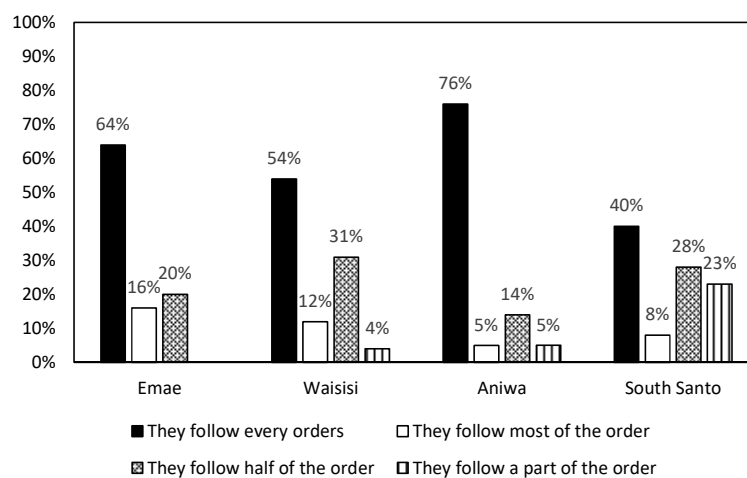


Figure 25: Degree of compliance when the chief gives orders to the community at the target survey sites

Source: Questionnaire survey

Answer to the question “how much level do you follow the orders of the chief of the other village given to the community when you visit the other village” at the s target survey sites is as follows. In Aniwa Island, 71% of surveyed households responded that they follow all instructions, and there is a strong tendency to follow instructions given by the chief of other villages. In addition, In Emae Island, though the lvel is not high as Aniwa Island, 66% of the surveyed households responded that they will follow all instructions and if percentage of “Follow every order” and ”Follow most of the order” is accumulated, the percentage of answer that they follow most instructions is 90%, and it is high level. On the other hand, in Waisisi and South Santo, the percentage of respondents who answered that they folow all the instructions of the chief of the other village is lower than those of the other two sites, and concersely, there are many surveyed households which “Follow half of order” and “”Follow some order”. In Waisisi and South Santo, the tendency to respect to the chief system of other villages is considered to be rather weak.

Since Emae Island and Aniwa Island are relatively small compared to Tanna Island and Espitu Santo Island where Waisisi and South Santo locate, and it is considered that the proportion of complying with rules of other villages is high in such a smaller islands.

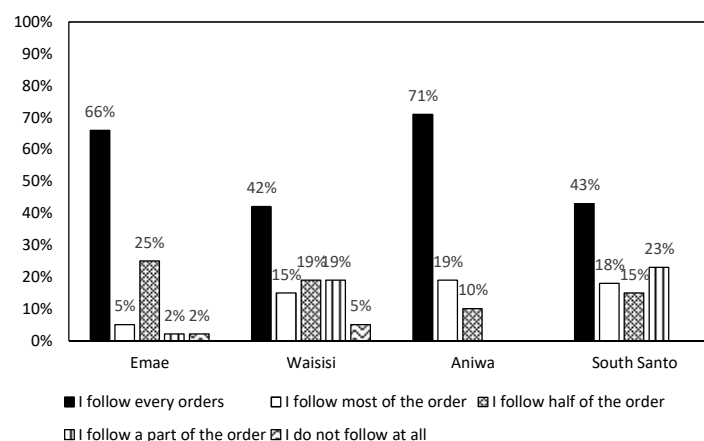


Figure 26: Degree of compliance with the instructions of the other village chief at the target survey sites

Source: Questionnaire survey

The answers to the question whether the opinion of their own can be reflected in the decision of the chief concerning the development of the community at the target survey site are as follows. In Emae

Island, the percentage of response of “Strongly agree” is 62% of the surveyed households and it is higher compared with the other three sites. However, if percentage of “Strongly agree” and ”Agree” are accumulated, it is over 90% of the surveyed households at all four sites, and It was confirmed that the chief system was operated democratically.

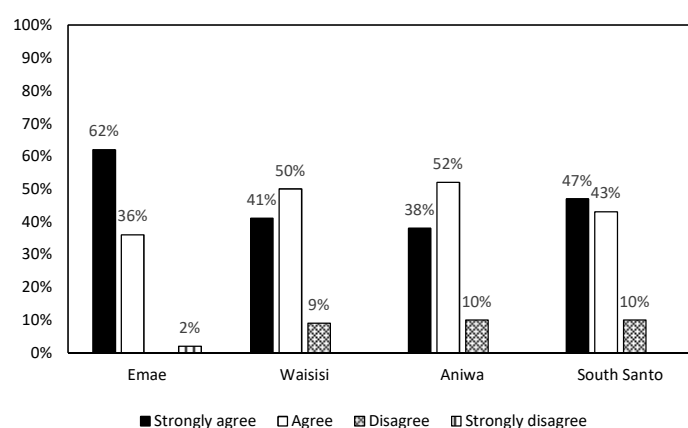


Figure 27: Reflection of the opinions in the decision of the Chief at the target survey sites
Source: Questionnaire survey

(2) Area Council

The answers to the question whether the area council is functioning sufficiently at the target survey sites are as follows. Unlike the case of the chief system, few opinions agree on functioning. In Emae Island and Waisisi, it is considered that the area council is functioning to some extent, since sum of percentage of “Strongly agree” and “Agree” are accumulated is relatively high. On the other hand, in Aniwa Island and South Santo, the percentage of surveyed households that do not agree or do not agree at all, are high at 65% and 71%, respectively, and it can be observed that the area council is not functioning sufficiently.

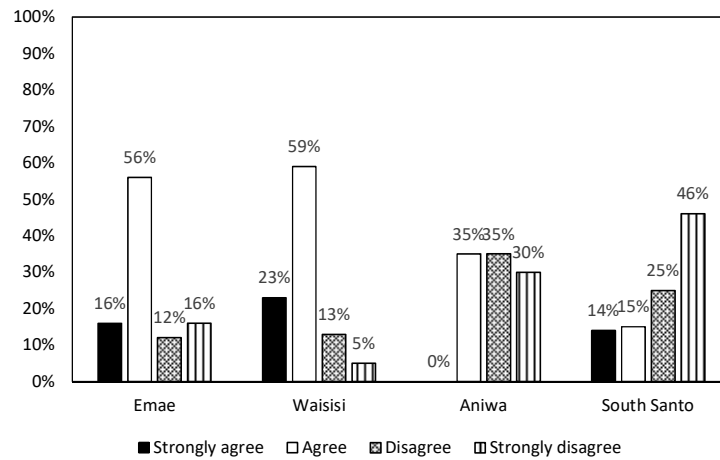


Figure 28: Status of function of Area Council at target survey sites

Source: Questionnaire survey

The answers to the question whether their opinions can be reflected in the decision of the area council on community development at the target survey sites are as follows. The surveyed households that strongly agree at all was 30% at most in four target survey sites. However, together with the proportion of those who responded that they agree, 75% and 91% of the surveyed households respectively are at high levels in Emae Island and Waisisi, and their opinions are reflected in the local governance of area councils to some extent. On the other hand, in Aniwa Island and South Santo, the percentage of surveyed households that do not agree, do not agree at all is high, and it was confirmed that their opinions were not sufficiently reflected in the area council.

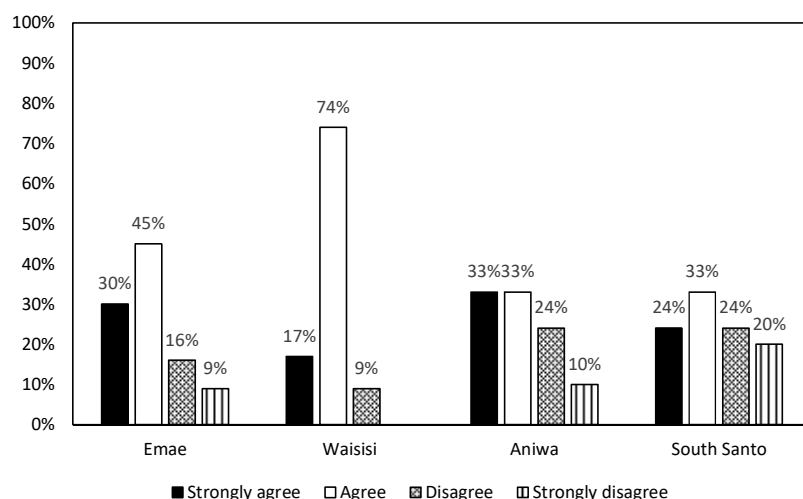


Figure 29: Whether to reflect opinion on the decision of the area council at the survey target site

Source: Questionnaire survey

The answer to the question whether the area council’s budget at the survey target site is appropriately used is as follows. The surveyed households that strongly agree at all 4 sites are at most 10% of the total at most. However, together with the percentage of responding of “agree”, it is high at 75% of the surveyed households in Waisisi, and it is considered that the budget is appropriately used. On the other hand, in Emae Island, Aniwa Island and South Santo, it was confirmed that the percentage of surveyed households which answered “Disagree” or “Strongly disagree” was high, and the budget of the area council is considered not used appropriately.

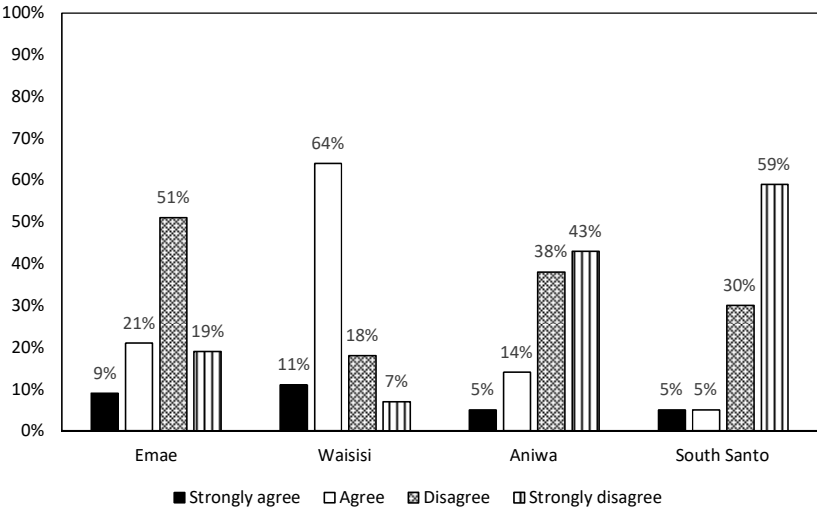


Figure 30: Judgement of appropriateness of use of budget for area council in the target survey sites

Source: Questionnaire survey

**The Role of Fisheries Resources and Community-
Based Coastal Resource Management Activities
during a Natural Disaster
- Case Study of Vanuatu
after Damage of Cyclone Pam -
the Project for Promotion of Grace of the Sea
in the Coastal Village (Phase III)
in the Republic of Vanuatu**

August 2017

**IC NET Limited
INTEM Consulting Inc.**

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Abbreviation

ACIAR	Australian Center for International Agricultural Research
CB-CRM	Community-Based Coastal Resource Management
CDC	Cyclone Disaster Committee
DFAT	Department of Foreign Affairs and Trade
FAD	Fish Aggregating Device
FRP	Fiber Reinforced Plastics
JICA	Japan International Cooperation Agency
KfW (Kreditanstalt für Wiederaufbau)	German Reconstruction Finance Corporation
MPA	Marine Protected Area
NGO	Non-Governmental Organization
OCHA	UN Office for the Coordination and Humanitarian Affairs
SPC	Pacific Community
UNDP	United Nation Development Program
VCAP	Vanuatu Coastal Adaptation Project
VFD	Vanuatu Fisheries Department

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1. Background of the Survey

From 12th to 14th March 2015, a Category 5¹ of tropical cyclone struck Vanuatu. The cyclone, named Pam, caused serious damage mainly in southern Vanuatu. According to the report, the number of deaths was 16 people and not many, but more than 160,000 people were suffered, and the damage of the houses was enormous. The economic value of the damage was presumed about Vt48 billion 60 million (\$ 494.4 million). Due to this serious damage, a state of emergency declaration was issued.

According to the interview with a manager of Coastal Fishery Development Division of the Vanuatu Fisheries Department (herein after referred to as ‘VFD’) at the time of the damage of Cyclone Pam, even though many areas had difficulties in procurement of food, in a part of the pilot sites of the Project for Promotion of the Grace of the Sea in the Coastal Village phase II (hereinafter referred to as “Phase II”) which was implemented from 2011 to 2014 by Japan International Cooperation Agency (JICA), taboo areas were temporarily opened only for one to two months at the view point of food security based on a plan of Community-Based Coastal Resource Management (hereinafter referred to as “CB-CRM”). In decisions making process and dealing with emergencies in this community, contribution of a local person who played a central role in Phase II was significant. In addition, there was a case that another central person of Phase II distributed tilapia which was personally cultured as emergency food to the neighborhood. In this way, it was confirmed that fishery resources and fishery resources management played an important role in food security when the damage of Cyclone Pam occurred. If such cases had occurred in other affected areas of Cyclone Pam, it is likely that the fishery resources managed based on the autonomy of the community will play an important role even in wider areas in a view point of food security during the event of a natural disaster. To confirm it, this survey was carried out.

2. Purpose of the Survey

This survey was conducted in the community of two southern provinces (Shefa Province and Tafea Province), which was severely damaged, to verify the role of fishery resources and the response of local population during natural disasters period such as Cyclone Pam, and to examine the utility of community-based resource management activities from the viewpoint of food security.

¹ The seriousness of the cyclone is classified by Category 1 to 5, and Category 5 is given when extremely destructive wind having a maximum wind speed of 280 km/h or more is blowing.

3. Methodology

3-1 Survey site

Remote islands of northern area of Shefa Province (Makira Island, Mataso Island, Tongariki Island and Buninga Island)

North Efate (Elepa Island and Mangaririu) and Aneityum Island

Emae Island, Tanna Island (Waisisi), and Aniwa Island

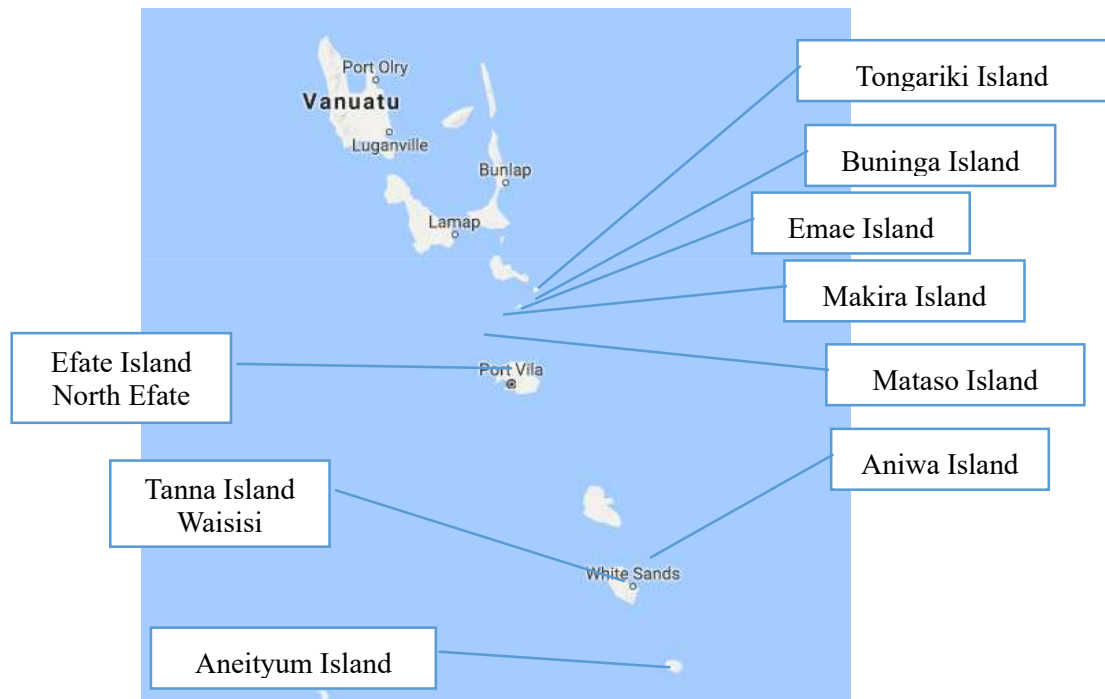


Figure 1: Survey sites

3-2 Survey Period

Site survey had been conducted from 10th to 29th April 2017.

3-3. Survey Method

First of all, a document survey was conducted to grasp the summary of entire damage of the cyclone and the outline of the emergency support. Next, in order to grasp the outline of population's responses and the role played by fishery products in emergency situations, interview survey was conducted by telephone etc. for remote islands where site visit was difficult. Based on the results of the interview survey, Site visit survey in areas where regular transportation can be used was carried out. This survey consisted of an interview and a questionnaire survey as a collection of additional information for cooperative sites concerning the roles of the fishery products and response of local population mentioned above. Questionnaire survey was to verify

interview survey result, and it was compared between the Phase II sites and other sites to confirm existence of difference by sites.

Each survey is summarized below.

3-3-1. Document survey

A document survey was carried out to grasp the overall damage caused by Cyclone Pam and the resource management situation of the target area. The collected reports etc. are as Table 1.

Table 1: Documents referred to the document survey

Title	Place of issue	Time published
Vanuatu Post-Disaster Needs Assessment Tropical Cyclone Pam	Prime Minister's office, Government of Vanuatu	March 2015
Vanuatu: Severe Tropical Cyclone Pam Situation Report No.2	UN Office for the Coordination of Humanitarian Affairs (hereinafter referred to as "OCHA")	March 2015
Vanuatu: Severe Tropical Cyclone Pam Situation Report No.6	OCHA	March 2015
Vanuatu: Severe Tropical Cyclone Pam Situation Report No.9	OCHA	March 2015
Vanuatu: Severe Tropical Cyclone Pam Situation Report No. 12	OCHA	March 2015
Tropical cyclone Pam: One-year progress report	International Federation of Red Cross and Red Crescent Societies	March 2016
Tropical Cyclone Pam Lessons Learned Workshop Report	Pacific Community	June 2015
Community Based Coastal Resource Management (CB-CRM) Plan for West Efate-Lelema Area	The Community of Lelema	October 2014
Community Based Coastal Resource Management (CB-CRM) Plan for Aneityum	The Community of Aneityum	October 2014

3-3-2. Interview survey by telephone etc.

Interview survey was conducted by telephone or direct visit of VFD office on the situation of the damage and the response of the local population for Area Secretaries, chairpersons of fishermen's

association and VFD staff in islands around Shefa Province (Makira Island, Mataso Island, Tongariki Island, Buninga Island, Matatho Island) where site visit survey was restricted since there was no regular mean of transportation.

3-3-3. Site Visit

(1) Additional information gathered by interview survey

Survey team visited Emae Island, Lelepa Island, Mangaliliu, Waisisi in Tanna Island, Aniwa Island and Aneityum Island where there were regular means of transportation, and conducted interviews with authorized officers and village representatives (such as chiefs).

(2) Questionnaire survey

In addition to “additional information gathered by interview survey”, in order to confirm the relationship between the socioeconomic situation before and after cyclone damage and the responses of local population at the time of the disaster, a questionnaire survey (refer to Appendix 1 for the number of samples in each place).

4. Survey Result

4-1. Outline of the damage of Cyclone Pam

Following results were obtained from on the document survey.

4-1-1. Passing route of Cyclone Pam

Passing route of Category 5 of Tropical Cyclone Pam which struck Vanuatu between March 12 and 14, 2015 were as Figure 2. It passed Efate Island where there was capital city of Port Vila, and went south. It also passed just near Erromango Island and Tanna Island and caused severe and widespread damage.

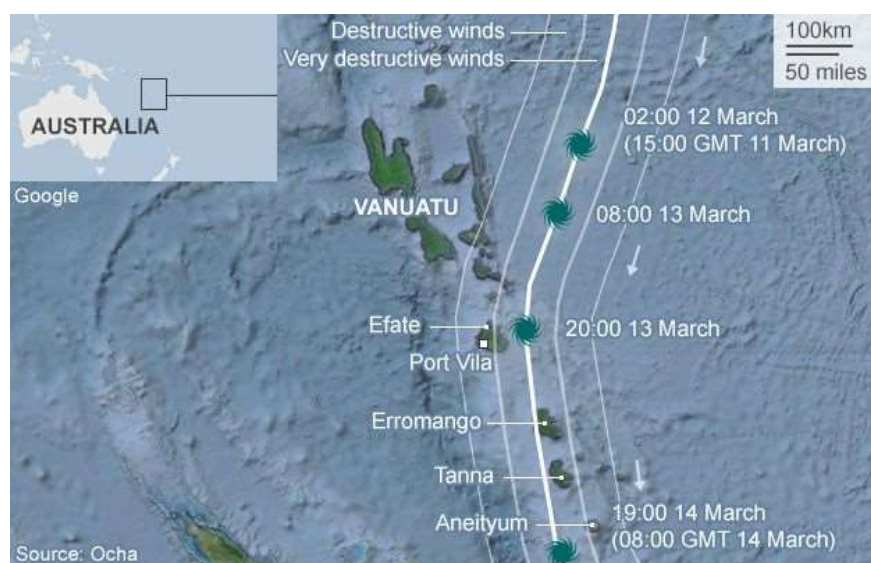


Figure 2: Route of the Cyclone Pam

Source: OCHA

4-1-2. Damage of Cyclone Pam

According to the situation report prepared by OCHA, the overall damage by Cyclone Pam was as Table 2.

Table 2: Overall damage of Cyclone Pam

Fatalities	16
People in evacuation centres	3,995
People affected by the cyclone	166,000
Islands affected by the cyclone	22

Source: Vanuatu tropical cyclone PAM Situation Report No.12

According to the “Post-Disaster needs Assessment Tropical Cyclone Pam, March 2015”, the total economic value of the effects caused by Tropical Cyclone Pam was estimated to be approximately VT48.6 billion (US\$449.4 million). Out of this, Vt29.3 billion (US\$270.9 million) was attributable to damage, and Vt 19.3 billion (US\$178.5 million) was attributable to loss. This was equivalent to 64.1% of the Gross Domestic Product (GDP) in Vanuatu. Summary of disaster effects by sector is shown in Table 3.

Table 3: Summary of disaster effects by Sector

	Disaster Effects	Share of Disaster	Lost

	(Vt million)			Effects (%)		personal income
	Damage	Losses	Total	Private	Public	Vt Million
Productive Sector	8,526	10,403	18,928	98	2	1,607
Agriculture	1,421	4,641	6,062	93	7	227
Commerce and Industry	1,196	2,152	3,348	100	0	487
Tourism	5,908	3,610	9,518	100	0	983
Social Sector	14,339	630	14,969	67	33	-
Housing (Private)	9,452	440	9,893	100	0	-
Health	870	107	977	1	99	-
Education	3,908	79	3,987	0	100	-
Culture	109	3	112	100	0	-
Infrastructure	6,403	2,926	9,329	51	49	-
Transport	3,017	2,137	5,155	43	57	-
Public Buildings	532	12	544	0	100	-
Water	414	284	697	63	37	-
Energy	179	106	285	100	0	-
Communication	2,261	387	2,648	67	33	-
Cross-Cutting Sector	0	5,328	5,328	0	100	-
Environment	0	5,328	5,328	0	100	-
Grand Total	29,268	19,286	48,554	69	31	1607

Source: Post-Disaster needs Assessment Tropical Cyclone Pam, March 2015



Photo: Coconut trees collapsed on livestock breeding facility (Teoma, Efate Island,



Photo: Houses destroyed by strong wind of the Cyclone (Malalip, Efate Island, Shefa

Shefa Province)	Province)
	
Photo: Bridge destroyed by effects of the Cyclone(Teoma, Efate Island, Shefa Province)	Photo: Poultry farm destroyed by strong wind of the Cyclone (Teoma, Efate Island, Shefa Province)

Photos were provided by Mr. William Morris

4-1-3. Supports by international organizations etc.

(1) Emergency food supply

The contents of the first emergency relief supplies sent to the affected provinces were as shown in Table 4.

Emergency relief supplies were sent to Tanna Province, Shefa Province, Malampa Province, Penama Province and Torba Province. The items sent as emergency supplies were rice, canned fish and meat, and instant noodles. In the target survey areas in this survey, Tanna Island and Aneityum Island in Tafea Province and Emae Island, North Efate and Lelepa Island where the level of the disaster was significant, canned fish was distributed in addition to canned meat. Distribution amount per capita was about 6 kg of rice, 0.5 kg of canned fish, 0.2 kg of canned meat and 0.2 kg of instant noodle. Distribution frequency was two or three depending on the damage situation. From the second time onwards, it was difficult to grasp the distribution amount accurately. However, according to interview survey through site visits, information was obtained that emergency relief supplies were distributed once every two to three months. If the amount per day per capita is calculated from this distribution amount (Calculated as two months), rice was 100g/day, canned fish was 8g/day, canned meat was 3g/day and instant noodles was 3g/day. Though sufficient amount of carbohydrates such as rice was distributed, it is difficult to ingest the necessary animal protein from supplied canned fish and meat, and considered that these emergency relief supply were supplementary position.

Table 4: Contents of emergency relief supplies sent to the provinces damaged by Cyclone Pam

Province/Island	Number of Household	Population (Household × household size)	Rice		Canned fish		Canned Meat		Instant noodle	
			Overall (Ton)	Per capita (kg)	Overall (Ton)	Per capita (kg)	Overall (Ton)	Per capita (kg)	Overall (Ton)	Per capita (kg)
Tafea Province	6,116	33,657	193.0	-	17.0	-	8	-	7	-
Tanna Island	5,535	30,443	175.1	5.8	15.0	0.5	7.0	0.2	6.0	0.2
Aneityum Island	176	986	5.6	5.7	0.5	0.5	0.2	0.2	0.2	0.2
Shefa Province	22,378	111,944	343.4	-	9.7	-	4.6	-	3.8	-
Emae Island	99	495	2.9	5.9	0.2	0.5	0.1	0.2	0.1	0.2
Tongoa Island	454	2,270	13.1	5.8	1.1	0.5	0.5	0.2	0.5	0.2
Buninga Island	23	134	0.8	6.0	0.1	0.5	0.03	0.2	0.03	0.2
Tongariki Island	55	415	2.4	5.8	0.2	0.5	0.1	0.2	0.1	0.2
Mataso Island	20	100	0.6	6.0	0.1	0.5	0.03	0.3	0.02	0.2
Makira Island	37	125	0.8	6.4	0.1	0.5	0.03	0.2	0.02	0.2
North Efate	499	2,494	14.4	5.8	1.2	0.5	0.6	0.2	0.5	0.2
Lelepa Island	83	415	2.4	5.8	0.2	0.5	0.1	0.2	0.1	0.2
Malampa Province	4,098	9,887	51.5	-	0	-	2.1	-	1.8	-
Penama Province	4,581	22,903	207.0	-	0	-	5.0	-	5	-
Torba Province	112	582	3.4	-	0	-	0.1	-	0.1	-

Source: Risk Resilience Unit

(2) Support for fisheries reconstruction and promotion

Following emergency support, procurement of fishery related materials is planned as shown in Table 5 to support the fisheries reconstruction and promotion. Information on the progress of equipment procurement was not obtained sufficiently.

Table 5 : Plan of equipment procurement for fisheries reconstruction and promotion

Name of province	Support organizations /Projects	Solar freezer	FAD materials	Fishing gear	5m fishing boat	Water proof bag	Fish processing equipment	Shell crafting equipment
Torba Province	Department of Foreign Affairs and Trade in Australia (DFAT)	3	3	3				
	Vanuatu Coastal Adaptation	4		1	1	1	5	

	Project (VCAP)							
Sanma Province	DFAT	2	2	2				
	VCAP	4		4				
Penama Province	DFAT	1	1	1				
	VCAP	11	2					
Malampa Province	DFAT	3	3	3				
	VCAP	7		5	1	1	7	3
Shefa Province	DFAT	6	7	7				
	SPC/ German Reconstruction Finance Corporation (KfW)	6	19	70	5	28	3	6
	UNDP	14			7			
	VCAP	5	2	5			5	
Tafea Province	DFAT	6	6	6				
	SPC/KfW	8	7	35	9	28	3	
	VCAP	16		16	2		16	
Total		96	52	158	25	58	39	9

Source: VFD

In addition, after the emergency assistance, construction of tilapia aquaculture pond is planned to support the fisheries reconstruction and promotion. Table 6 below shows the contents of the plan and progress. This activity was planned with reference to the case which tilapia that had been cultured became emergency food source after disaster of Cyclone Pam at east coast of Efate Island, Malalip of Efate Island, which will be described later.

Table 6: Plan of construction of aquaculture pond for fisheries reconstruction and promotion

Name of Provinces	Support Organizations	Number of aquaculture ponds planned	Situation of progress by August 2017
Torba Province	KfW	1	Plan has been completed and construction is pending
Sanma Province	KfW	2	Plan has been completed and construction is pending
Penama Province	KfW	2	Plan has been completed and construction is pending
Malampa Province	KfW	2	Plan was completed and construction is pending
Shefa Province	KfW	14	Five ponds have been completed. Plan of nine ponds was completed and construction is pending

Tafea Province	KfW	6	Three ponds have been completed. Three ponds are under construction
	Australian Center for International Agricultural Research (ACIAR)	2	Under construction
		29	

Source: VFD

Box1 Construction of aquaculture pond (Tanna Island)

After the disaster of Cyclone Pam, VFD urged donors to spread tilapia aquaculture in order to ensure food security and emergency food at the time of the disaster by referring to the case of Maralip, east coast of Efate Island described later. As a result, under the management of SPC, financial support from the German Reconstruction Finance Corporation (KfW) was provided and aquaculture ponds have been constructed in each island. This case is a tilapia aquaculture promotion activity which is carried out in the village especially away from shoreline in Tanna Island. Immediately after the disaster of Cyclone Pam, the local population of the community away from the shoreline where the food was scarce, began to conduct coastal fishery, and an increase in fishing pressure was observed. Tilapia aquaculture is considered meaningful to prevent such events.



Photo: Aquaculture pond which was under construction in Imaio, Tanna Island

4-2. Outline of the damage situation and correspondence of coastal population in remote islands adjacent to northern area of Efate Island

An interview survey result by telephone etc. is described below.

4-2-1. Makira Island/Matatho Island

(1) Damage situation in Makira Island / Mataso Island

In Makira Island and Mataso Island, although a number was not grasped, many canoes were damaged and these were impossible to use. In addition, although one boat was completely destroyed and it was unusable, the other boats were with minor damage, and it could be repaired and have used again. There was no fisheries related facility before the damage of Cyclone Pam, but after the damage, Fish Aggregating Device (FAD) and solar freezers were provided.

In the coastal area, the sand which was carried by fierce waves covered the reefs and many corals died. There was no direct damage to fishery resources by it. In addition, sand erosion occurred, the shape of the sandy beach changed. Coastal trees withered due to this.

For agricultural crops, the ground part of the crop planted in the gardens was broken, and people had survived by eating cassava, taro that were slightly left over and fallen bananas until emergency relief supply arrived. For cassava, it took six to seven months to recover to the original state and three to four months for sweet potato. In addition, before the damage of Cyclone Pam, people grew kava, but the kava was destroyed by the strong wind of the cyclone, and it is impossible to plant kava even in 2017.

(2) Reaction to the damage of Cyclone Pam

It took about a month and a half until emergency food arrived from the disaster of Cyclone Pam. Some support was directly transported by the National Disaster Management Office but it was distributed by the Village Disaster Committee later. Distribution amount was decided according to number of household size. While waiting for reply and support from the government, people asked for support from other islands.

People preserved bananas that were dropped and root crops in a preservation method that has been known long time ago so that they can be eaten later. In addition, in Mataso Island, there is particular leafy vegetables (melenaror), and it was recovered in two weeks and became the main food.

After the damage of Cyclone Pam, a few remaining chickens, goats, and pigs were also used as animal protein source, but at the time of the disaster, all the community people especially ingested animal protein only from fishery products. Specifically, one week after the disaster of the cyclone, the taboo area was opened, so that the local population caught and used ruby snapper, unicorn fish, parrotfish, soldier fish etc. inside the taboo area, and inside and outside the reef. In addition, before the disaster of the cyclone, only small fish could be caught and it took a long time to catch. However, the local population who fished off the coast of the reef caught a large number of large fish in a short time. This phenomenon was not seen before the disaster.

In Makira Island/Mataso Island, reef resources were recognized as very important from long time ago, and there is no particular change in people's views on the importance of reef resources before and after the cyclone's disaster. However, as of October 2017, the taboo area remains open.

4-2-2. Tongariki Island/Buninga Island

(1) Damage situation in Tongariki / Buninga Island

According to interviews with area secretaries of Bonginga Island and Tongarika Island and interviews with heads of fishermen's association in Tongariki Island, most of canoes which were approximately 20 before the damage of Cyclone Pam were damaged, spilled or completely damaged. For those with minimal damage, they were repaired and are now available for use in 2017. In addition, since the two aluminum boats have been moved to a safe place before the damage of the cyclone, it is in a condition to be able to use as of 2017. As a fishery related facility, the solar freezer and its buildings that were provided by the French embassy before the cyclone were damaged by the cyclone and became unusable. Further, seagrass and algae were flowed out by the waves, many of the shellfish that were in the rocky area have been washed away by intense waves, and coastal resources are still recovering.

Cyclone Pam damaged all gardens such as Taro, Banana, Yam, Orange, which were major crops. Local population survived by eating crops such as falling bananas and root crops. Cultivation of some root crops such as Taro and Yam was recovered about three months after the damage of Cyclone Pam, but due to further damage caused by the damage of El Niño, it took half a year to completely recover to the original state. However, even as of June 2017, the condition that sweet potatoes, bananas, oranges and kava have not been able to harvest.

(2) Reaction to the damage of Cyclone Pam

It took two to three weeks until people received the first support since the communication network was discontinued. Support was distributed through the Village Disaster Committee. Distribution amount was decided according to the number of household size. In the initial support, water, rice was supported and nurses were dispatched.

Livestock such as cows, pigs, goats, etc. died since there was no feed, and chickens that remained a little and the crab, the clam shell captured in the reef at the time of the ebb tide became sources of animal protein at the time of the disaster. However, proportion of fish was higher for animal protein source. Before the disaster of Cyclone Pam, most local population fished by canoes, but as the canoes were damaged, they cannot go fishing by canoes, and the fishing grounds became limited at accessible areas from the coast and rocky places for diving fishing. Therefore, target

fish species are also limited to reef fish, and the catch amount declined immediately after the disaster of Cyclone Pam.

Although the taboo area existed, it was opened before the damage of Cyclone Pam, and the opening as of 2017 is continued.

Community people feel that fishery resources are more important in emergencies. That is because people have to provide feed for poultry farming, but people only catch and eat for fishery product. Therefore local population are still unchanged and go for fishing every day.

4-2-3. Maralip, east coast of Efate Island

In Maralip, emergency food supply was distributed one month later. Meanwhile, people secured food by eating fallen agricultural products and fish caught in the sea. However, a VFD staff member who have lived in the area decided that it was impossible to supply enough food with the sea fish, and tilapia that had been cultured in an aquaculture pond managed by his family was distributed to about 200 people as free of charge during the disaster of Cyclone Pam. This became part of the community's emergency food. This distribution was continued for two months. As rain had not fell mostly after the damage of Cyclone Pam, and the source of water to the aquaculture pond withered. The pond was dried up in two months and the tilapia supply ended at that time.





Photo: Tilapia which was cultured in aquaculture pond in Maralip

4-3. Damage situation of southernmost islands of Efate Island and details of local population's response

Based on the information obtained in the northern remote island of Efate Island, survey team visited sites that were easy to visit as an additional information gathering survey, and conducted an interview survey.

4-3-1. Emae Island (Marae, Tongamea and Sangava)

(1) Damage situation in Emae Island

The damage situation surveyed in the three major villages in Emae Island was as Table 7.

Table 7: Damage status in Emae Island

Damage of house	Marae	59 houses out of 65 were damaged.
	Tongamea	37 houses out of 42 were damaged.
	Sangava	95% of the houses were damaged and only four houses were safe.
Damage of boats and canoes	Marae	All six boats were damaged.
	Tongamea	There was no damage for boats. However, four canoes out of 10 were damaged.
	Sangava	One boat out of four was damaged.
Damage of garden	Marae	Leaves and stems of crops temporarily were broken in all the gardens and were devastatingly damaged. However, cultivation was started for cassava (six to seven months before harvest) and sweet potato (three months until harvest) again after disaster of the cyclone. However, concerning coconut tree and kava, it is no

		longer possible to cultivate at the time of survey which was after two years of the disaster.
	Tongamea	Temporarily all leaves and stems of crops in all gardens were broken and were devastated. As of 2017, the field crops are returning to their original state.
	Sangava	Temporarily all leaves and stems of crops in all gardens were broken and were devastated. It has been on the way of reconstruction. Since this area is most populated area in Emae Island, it has not reached full self-sufficiency.

(3) Reaction to the damage of Cyclone Pam

In Marae, the fishery products were originally an important source of food and source of income. However, since most of the crops were damaged after the cyclone and fishing gears such as spear guns were included as emergency relief supplies, local population relied on fisheries as a food source and a cash income source more than before. Since it took time to recover agriculture, people relied on fishery products more than ever, and the fishing pressure to the foreshore increased as a food source and cash income source. Marae's chief concerned about the reduce of fishery resources due to these effects and proposed Village Council to establish a taboo area and it was decided to establish a taboo area (2 km × 500 m) at Marae's foreshore from 3rd September 2015 which was six months after the cyclone damage. About the taboo area, it has been protected as of April 2017. Within this taboo area, catch is prohibited for all fish, shellfish, and crustaceans.

In Tongamea, most of the crops were damaged. Therefore, the Chief of the Tongamea decided on 15th May 2015 that the taboo area will be opened for three months before crops can be harvested again. The taboo area was closed on schedule in September 2015 when it was confirmed that the crops could be harvested and there was no problem with the food situation. It has been kept closed as of April 2017. However, according to an interview with the female group, there was an information that the taboo area was at the edge of the village and the foreshore in the center of the village was an accessible area. Therefore, they did not use much there when the taboo area was opened.

In Sangava, most of the crops were damaged. Until one month later that the emergency supplies had arrived, local population staved off by emergency supplies from the relatives of Port Vila and fishery products. There was a proposal for opening the taboo area from the local population, and it was decided by the Village Council to open the taboo area after one week of the cyclone damage. Sangava is most populated area in Emae Island. Restoration of the crop cultivation has been delayed and the supply cannot catch up with demand. Therefore, the taboo area remains open as

of April 2017. However, they are considering to close the taboo area again in the near future.



Figure 3: Taboo areas in Emae Island in 2015



Figure 4: Taboo areas in Emae Island at the time of the survey in April 2017

4-3-2. Lelepa Island and Mangaliliu (Phase II sites)

(1) Damage situation in Lelepa Island and Mangaliliu

Damage situation of Lelepa Island and Mangaliliu was as Table 8. In Lelepa Island and Mangaliliu, damage of houses and fishing hears by Cyclone Pam was relatively minor. However, in Mangaliliu, their gardens had severe damages.

According to interviews with an authorized officer (former community counterpart of the Project for Promotion of Grace of the Sea in the Coastal Village phase II), he mentioned that as a reason which Lelepa and Mangaliliu only had relatively minor damage, they were predicted the coming of cyclone in a traditional way of checking movement of stars with overlapping certain branch of trees, and some measures were taken against the cyclone, such as fixing the roof.

Table 8: Damage status in Lelepa Island and Mangaliliu

Damage of house	Lelepa	Roofs of two houses were broken.
	Mangaliliu	0
Damage of boats and canoes	Lelepa	0
	Mangaliliu	Five to six canoes were damaged since it took long time to fix roof and there was not time to move them. The sailing canoe which was provided in Phase II was also damaged.
Damage of garden	Lelepa	Originally, there were few gardens on the island, and there was few damage.
	Mangaliliu	All leaves and stems of crops such as cassava and yam were broken. As of 2017, these crops are recovered to the original state, but it has been difficult to cultivate yam due to salt damage.

(2) Reaction to the damage of Cyclone Pam

According to interviews with the authorized officer in Lelepa Island, Mangaliliu could access to Port Vila by land route and there was no shortage of supplies.

However, in Lelepa Island, there was shortage of the water and the food. Since the emergency supplies were distributed based on the result of the investigation of the damage situation of the cyclone, a survey of the damage situation was conducted and it took one to two weeks to arrive the emergency supplies based on that report. Until the emergency supplies arrived, some supplies arrived from persons who was born in the Lelepa Island, and lived and had income in Port Vila, and also from the World Heritage Committee, etc. Though Lelepa Island usually had a serious problem of drinking water and it was extremely difficult in the disaster period of cyclone damage. Water was transported many times from the mainland. In addition, it was difficult to obtain cassava, sweet potato and island cabbage, which were usual staple foods, since gardens² owned in Mangaliliu side was damaged.

After one week of the disaster, although emergency relief supplies started to arrive, it was mainly rice and canned foods. Lelepa's authorized officer was concerned about residents' lack of nutrition since they cannot eat cassava, sweet potatoes, island cabbage, etc. as usual. He consulted with members of the MPA committee in Mangaliliu to open the taboo area temporally and made recommendations to the Chiefs. This proposal was resolved at Lelema's Chief Council and a

² Since there is little suitable land for gardens on Lelepa Island, many residents have gardens on Mangaliliu.

temporary opening of the taboo area was approved. The use of the taboo area was permitted for fishery products excluding trochus and green snail which was prohibited to catch in the Fisheries Act. However, all catch including fish was prohibited in the taboo area at Hat Island which was symbol of the World Heritage. In addition, sales were banned for everything caught in the taboo area. Although it was temporary, it has been said that the opening period has been recognized not only by the provision of protein sources among local population, but it was also recognized to contribute greatly from the viewpoint of mental rest as food can be secured whenever necessary (For this, see 4-5-2. Role and awareness of local population on fisheries resources management when the natural disasters occur)

About one month after opening up the taboo area as above, the authorized officer who confirmed that the local population's lives had returned to their original recommended to close the taboo area again. Since it was approved, the taboo area was closed again. In this way, the reason why the authorized officer could play a central role in resource management that consciousness of ownership was very high on the plan that he had an experience to lead planning of CB-CRM plan through participatory approach in Phase I and Phase II of the Project, and the trust from the local population was also increased.

In addition, according to an interview survey conducted to the authorized officer, after disaster of Cyclone Pam, a large group of skipjack which was not seen before disaster of Cyclone Pam was seen around FAD which was deployed by the Phase II of the Project. Approximately 20 fishermen fished around FAD, caught 10 to 30 /times each time, and sold the most of them and allocated some for food. Even in normal times before the damage of Cyclone Pam, there was a time to catch about 40 in one operation, but it was rare as one to two times per month. This was a precious source of income right after the disaster. The group of skipjack was seen around the FAD for about a month thereafter, but it gradually declined and now it cannot be seen.

4-3-3. Waisisi, Tanna Island

(1) Damage situation in Waisisi

Damage situation of Waisisi was as following Table 9.

Table 9: Damage situation in Waisisi

Damage of house	All houses were collapsed
Damage of boats and canoes	Eleven out of the 15 FRP boats and 60 out of 100 canoe were damaged.
Damage of garden	In all the gardens, there were damage such as breaking of

	leaves and stems of the crop. Regarding crops in the field, it has been recovered to its original state as of the year 2017.

(2) Reaction to the damage of Cyclone Pam

Cyclone Pam caused serious damage to the crops in Waisisi. People ate things that were not damaged such as cassava and banana in the inland gardens, mushrooms, fish etc, until when emergency supplies arrived after two weeks. Originally, the fishery in the taboo area was not restricted and only spear gun fishing was banned. Therefore, the taboo area was not opened in Waisisi community even when there were damages after the Cyclone Pam. In addition, there was no request for opening of taboo area by local population since most of the surroundings area in Waisisi were open access.

4-3-4. Aniwa Island (Ikoukau, Isavai and Imatu)

(1) Damage of Aniwa Island

Damages by Cyclone Pam in Aniwa Island are as following Table 10. Regarding the gardens, there were major damage in all the villages. With regard to the damage of houses and boats, Isavai which had prepared in advance through the awareness raising of NGO did not suffer serious damage, but there were major damage in Ikoukau and Imatu.

Table 10: Damage status in Aniwa Island

Damage of house	Ikoukau	About 80% of houses were damaged.
	Isavai	Before being affected by Cyclone Pam, a NGO, Care International had been aware of cyclone countermeasures. As a result, there was almost no damage to the houses, and only the classrooms of the schools were destroyed (the classroom was restored with the support of Japan).
	Imatu	Four of the 22 houses collapsed.
Damage of boats and canoes	Ikoukau	Twenty out of the 35 canoes were damaged.
	Isavai	There was no damage to the boats, but two outboard motors were damaged.
	Imatu	Regarding canoes, 20 vessels out of 42 were damaged.
Damage of garden	Ikoukau	In all the gardens, there were damage such as breaking of leaves and stems of the crops. Regarding crops in the garden, it has returned to its original state as of the year 2017. However, many orange trees, which are special products, broke down, and it is

		not completely recovered yet in 2017.
	Isavai	In about 95% of the gardens, there were damage such as breaking of leaves and stems of the crops. Regarding crops in the garden, it has returned to its original state as of the year 2017. However, many orange trees, which are special products, broke down, and it is not completely recovered yet in 2017. The gardens also met drought damage and the restoration was further delayed.
	Imatu	About 100% of the gardens, there were damage such as breaking of leaves and stems of the crops. Regarding crops in the garden, it has returned to its original state as of the year 2017. However, many orange trees, which are special products, broke down, and it is not completely recovered yet in 2017.

(2) Reaction to the damage of Cyclone Pam

In the three communities at Aniwa Island, foods such as cassava, bananas left in the gardens, coconuts fallen, fish and the like were eaten until an emergency supplies arrived. The emergency supplies (rice, canned food, toothpaste, soap, towels, clothes, water, etc.) were delivered by NGO Care International in about a week (about 3 week supplies at a time). Support had been continued for several months.

As shown in the Figure 5, there was a small taboo area in Ikoukau and the taboo area in the lagoon. When Cyclone Pam passed in March 2015, it was in the timing of usual opening of the taboo area inside the lagoon. Therefore the taboo area was opened but there was no opening of taboo area for the purpose of food procurement in the emergency period. In the lagoon, fish such as mullet and emperor were caught, and it became a protein source of local population in the Aniwa Island.

Following the disaster of Cyclone Pam, a new taboo areas were established in Isavai and Imatu as Table 11 and Figure 6 below through awareness raising by other donor's projects and through initiatives of the chief who concerned about resource reduction.

Table 11: Outline of new taboo areas after Cyclone Pam

Isavai	Since 2016, taboo area (2.5 km × 100 m) was establish in the eastern part of the island. Within this taboo area, catch of all fish is banned. This taboo area was established as a result of support by the Vanuatu Coastal Adaptation Project (VCAP) conducted by SPC.

Imatu	Taboo area (500 m × 50 m) was established in front of Imatu from 2017. All fish catch is prohibited in this taboo area. Currently there is an open taboo area, but chef is considering opening and closing two taboo areas alternately.



Figure 5: Taboo areas in Aniwa Island before disaster of Cyclone Pam



Figure 6: Taboo areas in Aniwa Island as of April 2017

4-3-5. Aneityum (Phase II site)

(1) Damage situation in Aneityum Island

The damage situation of Aneityum Island was as following Table 12. In Aneityum Island, all the souvenir shops of Mystery Island where is remote island and also tourism island and there is an airport collapsed, but damage on the main island side was relatively minor. However, the leaves and stems of crops in the field were almost damaged.

As the reason which the damage was relatively minor in Aneityum Island, Cyclone Disaster Committee (CDC) (which have coordinated with government agencies) had been provided the information of the cyclone a week before. Two hours before the arrival of the cyclone, local population evacuated to the evacuation center from the flood zone and the coastal area if necessary. There were some houses which have cyclone shelters.

Table 12: Damage status in Aneityum Island

Damage of house	Three houses out of 400 houses were completely destroyed. Repair of the roofs etc. were carried out by every community member.
Damage of boats and canoes	Community members helped each other and boats and canoes were moved to a safe place before the cyclone arrived. Therefore, there was not severe damage. Repair of the canoes was also carried out by community members.
Damage of garden	Analcohat (Southern part of Aneityum Island): Nearly 80% of cassava, taro and others were damaged. Port Patrick (Northern part of Aneityum Island): The damage was significant due to the influence of waves and wind, but details are unknown.

(2) Reaction to the damage of Cyclone Pam

It took a month to receive an emergency relief supplies. In the emergency relief supplies, rice, noodles, canned food and water were mainly supplied and CDC distributed them to the whole island. However, with prior guidance by CDC, many households kept water in clean containers, and there were also water supply facilities. Therefore, emergency supply of water was not so necessary. In addition, there was no starvation condition. As the reasons that there was no difficulties on the food situation, it was mentioned by Area Secretary that all community members always prepared bananas and bread fruits as preserved foods at any time. As for the preservation method, holes were dug in the ground, and bananas and bread fruits were wrapped by banana leaves and the holes were filled up. The wrapping leaves were replaced every six months, and it can usually preserve for two-three years. This preserved foods were eaten with coconut milk etc.

In addition, as community members prepared in advance for the cyclone based on the

information from CDC etc., cassava) taro and banana were sufficiently prepared. Manioc, banana and taro can preserve for three days, three weeks and about one month respectively. Sweet potato did not suffer severe damage and it survived even when the cyclone came. Sweet potato became possible to harvest again after two months. Three months later, cassava became able to cultivate after three months and taro and banana started to harvest in the original status after one year.

Community members utilized fishery products since taboo areas were opened. After the cyclone, Zone 5 where was around the Mystery Islands was not opened, but some taboo areas where the land owners admitted were opened. However, there was regulation of the fishing methods (available fishing gear, time zone). Only certain fish and shellfish (See Appendix 3 5. Resource management activities in Aneityum before disaster) were targets of catch, and green snail and trochus were banned. During the opening, it was always decided available fishing methods etc. with the advice of the Marine Protected Area (MPA) Committee. Opening of the taboo areas ended in one month in some places and all taboo areas were closed again in seven weeks. After first emergency supply arrived, they were arrived after 3 months and 6 month. Finally, emergency supplies were arrived three times in total. The end of the emergency supplies were judged as a result of the assessment.

4-4. Summary on the damage situation by Cyclone Pam and reaction of local population at the survey sites

Table 13 summarizes the damage situation and the reaction to Cyclone Pam obtained from the survey results by phone, etc. and interview in site survey.

Table 13: Summary on the damage situation by Cyclone Pam and reaction of local population at the survey sites

	Scale of damage	Reaction at the time of disaster	Role of fishery resources	Situation of crops and livestock	Other notable points
Makira Island/ Mataso Island	Devastating damage	Request for support to other islands, catch of fishery products	Important animal protein source and income source that can be used immediately in case of emergency	Breaking of all leaves and stems of the crops on the ground and taking a few months to recover, all the livestock died	A phenomenon which catching number of large fish in a short hours was seen immediately after the disaster
Tongariki Island/ Buninga Island	Devastating damage	Ingestion of agricultural crops remaining in the gardens and fishery products	Important animal protein source that can be used immediately in case of emergency	Breaking of all leaves and stems of the crops on the ground and taking a few months to recover, all the livestock died without feed	Immediately after the disaster, the fish catch was more than before the cyclone
Maralip, Efate Island	Devastating damage		Important animal protein source that can be used		Distributed Tilapia which was privately cultured to local

			immediately in case of emergency		population free of charge
Emae Island	Devastating damage	Ingesting agricultural crops remaining in the gardens and fishery products, opening of the taboo area in two communities	Important food sources, income sources that can be used immediately in case of emergency	Breaking of all leaves and stems of the crops on the ground and taking a few months to recover, some crops such as kava were not able to recover, most of livestock died	One taboo area was closed after three months and another is still open. Establishment of a new taboo area in Marae
Lelepa Island and Mangaliliu	Damage is minor due to advance preparation	Ingesting agricultural crops remaining in the gardens and fishery products, opening of a part of the taboo areas	Important animal protein source that can be used immediately in case of emergency	Breaking of all leaves and stems of the crops on the ground and taking a few months to recover in Mangaliliu side	Closure of the taboo area A large group of skipjack that was not seen around FAD before disaster of Cyclone Pam contributed as emergency food
Waisisi, Tanna Island	Devastating damage	Ingestion of agricultural crops remaining in the gardens and fishery products	Important food sources available immediately in case of emergency	Breaking of all leaves and stems of the crops on the ground and taking a few months to recover,	Nothing particularly
Aniwa Island	Devastating damage in two communities	Ingestion of agricultural crops remaining in the gardens and fishery products	Valuable animal protein source	Breaking of all leaves and stems of the crops on the ground and taking a few months to recover, and the oranges were damaged and production was decreased	Establish a new taboo area in two communities
Aneityum island	Damage is minor due to advance preparation	Ingestion of agricultural crops remaining in the gardens, fishery products, preserved foods, partial opening of the taboo areas	Supplementary food source	Breaking of all leaves and stems of the crops on the ground and taking a few months to recover	Closure of taboo area

Based on these results, the matters considered to have been effective for food security at the time of disaster are summarized below.

4-5. Role of fisheries resources and the management at the time of a natural disaster and awareness of local population

4-5-1. Importance of fisheries resources on food security and awareness of local population

Each items considered effective for food security at the time of the disaster mentioned above was verified by questionnaire survey. Each item will be described in detail below.

- Fisheries products became one of emergency food sources at the time of disaster of the

cyclone

According to the additional information collecting survey carried out in the surveyed households of Lelepa Island and Mangaliliu, the results of the survey that confirmed the food circumstances until the emergency assistance arrived at the time of disaster of Cyclone Pam are shown in Figure 7 below.

In Lelepa Island and Mangaliliu, the households who answered that “fisheries products was a little” for the foods that they ate were 23% and 22% respectively, and many households used fisheries products in the event of the disaster . Especially, in Mangaliliu, 52% of surveyed households answered that they ate only fish and shellfish. Before the disaster, it was confirmed by interview survey that root crops such as cassava and taro is the center of the meal, and fish and shellfish were supplementary food. Therefore, it was found out that coastal resources are important food source during the emergency period.

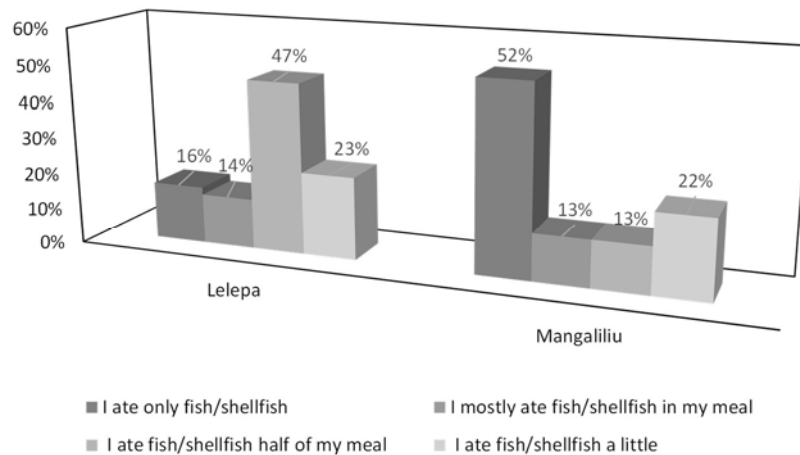


Figure 7: Food circumstances in the survey households of Lelepa Island and Mangaliliu during disaster of Cyclone Pam

Source: Questionnaire Survey

In addition, among the sites surveyed, livestock died due to insufficient feed in many islands where there was severe damage, and only fishery resources which was accessible from the coast even if the canoe and boat were damaged became a source of animal protein for local population at the time of the disaster.

- In the community where the taboo area had been established, the taboo area served as an emergency food store

In one village of Emae Island, a case was confirmed that the taboo area of foreshore was opened

shortly after the disaster, and closed after three months of the disaster when crops were able to be harvested. Emae Island was a home island of one of the VFD staff, and has been in the process of preparing a draft of resource management plan, with reference to the method of Phase II of the Project. Since the village mentioned above was a village of representatives of this resource management group, he advised the Chief to open and close the taboo area in a planned manner. On the other hand, in another village in Emae Island, the taboo area was opened at the time of the disaster and it became an urgent food source, but it remains open even as of April 2017 even the reconstruction has been advanced.

In addition, in Lelepa Island, Mangaliliu and Aneityum Island, preliminary preparations were carried out well and damage of houses was a little. However, they have kept the important taboo area of Hat Island (Lelepa Island and Mangaliliu) and Mystery Island (Aneityum Island) respectively, and managed a vast taboo area expanded during Phase II of the Project based on the resource management plan. Although it was opened a part of the taboo area at the time of the disaster, they confirmed that the life of the local population returned to normal status and closed again.

In Aneityum Island, though opening of taboo areas was not necessarily indispensable since food such as root crops was prepared sufficiently as a preserved food beforehand and it was confirmed by interview survey that fishes and shellfishes were supplementary position to the last before the disaster, a part of the controlled areas were temporary opened at the land owner's will. On the other hand, in Lelepa Island and Mangaliliu, it was confirmed that fishery products in opened taboo area had become emergency food until emergency supply arrived.

The results of the questionnaire survey on the catch in the taboo area at the time of the disaster are shown in Figure 8 below. In the surveyed households of Lelepa Island, 85% of the catches within the opened taboo area were reef fish. Even in Mangaliliu, 58% of catches within in the surveyed households were reef fish.

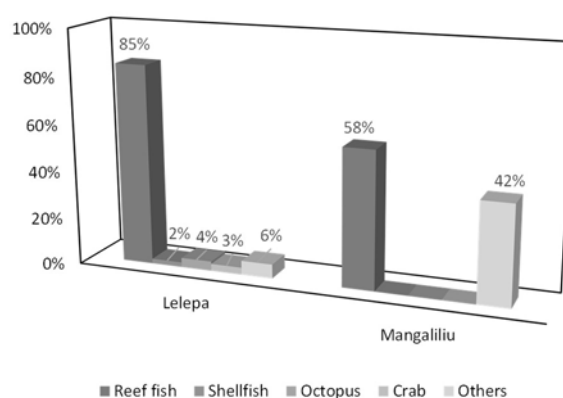


Figure 8: Fishery products within the taboo area opened at the time of the disaster of Cyclone

Pam in the surveyed households in Lelepa Island and Mangaliliu

Source: Questionnaire Survey

The number of days which the surveyed households of Lelepa Island and Mangaliliu used the taboo areas until the emergency supplies arrived at the time of the disaster at Cyclone Pam were as shown in Figure 9 below.

In Lelepa Island, 70% of the surveyed households used for one to five days. According to the interview survey, it was one or two weeks after the emergency supplies arrived, so many households used the opened taboo area about half of the days. Concerning Mangaliliu, 33% of surveyed households used one to five days, 21% used five to 10 days, 46% used 11 to 20 days, and overall result was that all households used one to 20 days. In Mangaliliu, many households had used taboo area almost every day until emergency supplies arrived.

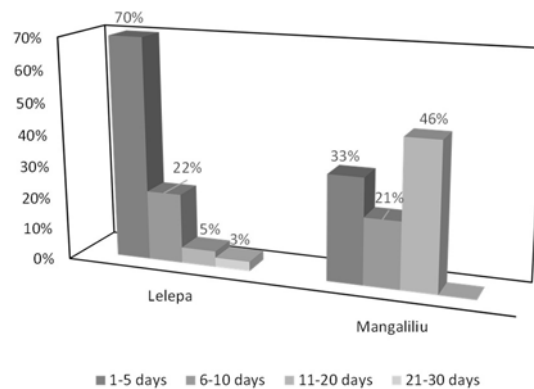


Figure 9: Number of days using the taboo area until emergency supplies arrived at the time of disaster of Cyclone Pam in the surveyed households of Lelepa Island and Mangaliliu

Source: Questionnaire Survey

The survey results on the way of using fish in the taboo areas opened at the time of the disaster of Cyclone Pam in the survey household of Lelepa Island and Mangaliliu were as shown in Figure 10 below.

Ninety five of households in Lelepa Island and 75% of households in Mangaliliu have consumed all of them. As mentioned in “3-3-2. Lelepa Island and Mangaliliu (Phase II Site)”, it was considered that this was because selling was forbidden for catches caught in the taboo area and the result supports a result of the interviews survey. However, the rules were not thorough, and 4% of people in Lelepa Island, and 25% of people in Mangaliliu sold a part of the catch.

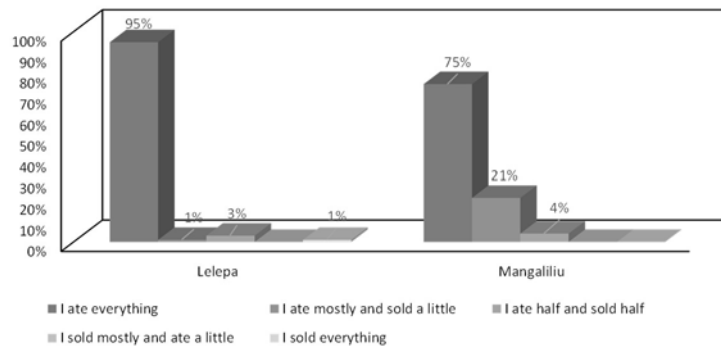


Figure 10: Way to use catches in the taboo area in the surveyed households of Lelepa Island and Mangaliliu

Source: Questionnaire Survey

The survey results on the use of profits when fishery products caught in taboo area was sold at the time of disaster of Cyclone Pam in the surveyed households in Lelepa Island and Mangaliliu were shown in Figure 11 below. In Lelepa Island, 51% of households answered that they purchased food. On the other hand, in Mangaliliu, only 25% of households answered that they purchased food.

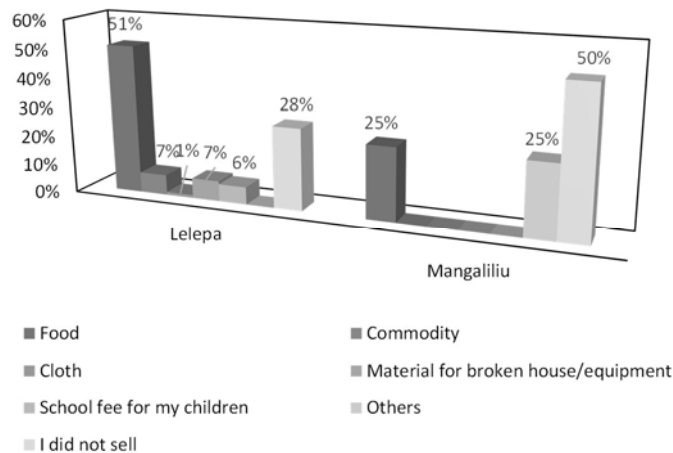


Figure 11: Way of using benefits in the surveyed households of Lelepa Island and Mangaliliu when fishery products caught in the taboo area were sold

Source: Questionnaire Survey

Meaning of opening and closing of the taboo area at the time of the disaster of Cyclone Pam in Lelepa Island and Mangaliliu, Aneityum Island was differed significantly from other sites since opening and closing of the taboo area in these sites were devised by the community initiative not

by the Chiefs, and they conducted it according to the management plan prepared in the Phase II of the Project when central figures in other sites to conduct same actions were the Chiefs. Regarding this, it is thought that there is a high possibility that community autonomy has been enhanced as the result of the implementation of Phase II of the Project, the result of long-term support activities of VFD etc.

- Reaffirmed the importance of fishery resources due to the disaster of Cyclone Pam

In Aniwa Island, there was no large taboo area other than the taboo area in the lagoon which originally banned seasonal fishing. The taboo area in the lagoon was opened as usual and became a valuable animal protein source, but there was no case of opening the taboo area at the time of disaster of Cyclone Pam. However, new taboo areas were set up in response to recommendations from outsiders in two communities. It seems that community has recognized fishery resources as important in disaster period.

In the surveyed household of questionnaire survey conducted in Lelepa Island and Mangaliliu, survey results on recognition of resource conditions in reef fish, shellfish, and other coastal resources in “Immediately after the taboo area expanded”, “Before disaster of Cyclone Pam” and “Now” were as shown in Figure 12 below. In all resources, the resource increased immediately after the taboo areas were expanded. However, the local population felt that resources had decreased before disaster of Cyclone Pam, and thereafter it has been recovered. Prior to disaster of Cyclone Pam, although the coastal resource management activity was somewhat stagnant and the rules in the taboo area were not complied with, it is inferred that people has started to compile the rules in the taboo areas again as the result of disaster.

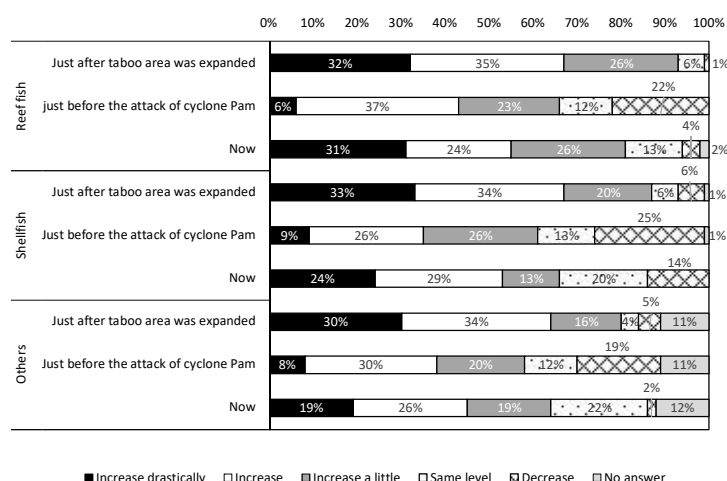


Figure 12: Recognition of resource status in reef fish, shellfish, and other coastal resources in survey households of Lelepa and Mangaliliu

Source: Questionnaire Survey

- Fisheries resources became an important source of income at the time of disaster of Cyclone Pam

According to the results of the questionnaire survey carried out in the visited sites (see Appendix 1), among the sites where the survey was conducted, importance of livestock as a source of income is lower than in comparison with before the disaster in Emae Island, Waisisi in Tanna Island and Aniwa Island where the damage was particularly significant. As an example, Figure 13 show the main income source for men in Emae Island. Among the first to third main income sources, although surveyed households responded that percentage of livestock were 11%, 6% and 6% respectively before the disaster, surveyed households who responded “livestock is the first source of income” has been disappeared “now” and importance of livestock also declined as the second and third income sources. It seems that it is attributed to the fact that the livestock has died when there was no feed at the time of the disaster and it takes a long time to recover afterwards. Furthermore, in Emae Island, households who recognize fishery as an important source of income have increased considerably compared to “before the disaster”, and it was confirmed that fishery resources were a source of animal protein which can resist in disaster period.

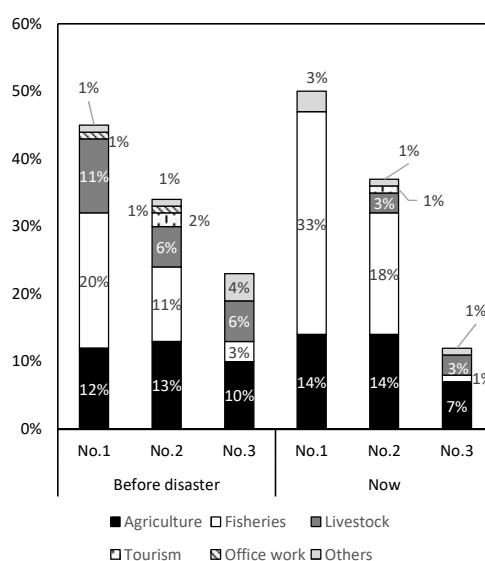


Figure 13: Major income sources of men in Emae Island before and after disaster of Cyclone Pam
Source: Questionnaire Survey

Among the surveyed sites, Makira Island/Mataso Island and Emae Island where the damage was significant, have answered that fishery resources have become important sources of income

as well as food sources.

In addition, according to the results of the questionnaire survey conducted at the visited sites (see Appendix 1), percentage of men’s income from fishery in Emae Island and Aniwa Island has increased comparing with before disaster of Cyclone Pam.

On the other hand, in Emae Island and Aniwa Island, the percentage women’s income from fishery is lower than before the disaster (see Figure 14 and Figure 15 below). It was considered that it became difficult for women to fish at the foreshore since new taboo areas were established in Emae Island and Aniwa Island in addition to reduction of the resource in the foreshore due to Cyclone Pam

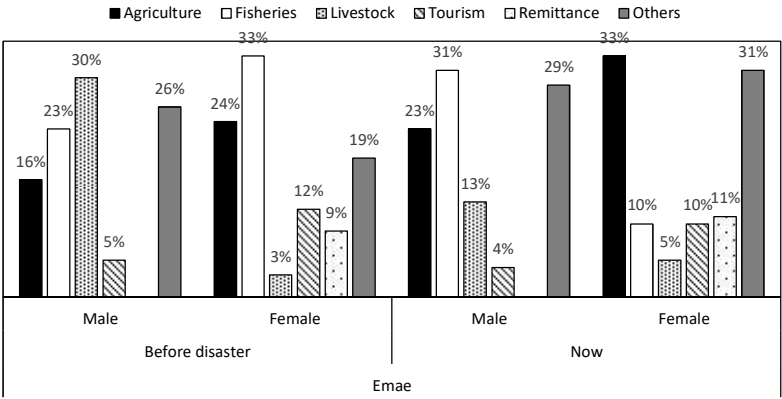


Figure 14: Breakdown of average income before and after disasters of men and women in the surveyed house of Emae Island

Source: Questionnaire Survey

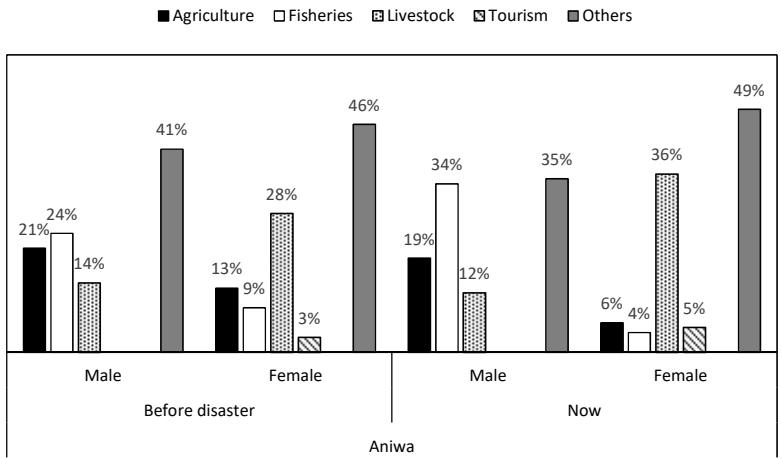


Figure 15: Breakdown of average income before and after disasters of men and women in the surveyed house of Aniwa Island

Source: Questionnaire Survey

4-5-2. Role of fishery resources management and consciousness of local population when a natural disaster occurred

The answers to the question “whether the expansion of the taboo area was useful to secure fishery resources” in the supplementary survey conducted in the survey households of Lelepa Island and Mangaliliu are as Figure 16. Together with the items of “Completely agree” and “Agree”, more than 90% of surveyed households answered that expansion of the taboo area was useful for resource management and emergency food.

In addition, for the question “whether there was consciousness of food security even before the disaster of cyclone Pam as the taboo area is in the foreshore” in the target households of the supplementary survey which was also conducted in Lelepa Island and Mangaliliu, the percentage of surveyed households which answered “I completely had” or “I had” was 55% and 75% respectively and it was high in Mangaliliu. It can be said that the proportion of people who consider that the taboo area is functioning as food security is increasing triggered by disaster of Cyclone Pam.

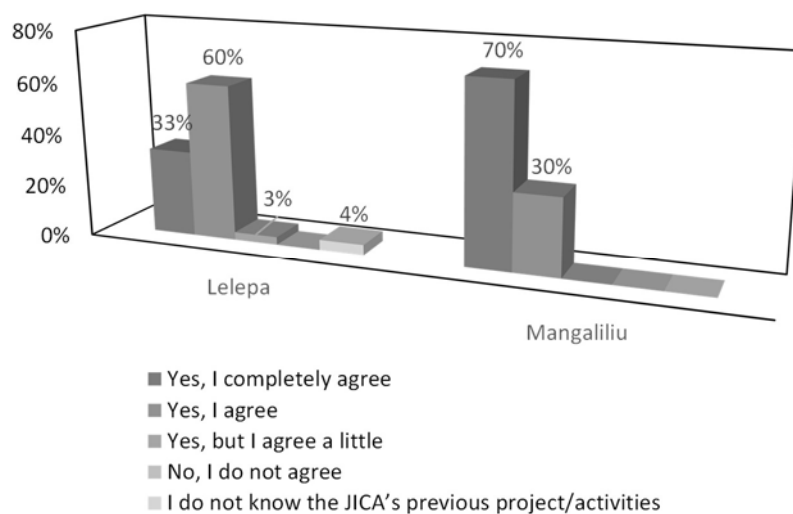


Figure 16: Answers to questions whether the expansion of the taboo area helped in resource management and emergency food situation in the surveyed households of Lelepa Island and Mangaliliu

Source: Questionnaire survey

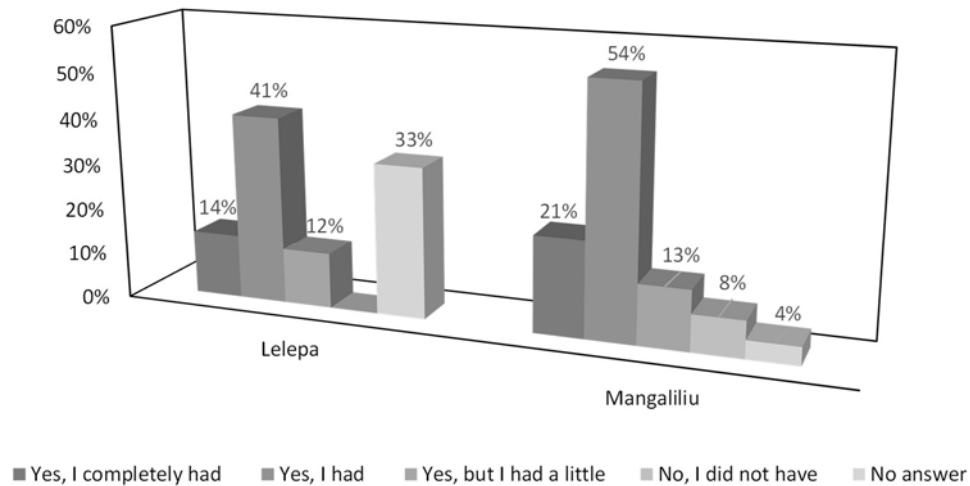


Figure 17: Answers to the question whether there was awareness of food security due to the existence of the taboo area even before the disaster of cyclone Pam in the surveyed households of Lelepa Island and Mangaliliu

Source: Questionnaire survey

In answer to the questionnaire survey “whether importance of fishery resources is recognized and it is better to implement resource management activities in the future”, a high percentage of positive opinion was shown in every site. Every target site wants to continue resource management activities in the future.

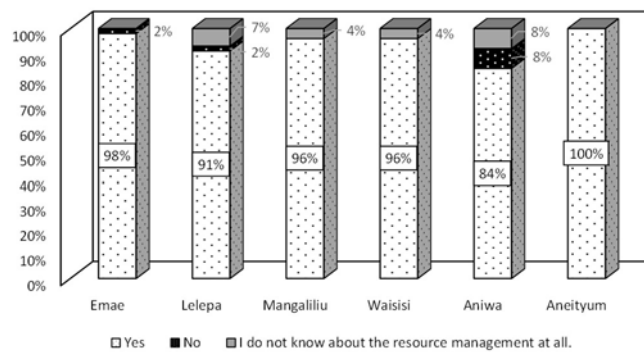


Figure 18: Answers to the question whether it is better to continue resource management activities in this community

Source: Questionnaire survey

However, in answer to the question “whether the continuation of resource management is possible” at the survey target sites, the percentage of answer “It is possible at same level” is only 13% in Lelepa Island, but “It is possible but smaller level” or “it is difficult to sustain” was 82%. In Lelepa Island, the entire circumference of the island is a taboo area. However, the result shows that many local population are wondering that taboo area is too wide. In addition, 35% of surveyed households in Aniwa Island where a large taboo area was established after disaster of Cyclone Pam answered that it is possible but smaller level.

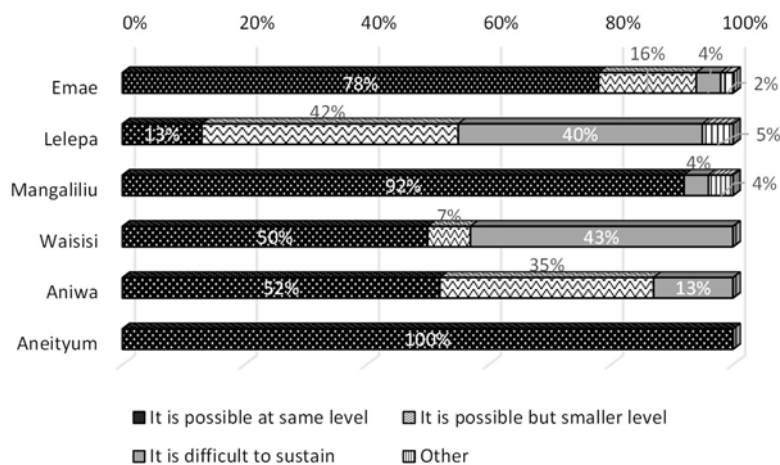


Figure 19: Answer to the question whether the continuation of resource management is possible at the survey target sites

Source: Questionnaire survey

In view of the above, although the target site recognizes the importance of fishery resources and fishery resources management, it can be seen that the motivation for the continuation of the existing fishery resource management has declined in a part of communities such as Lelepa Island with a large taboo area and Aniwa Island with establishment of a taboo area after the disaster.

5. Summary

According to analysis so far, it has been confirmed that fishery resources are important food sources, animal protein, sources of income in case of disaster such as Cyclone Pam, it is relatively resistible against disasters compared to agriculture and livestock, and it contributes to the reduction of the weakness of local population against natural disasters.

In addition, it could be confirmed that as a role of coastal resource management in the event of a disaster, not only resource management measures such as taboo areas, but also the important role of resource management supporting measures such as swarming effect by setting up FAD and securing food resources in emergency through aquaculture.

Even at the time of the disaster, the community that had been engaged in fishery resources management activities had not opened the taboo area disorderly, but fixed the deadline, established prohibited fishing gears and target species, and made use in planned way. Such a case should be noted in the meaning that it was possible to manage fishery resources according to the situation based on the rules set in the community even when it was difficult to secure food.

In addition, as the results of disaster of Cyclone Pam, new taboo areas were set up in Emae Island and Aniwa Island. This was a result that local population were aware that fishery resources were important source of food, animal protein source and income source in the event of a disaster, and at the same time, it was the community's decision to concern excessive catch pressure. This can be highly appreciated.

Therefore, the integrated CB-CRM approach is an approach that can greatly contribute to sustainable use of coastal resources and food security in case of emergencies such as disasters.

On the other hand, even though local population recognize the importance of fishery resources, there were many opinions that continuing fishery resource management activities was difficult as the taboo area was too wide in Elepa Island and Aniwa Island. In addition, a phenomenon was observed in which income of female from fishery declined at the surveyed target sites where new taboo areas were set such as Emae Island and Aniwa Island since the taboo area was expanded after the disaster of Cyclone Pam.

It is natural that enlarging the scope of the control area of fishery resources will be advantageous for resource conservation and food security. However, due to disaster countermeasures functions, dissatisfaction of the local population is easy to accumulate in the taboo area which is too wide even for sites that secure the necessary extent.

From now on, it is necessary to consider how much space is appropriate as disaster countermeasure function in the taboo area. It is also necessary to raise incentives for resource management by local population by reducing the area or rotating some taboo areas for not decreasing income due to the expansion of the taboo area and the motivation for resource

management is not lost.

Further, when fisheries resources activities will be newly established, it is necessary not only to completely ban taboo areas but also to consider the range, target, period, etc., to reduce the burden of the local population. In the decision procedure, it is necessary for local population and VFD to discuss thoroughly while respecting the opinion of the Chiefs, and to conduct subjective management by the local population.

In the future, it is obvious that fishery products play a more important role as emergency food source at the time of the disaster if VFD continues to motivate and support the local population for the coastal resource management, foster awareness of local population's ownership of coastal resources and their capacities, and their management activity level improves. From such a point of view, it is considered to be indispensable that the government is involved subjectively in the dissemination of community-based coastal resource management activities.

Appendix 1: Economic impact on each site at the time of disaster of Cyclone Pam

In order to survey the economic impact given by Cyclone Pam, a questionnaire survey was conducted in addition to site visit. Questionnaires were distributed as shown in Table 1 and Table 2 below.

Table 1: Distributing situation of questionnaire in Shefa Province

Name of communities	Lelepa Island	Mangaliliu Efate Island	Emae Island (Marae, Tongamea, Sangava)
Number of households surveyed	81	25	46
Number of whole household	99	76	168
Percentage of surveyed households in whole household	82%	32%	27.4%

表 2：タフエア州における質問票の配布状況

Name of communities	Aneityum Island (Analcohat)	Waisisi Tannna Island	Aniwa Island
Number of households surveyed	36	28	24
Number of whole household	130	100	91
Percentage of surveyed households in whole household	28%	28%	26%

The sex and age ratio of respondents in households in this survey are as shown in Table 3 below.

Table 3: sex and age ratio of respondents in the surveyed households

	Age	20 ~ 29 years old	30 ~ 39 years old	40 ~ 49 years old	50 ~ 59 years old	More than 60 years old	No answer
Lelepa Island	Men	7	6	8	11	5	1
		18%	16%	21%	29%	13%	3%
	Women	5	16	8	6	5	3
		12%	37%	18%	14%	12%	7%
Mangaliliu	Men	3	5	4	2	3	
		18%	28%	24%	12%	18%	0%

	Women		5	3			
		0%	62%	38%	0%	0%	0%
Aneityum Island	Men	1	1	2	1		
		20%	20%	40%	20%	0%	0%
	Women	1		2			
		33%	0%	67%	0%	0%	0%
Emae Island	Men	7	6	4	9	3	1
		23%	20%	13%	30%	10%	4%
	Women	3	3	2	6	2	
		19%	19%	12%	38%	12%	0%
Waisisi, Tanna Island	Men	3	4	6	1	2	2
		17%	22%	33%	6%	11%	11%
	Women	4	2	4	0	0	0
		40%	20%	40%	0%	0%	0%
Aniwa Island	Men	3	2	4	1	2	
		25%	17%	33%	8%	17%	0%
	Women	1	5	4	0	1	1
		8%	42%	34%	0%	8%	8%

Source: Questionnaire survey

The sex and educational background of respondents in households in this survey are as shown in Table 5 below.

Table 4: Sex and educational background of respondents in surveyed households

	Lelepa Island		Mangaliliu Efate Island		Aneityum Island		Emae Island		Waisisi Tanna Island		Aniwa Island	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
No school	26	3	1	0	1	0	0	0	3	2	2	2
	68%	7%	6%	0%	20%	0%	0%	0%	17%	20%	18%	17%
Primary school	7	34	13	5	2	0	19	10	10	4	4	7
	18%	79%	76%	62%	40%	0%	66%	63%	55%	40%	33%	58%
Secondary school	1	6	2	2	0	0	10	5	5	2	4	2
	3%	14%	12%	25%	0%	0%	34%	31%	28%	20%	33%	17%
High school		0	0	1	1	2	0	1	0	0	0	0
	0%	0%	0%	13%	20%	50%	0%	6%	0%	0%	0%	0%
University	0	0	0	0	0	0	0	0	0	0	0	0
	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Others	1	0	1	0	1	1	0	0	0	1	1	1
	3%	0%	6%	0%	20%	25%	0%	0%	0%	10%	8%	8%

No answer	3	0	0	0	0	1	0	0	0	1	1	
	8%	0%	0%	0%	0%	25%	0%	0%	0%	10%	8%	0%
Total	38	43	17	8	5	4	29	16	18	10	12	12
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Source: Questionnaire survey

(1) Emae Island

The survey results of the economic impact in the surveyed households at Emae Island are shown below.

The survey results of the main income sources of male and female before the disaster and now in the surveyed households at Emae Island are as follows. In Emae Island, there was a big change between before the disaster and now. Regarding the source of income for male, 11% of surveyed households that used livestock as the main source of income, it was disappeared after the disaster of Cyclone Pam and the proportion of households that changed fishing as the main source of income increased. On the other hand, for the female, tourism is increasing as the main source of income now. This refers to manufacturing and selling handicrafts (mats, bags, etc.) as well as Lelepa Island and Mangaliliu.

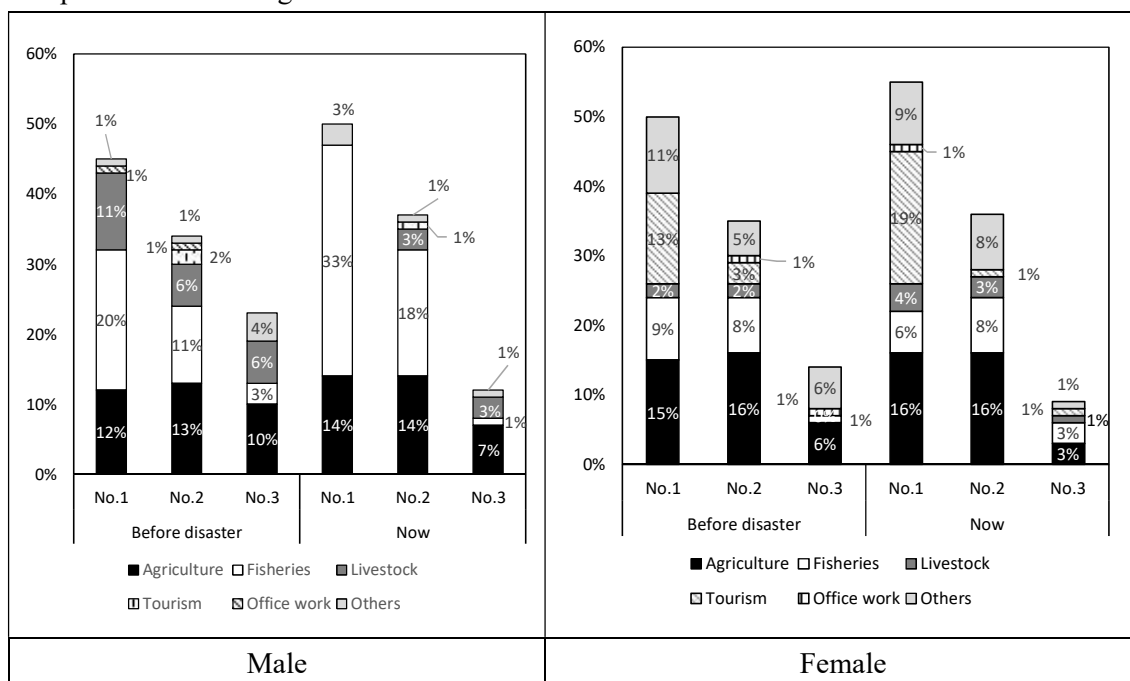


Figure 1: Main income sources of male and female before the disaster and now in the surveyed households at Emae Island

Source: Questionnaire survey

Survey results of the income and the breakdown of male and female before disaster and now in the surveyed households at Emae Island are shown below. As a result of taking the average of the surveyed households, average income has declined sharply in both male and female in Emae Island after the disaster. Especially income of male have decreased by nearly half. Looking at the breakdown of the average income before the disaster of male and female in Emae Island, the percentage of livestock income accounted for 30% and 13% respectively for male and female before the disaster, but now, they are 13% and 5% respectively. It is possible to read that livestock was greatly damaged in Emae Island during the disaster period of Cyclone Pam. On the other hand, for fishery, income of male have greatly increased from 23% to 31%, while those for females has decreased from 33% to 10%. There is a possibility that income has decreased because the newly established taboo area after Cylone Pam, male fishers goes fishing outside the taboo area, but female fishers cannot do it at the foreshore due to the establishment of the taboo area and coastal resources are decreased. Regarding agriculture, the current ratio is higher than income before the disaster. It is considered that the reconstruction of agriculture is advanced after the disaster.

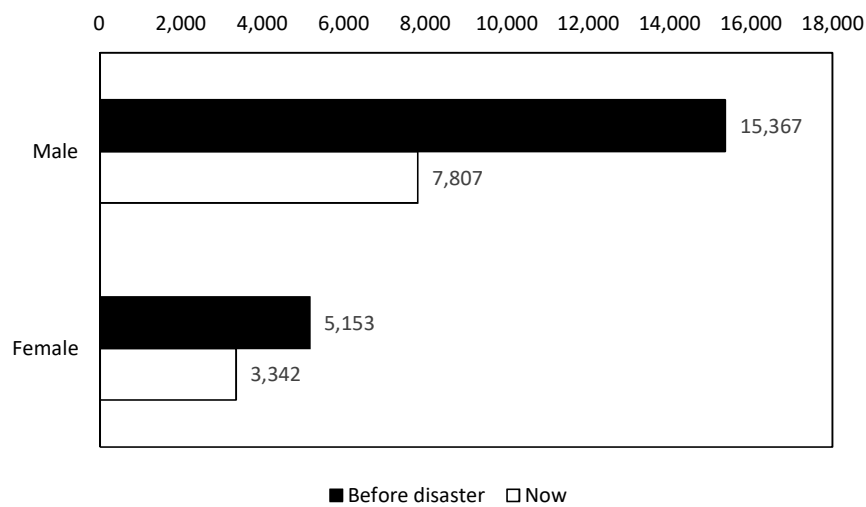


Figure 2: Average income for male and female before the disaster and now in the surveyed households at Emae Island

Source: Questionnaire survey

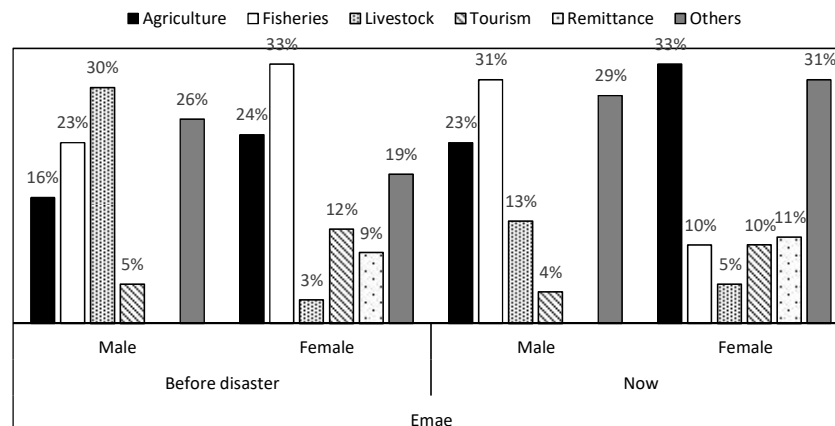


Figure 3: Breakdown of the average income of male and female before disaster and now in the surveyed households at Emae Island

Source: Questionnaire survey

Survey results on the relationship between increase and decrease in coastal resources and income in the surveyed households at Emae Island are as follows. In Emae Island, 80% of the households answered that their revenues were largely or slightly decreased due to the decrease in coastal resources. Because fishery accounts for a high proportion of average income of male, it seems that it is influenced by the decrease of income due to the decrease of resources mainly for female.

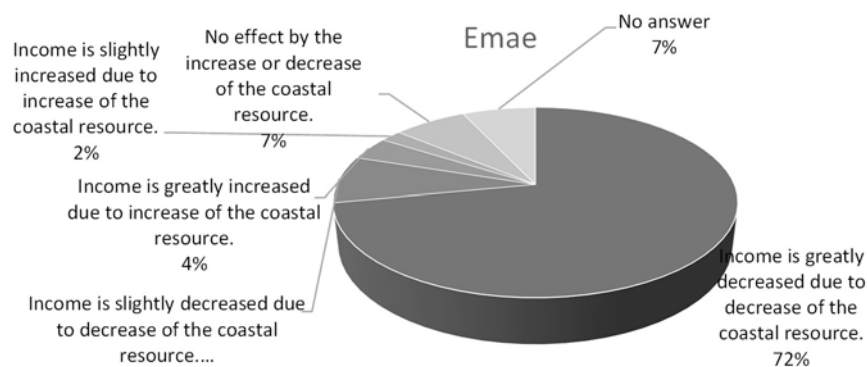


Figure 4: Relationship between increase and decrease in coastal resources and income in the surveyed households at Emae Island

Source: Questionnaire survey

Survey results on expenditure and its breakdown before disaster and now in the surveyed households at Emae Island are as follows. In Emae Island, expenditure at present is slightly lower than before the disaster, but there is no change mostly. Looking at the breakdown, the proportion

occupied by educational expenses rose sharply to 69% instead of the large decrease in food expenditure. The reason for this is unknown.

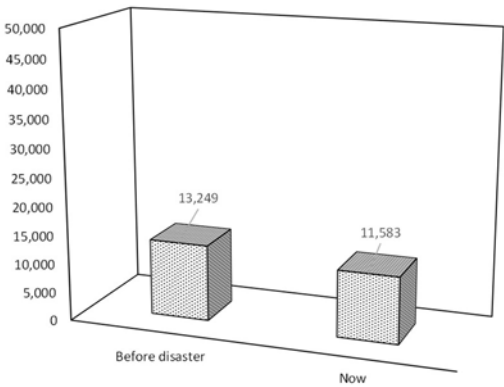


Figure 5: Expenditure before disaster and now in the surveyed households at Emae Island
Source: Questionnaire survey

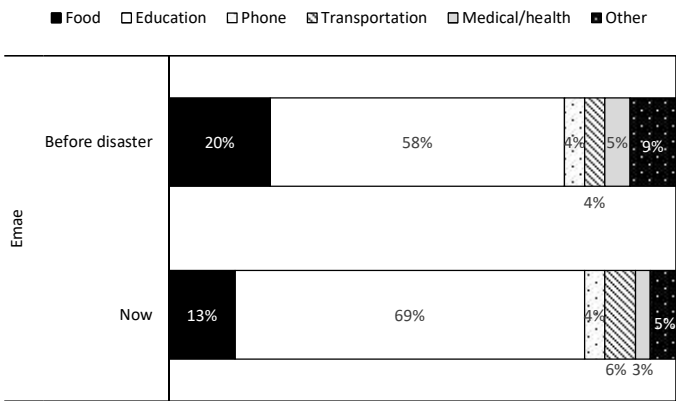


Figure 6: Breakdown of expenditure before disaster and now in the surveyed households at Emae Island
Source: Questionnaire survey

(2) Lelepa Island and Mangaliliu

The survey results of the questionnaire survey in Lelepa Island and Mangaliliu on the economic impact that Cyclone Pam affected to Lelepa Island and Mangaliliu are shown below.

Survey results of male and female’s major income sources in the surveyed households at Lelepa Island before disaster and now were as follows. Regarding Lelepa Island, no major change has been observed before the disaster and now. On the other hand, for Mangaliliu, the current

proportion of tourism conducted by both male and female is slightly higher than before the disaster. Many people who responded “tourism” conduct manufacturing and selling of handicrafts. In the Project of Promotion of Grace of the Sea in Coastal Village Phase II, manufacturing of handicrafts were supported, and it seems that some contributions were made by the Project.

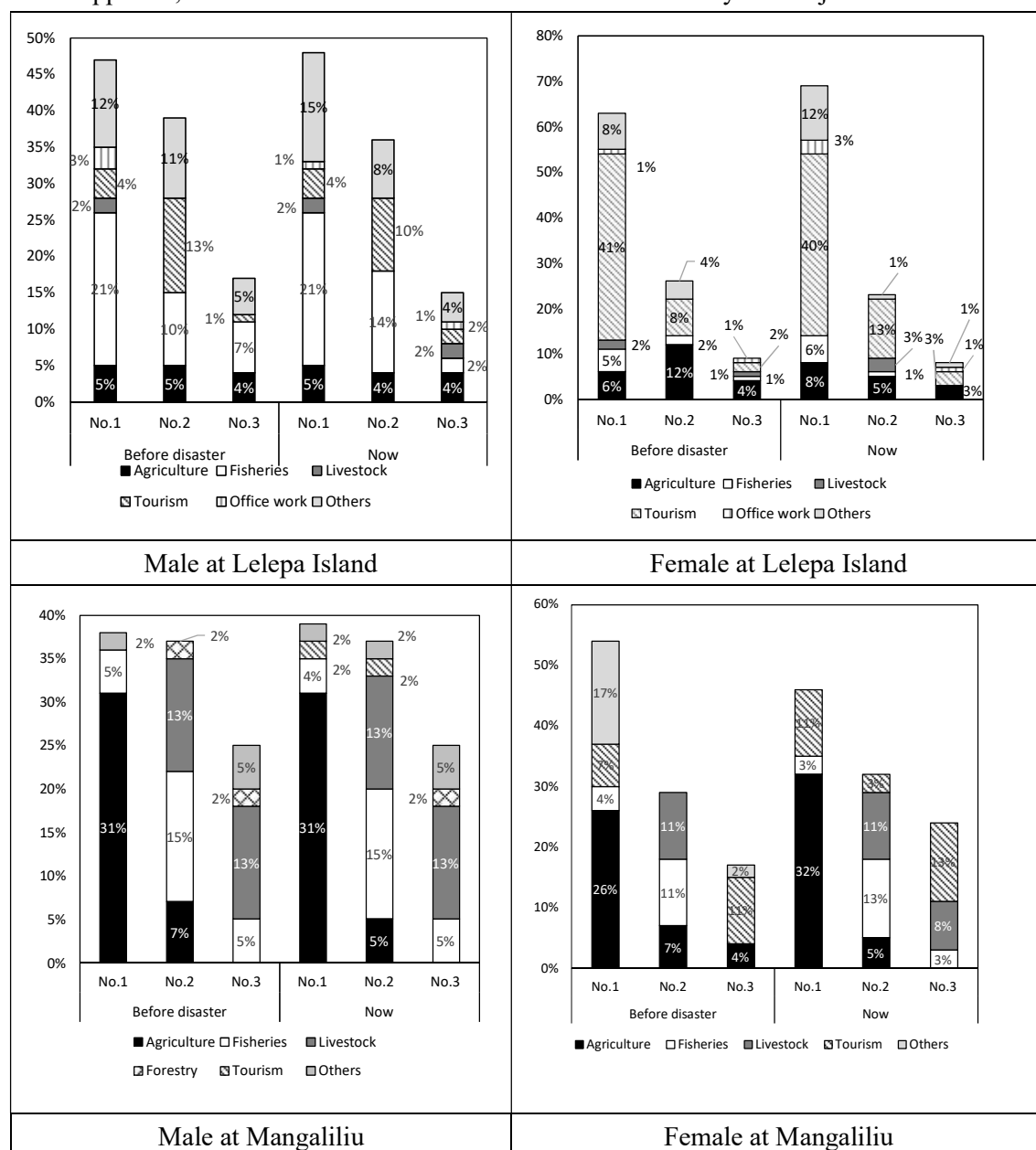


Figure 7: Male and female’s major income sources before disaster and now in the surveyed households at Lelepa Island and Mangaliliu

Source: Questionnaire survey

Survey results on incomes of male and female and the breakdown before and after the disaster in

the surveyed households at Lelepa Island and Mangaliliu were shown below. As a result of calculating the average on the information of the surveyed households, the average monthly income of both male and female is decreasing in Lelepa Island, although it is slight. Looking at the breakdown of the average income of male and female at Lelepa before disaster and now, income from female's tourism industry is somewhat decreased. In addition, overseas remittances are increasing in female's income sources. However, there is no big change overall, and it is thought that overall income was decreasing. Meanwhile, breakdown of average income before and after disaster in Mangaliliu, average income for both male and female is increasing. In Mangaliliu, tourism has increased slightly for both male and female, and overseas remittances are newly added.

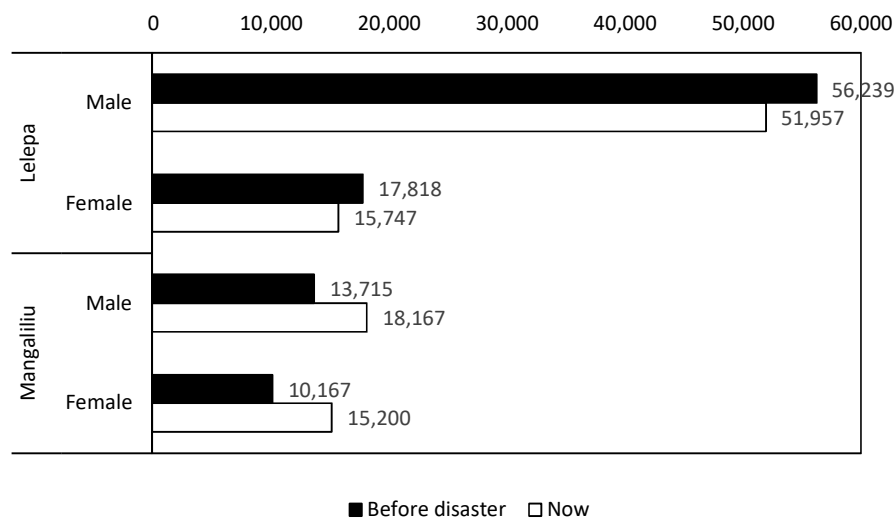


Figure 8: Average income of male and female before disaster and now in the surveyed households at Lelepa Island and Mangaliliu

Source: Questionnaire survey

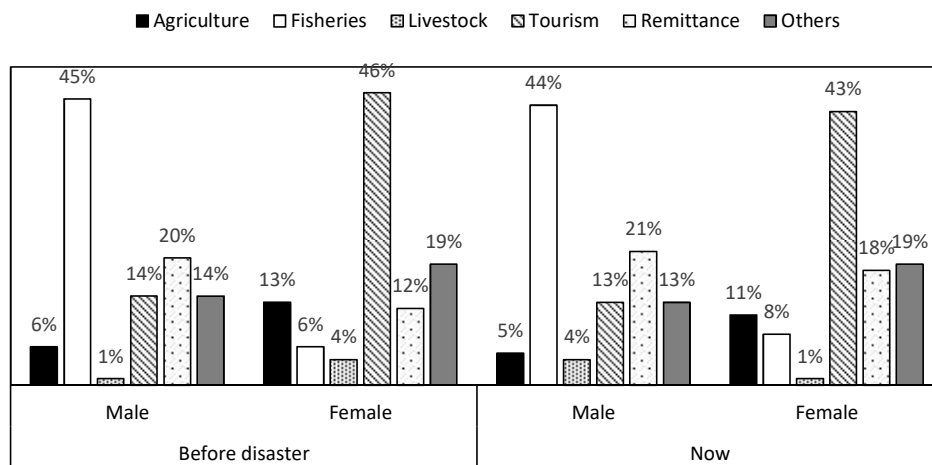


Figure 9: Breakdown of average income of male and female before disaster and now in the surveyed households of Lelepa Island

Source: Questionnaire survey

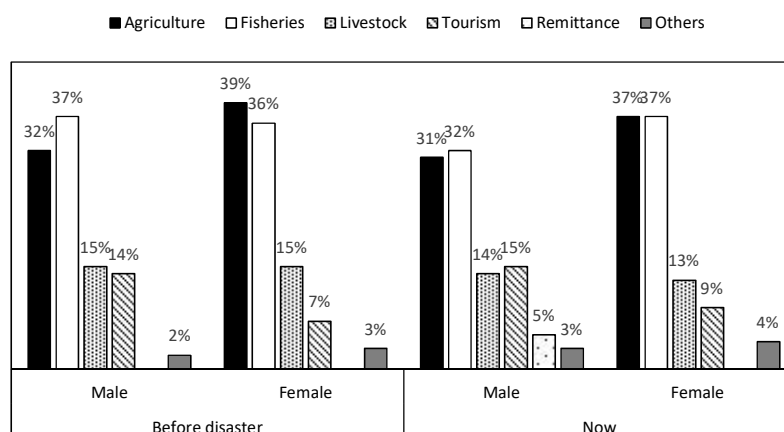


Figure 10: Breakdown of average income of male and female before disaster and now in the surveyed households of Mangaliliu

Source: Questionnaire survey

Survey results on the relationship between increase or decrease in coastal resources and income in the surveyed households at Lelepa Island and Mangaliliu are as follows. In Lelepa Island, households which answered that income was decreased largely or a little as a result of the decrease in coastal resources was 32%, while 12% of households answered that there was no increase or decrease, and households which answered that income was increased largely or a little as a result of the increase in the coastal resources was 23%. The breakdown of the above average income

confirms that the proportion of male income obtained from fishery has decreased slightly. Meanwhile, in Mangaliliu, households which answered that income was decreased largely or a little as a result of the decrease in coastal resources was 32%, while 12% of households answered that there was no increase or decrease, and households which answered that income was increased largely or a little as a result of the increase in the coastal resources was 8%. The breakdown of the above average income confirms that the proportion of male income from fishery has decreased.

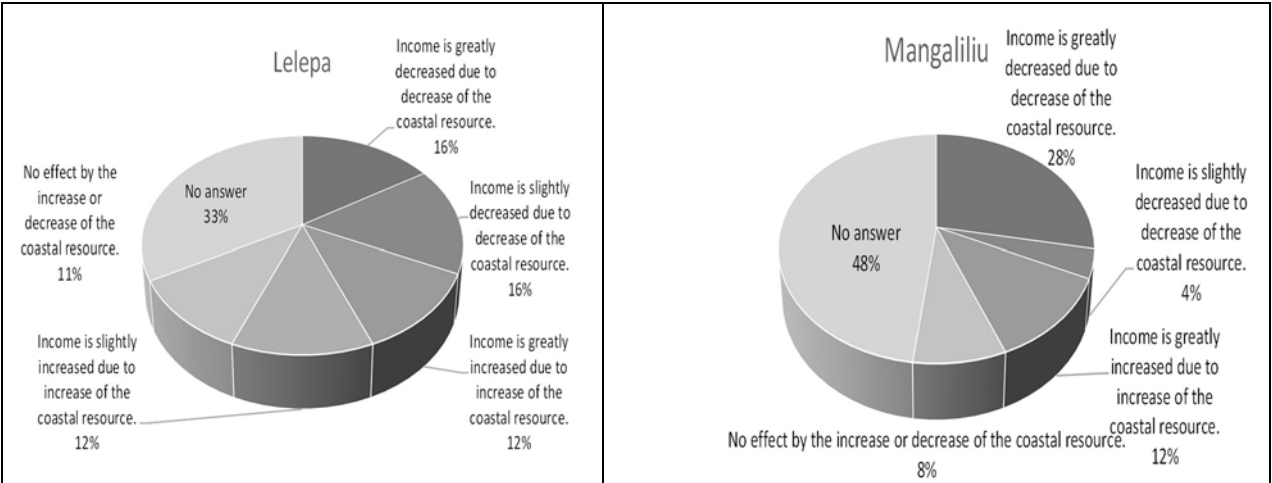


Figure 11: Relationship between increase or decrease in coastal resources and income in the surveyed households at Lelepa Island and Mangaliliu

Source: Questionnaire survey

Survey results on the expenditure and its breakdown before disaster and now in the surveyed households at Lelepa Island and Mangaliliu are as follows. In Lelepa Island, expenditure at now is somewhat reduced compared to before disaster. Food expenses, education expenditure accounts for an increasing proportion, but expenditure is suppressed as telephone and transportation costs are decreasing. On the other hand, in Mangaliliu, the expenditure is increasing. Food expenses and educational expenses account for a decrease, but other expenditures are increasing.

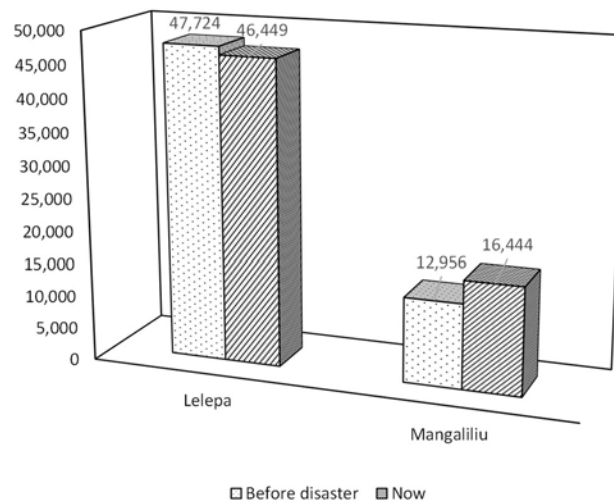


Figure 12: Expenditure before disaster and now in the surveyed households at Lelepa Island and Mangaliliu

Source: Questionnaire survey

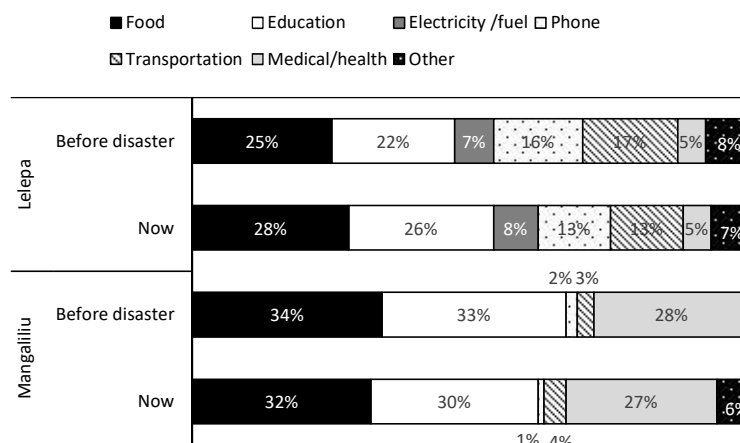


Figure13: Breakdown of expenditure before disaster and now in the surveyed households at Lelepa Island and Mangaliliu

Source: Questionnaire survey

(3) Waisisi, Tanna Island

The survey results of the economic impact in the surveyed households at Waisisi are shown below.

The survey results of the main income sources of male and female before the disaster and now

in the surveyed households at Waisisi are as follows. In Waisisi, there were many “no answer” on the questions about income, but among respondents, the proportion of agriculture is decreasing at the source of the first income source for male, the number of households where forestry and tourism are the highest instead of it, and diversification is occurring. Regarding livestock as well, the percentage of revenues after the disaster is decreasing. There is no significant change in the fishery. While boats and canoes were damaged, it is considered that there is still no substitute industry for fishery in Waisisi.

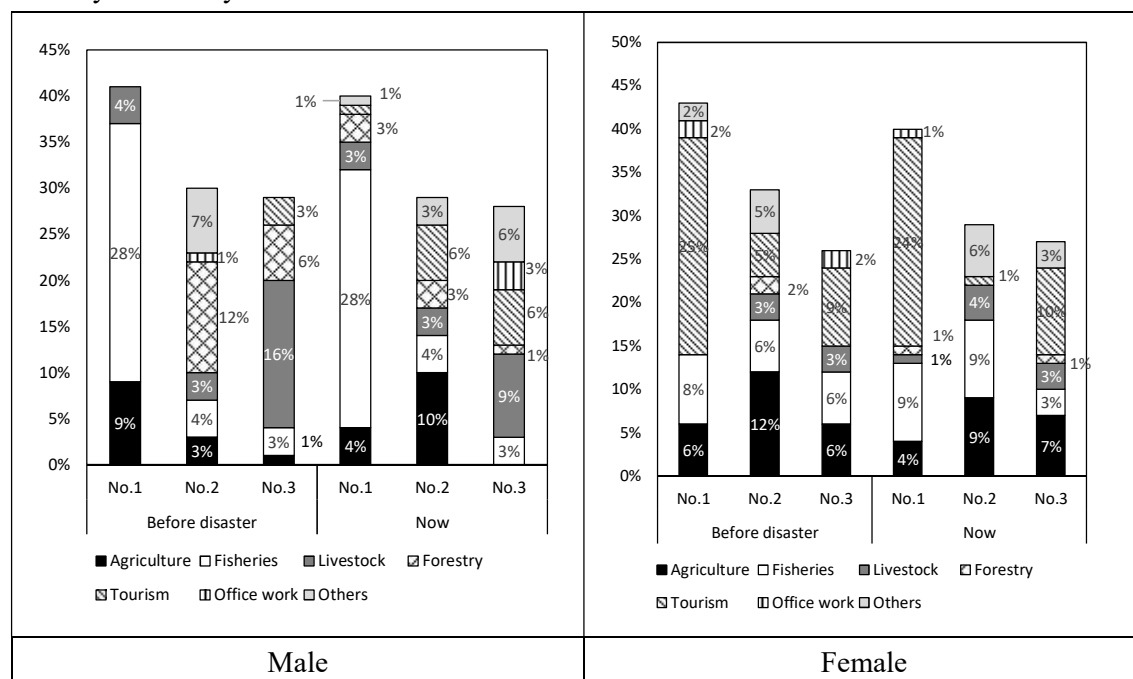


Figure 14: Main income sources of male and female before the disaster and now in the surveyed households at Waisisi

Source: Questionnaire survey

Survey results of the income and the breakdown of male and female before disaster and now in the surveyed households at Waisisi are shown below. As a result of taking the average of the surveyed households, the average monthly income of both male and female has decreased in Waisisi³. In terms of breakdown, the proportion of fishery income of male decreases, and the income from agriculture increases greatly. It seems that the proportion of income of fishery is decreasing because Cyclone Pam has greatly damaged boats and canoes. Meanwhile, income of female is 100% in tourism. Like other sites, this is due to the manufacture of handicrafts (mats

³ However, since the number of households who responded was a little and the amount of money compared with the average expenditure on which was conducted in the questionnaire survey was overwhelmingly small, and the reliability of the data is limited.

and bags).

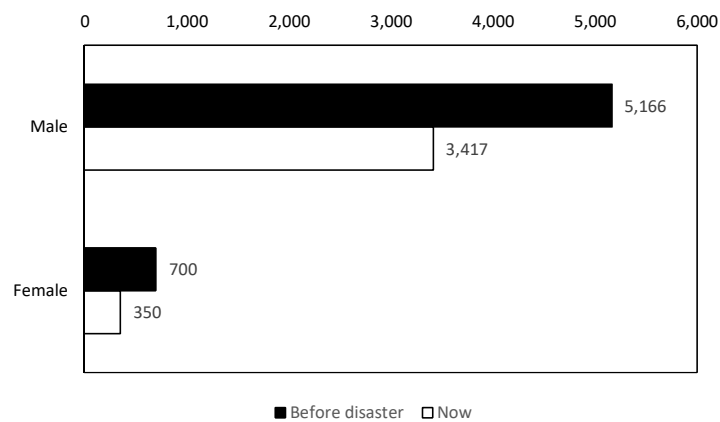


Figure 15: Average income for male and female before the disaster and now in the surveyed households at Waisisi

Source: Questionnaire survey

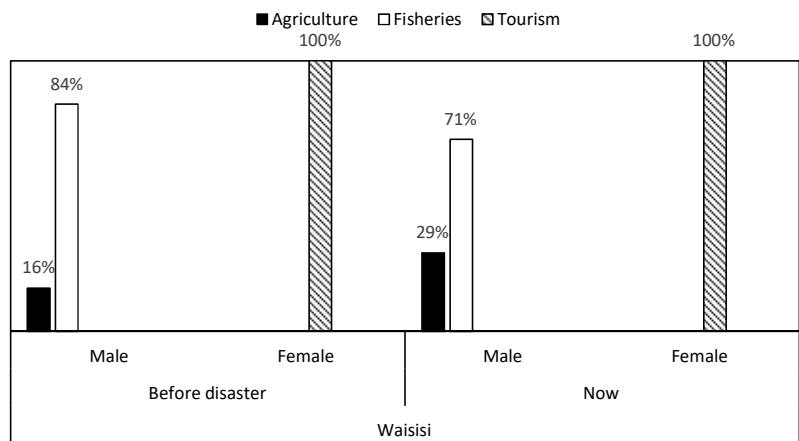


Figure 16: Breakdown of the average income of male and female before disaster and now in the surveyed households at Waisisi

Source: Questionnaire survey

Survey results on the relationship between increase and decrease in coastal resources and income in the surveyed households at Waisisi are as follows. In Waisisi, 33% of households responded that there was a decrease in income due to the decrease in coastal resources. It seems that reduction of coastal resources will not affect income, as many of Waisisi fishers operate in fishing grounds far from Waisisi.

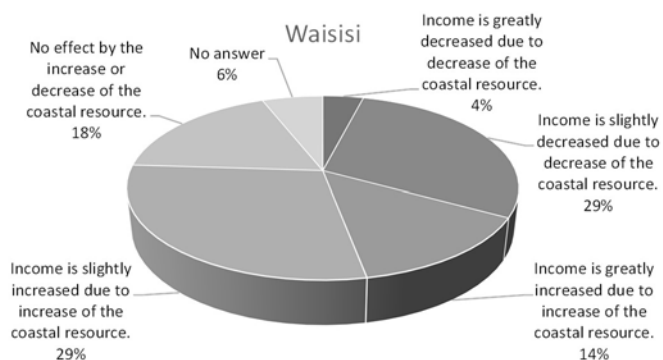


Figure 17: Relationship between increase and decrease in coastal resources and income in the surveyed households at Waisisi

Source: Questionnaire survey

Survey results on expenditure and its breakdown before disaster and now in the surveyed households at Waisisi are as follows. In Waisisi, the average expenditure at present is almost the same as before disaster. Even with the breakdown, the influence of cyclone Pam is hardly seen.

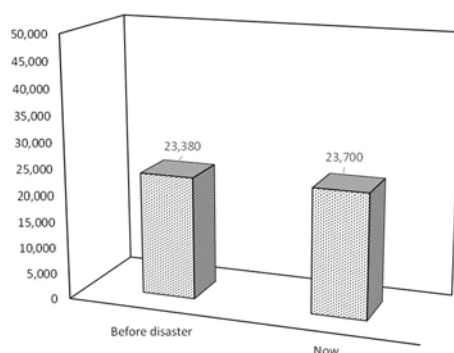


Figure 18: Expenditure before disaster and now in the surveyed households at Waisisi

Source: Questionnaire survey

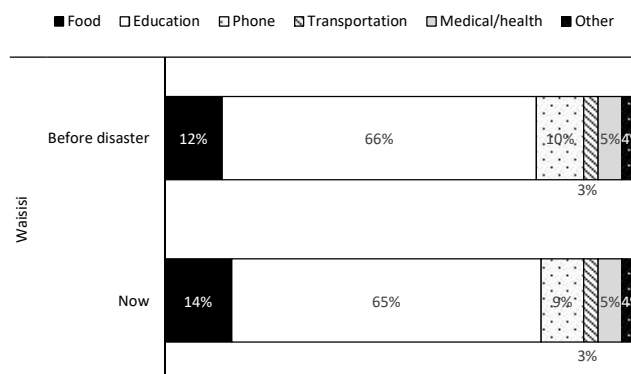


Figure 19: Breakdown of expenditure before disaster and now in the surveyed households at Waisisi

Source: Questionnaire survey

(4) Aniwa Island

The survey results of the economic impact in the surveyed households at Aniwa Island are shown below.

The survey results of the main income sources of male and female before the disaster and now in the surveyed households at Aniwa Island are as follows. In Aniwa Island, the most important source of income through before disaster and now are agriculture (orange), fishery and livestock, and the proportion of fishery is increasing now. Conversely, agriculture, livestock and forestry (sandalwood) were somewhat less important because they were damaged by Cyclone Pam. On the other hand, for female, the proportion of agriculture and livestock declined due to the damage of Cyclone Pam and the proportion of tourism (manufacture and sale of handicrafts such as mat etc.) is increasing.

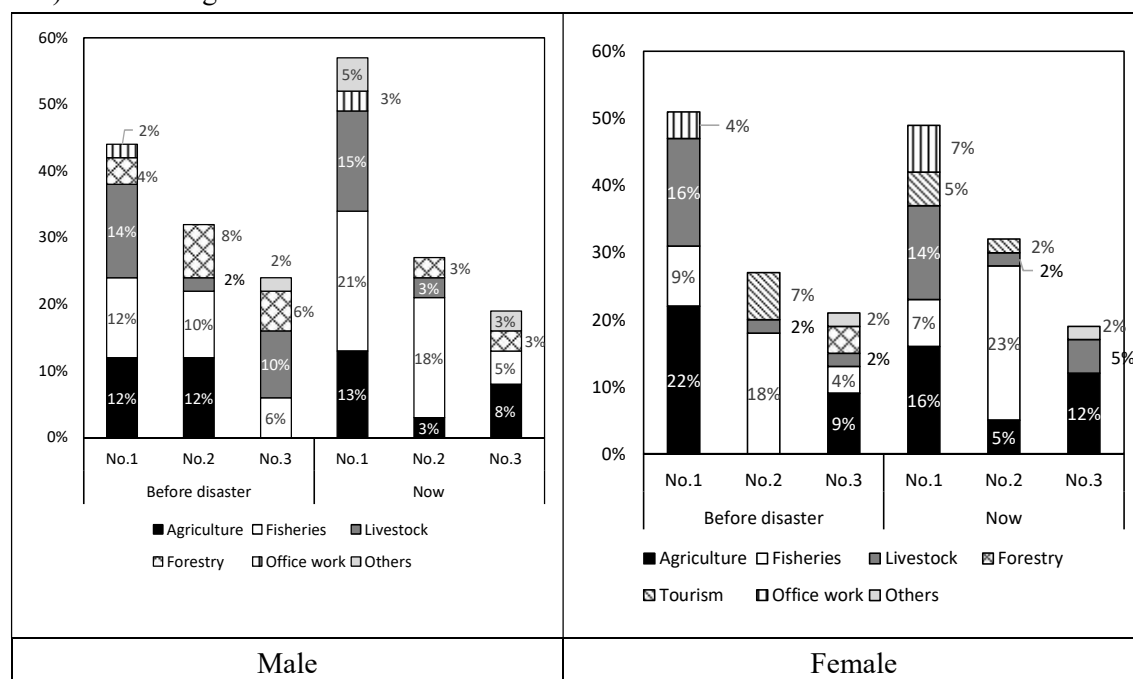


Figure 20: Main income sources of male and female before the disaster and now in the surveyed households at Aniwa Island

Source: Questionnaire survey

Survey results of the income and the breakdown of male and female before disaster and now

in the surveyed households at Aniwa Island are shown below. As a result of taking the average of the surveyed households, in Aniwa Island, the average income of male has decreased greatly after disaster of Cyclone Pam. Looking at the breakdown, the proportion of income from agriculture and livestock decreases and the proportion of fishery is increasing. While their garden was damaged, the importance of the fishery seems to be increasing, as the solar freezer and other support were provided after the disaster. Regarding the livestock, it is conceivable that it was the work of male but it was shifted to the work of female now.

On the other hand, income of female has not changed significantly. However, in terms of percentage, income from agriculture and fishery is decreasing. Regarding fishery, the fact that the trend of decrease in the resources of reef fish is found in the interview survey and there were villages where new taboo areas were established after disaster of Cyclone Pam. Therefore, it is considered that women may not do fishing at the foreshore.

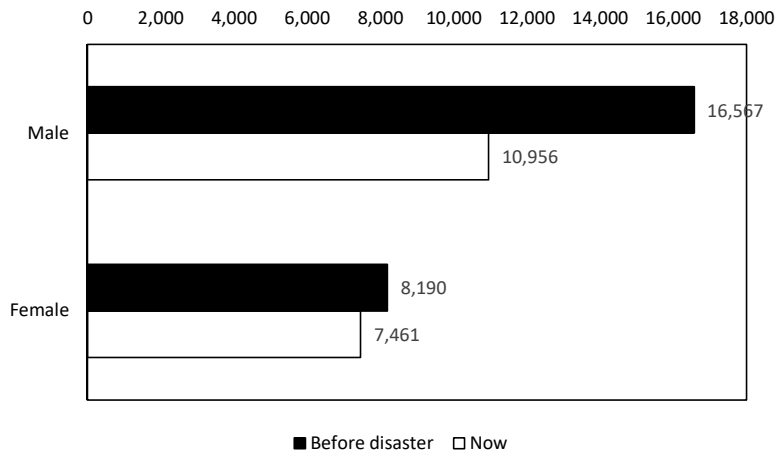


Figure 21: Average income for male and female before the disaster and now in the surveyed households at Aniwa Island

Source: Questionnaire survey

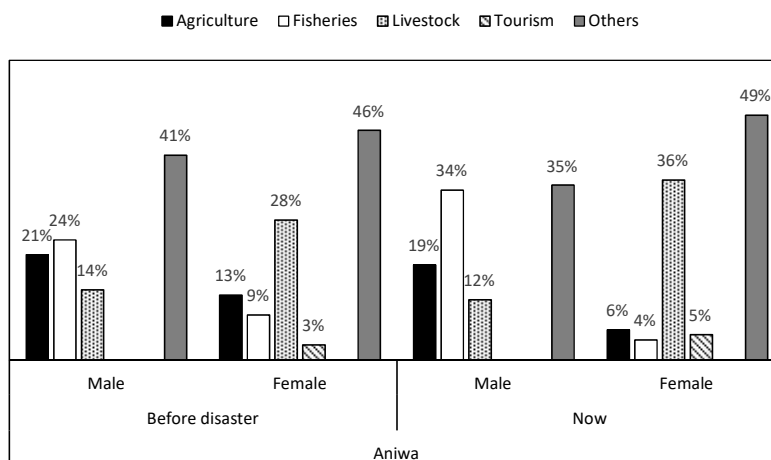


Figure 22: Breakdown of the average income of male and female before disaster and now in the surveyed households at Aniwa Island

Source: Questionnaire survey

Survey results on the relationship between increase and decrease in coastal resources and income in the surveyed households at Aniwa are as follows. In Aniwa Island, 50% of the households answered that their income was largely or slightly decreased due to the decrease in coastal resources. Since average income of male accounts for a higher percentage, it is considered that female are influenced by resource reduction mainly and decreased income by taboo area newly established after disaster of Cyclone Pam.

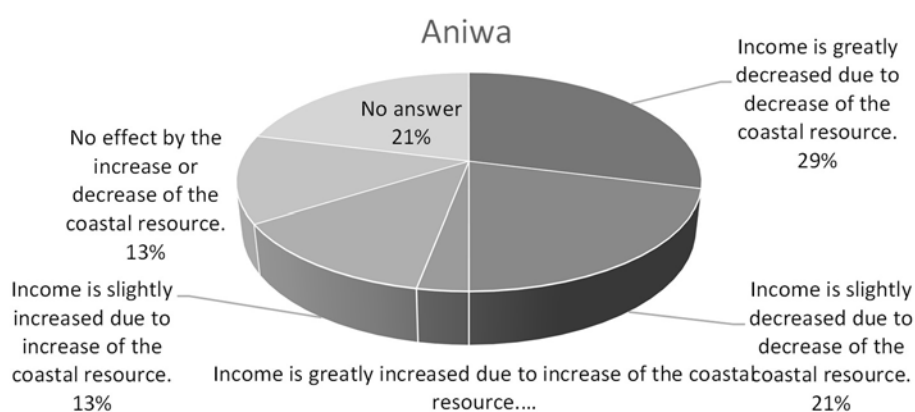


Figure 23: Relationship between increase and decrease in coastal resources and income in the surveyed households at Aniwa Island

Source: Questionnaire survey

Survey results on expenditure and its breakdown before disaster and now in the surveyed households at Aniwa Island are as follows. In Aniwa Island, expenditure at present is slightly increased compared to before the disaster. Before the disaster, even looking at breakdown now, the proportion of telephone charge and transportation expenditures accounts for a little increase, there is no major change. In Aniwa Island, it seems that there was no influence on the large expenditure by Cyclone Pam.

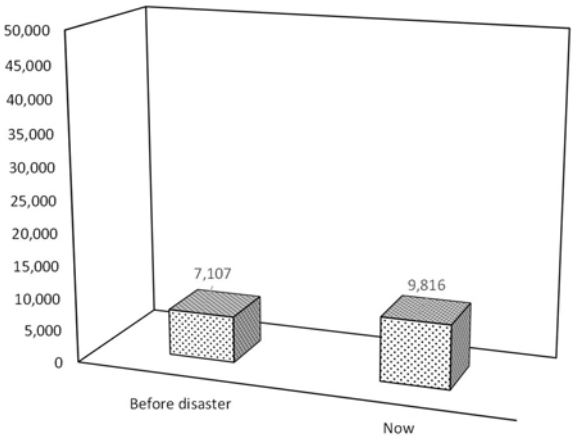


Figure 24: Expenditure before disaster and now in the surveyed households at Aniwa Island
Source: Questionnaire survey

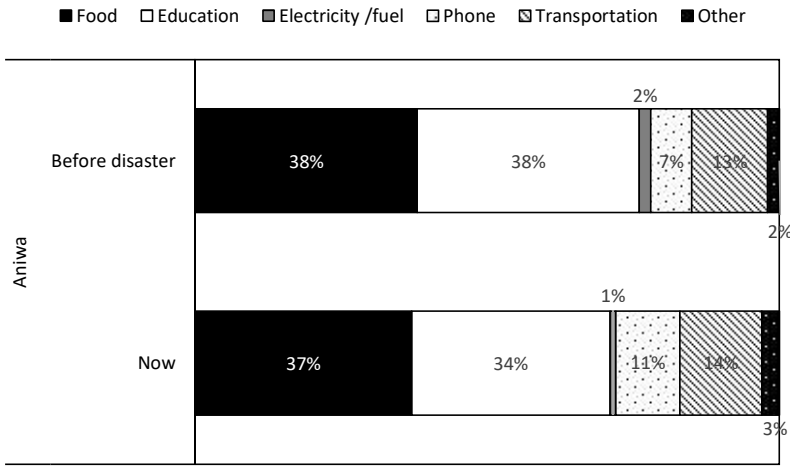


Figure 25: Breakdown of expenditure before disaster and now in the surveyed households at Aniwa Island
Source: Questionnaire survey

(5) Aneityum

The survey results of the economic impact of surveyed households in Aneityum Island are shown below.

The survey results of the main income sources of male and female before the disaster and now in the surveyed households at Aneityum Island were as follows. In Aneityum Island, the most important revenue source is tourism through before disaster and now. However, unlike Lelepa Island and Mangaliliu, the tourism industry is not the manufacture of handicrafts, but rather the sale of souvenirs to tourist boats (most of them are imported from overseas). After the disaster, households who selected agriculture as the primary source of income for male's income have disappeared. There is no household which fishery is the primary source of income, but after the disaster, there are some households that fishery becomes the third source of income from the second source of income. As for female, the situation that the tourism industry had been the main source of income in almost all households has not changed mostly.

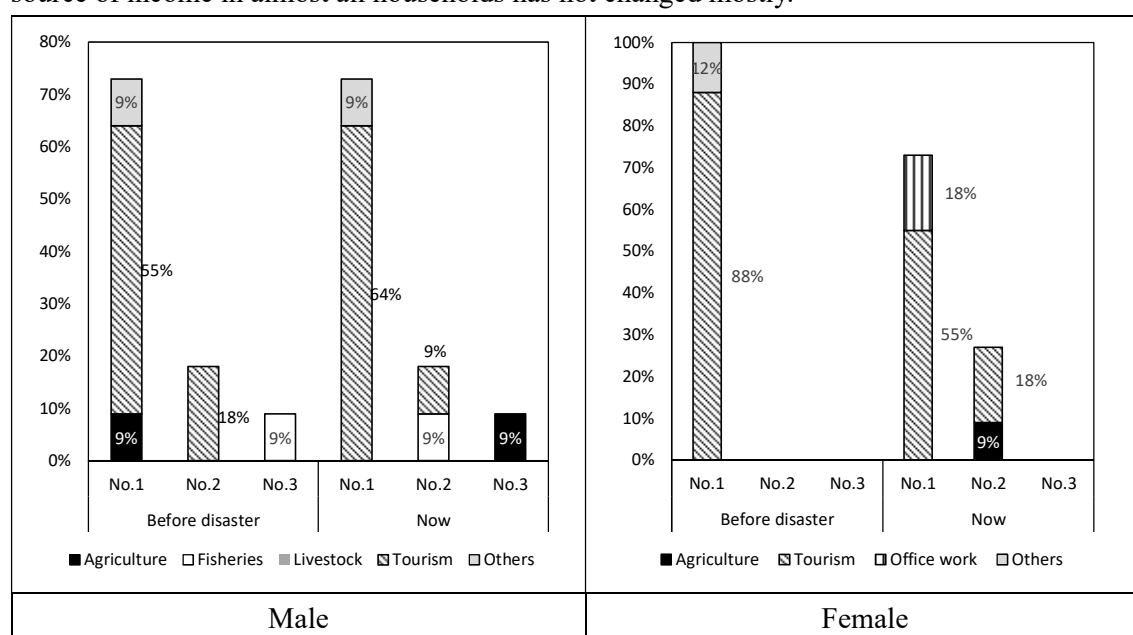


Figure 26: Main income sources of male and female before the disaster and now in the surveyed households at Aneityum Island

Source: Questionnaire survey

Survey results of the income and the breakdown of male and female before disaster and now in the surveyed households at Aneityum Island are shown below. As a result of taking the average of the surveyed households, average monthly income for Aneityum Island has declined largely for both male and female. Looking at the average income breakdown of men and women in

Aneityum Island, the average income breakdown before disaster and now shows that the ratio of income from agriculture decreases for male and female, and it tends to be more weighted toward the tourism industry. The fact that their garden was damaged by the disaster of Cyclone Pam is considered to be a factor.

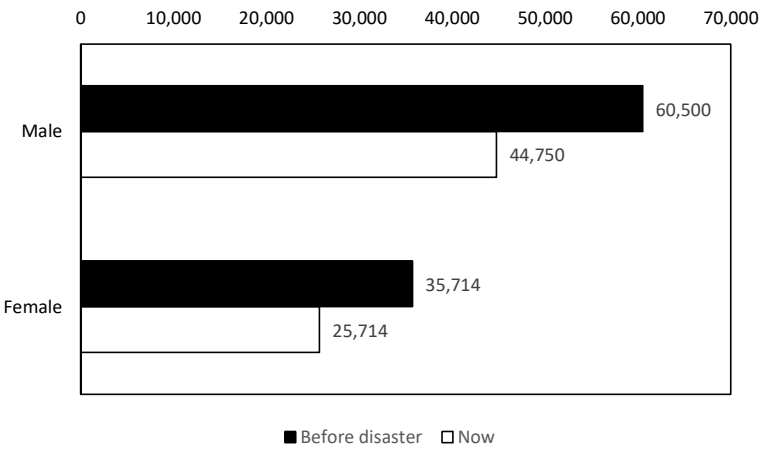


Figure 27: Average income for male and female before the disaster and now in the surveyed households at Aneiyum Island

Source: Questionnaire survey

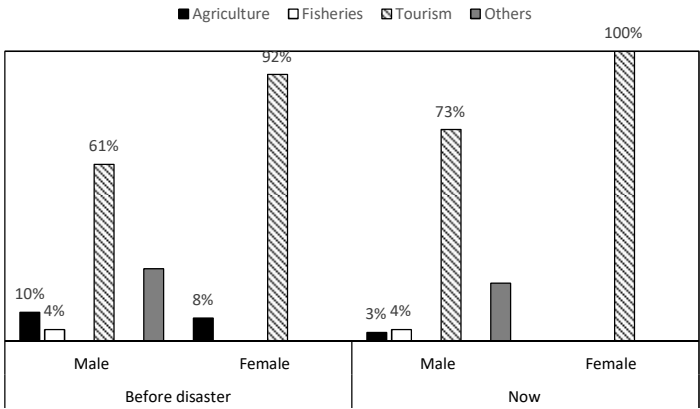


Figure 28: Breakdown of the average income of male and female women before disaster and now in the surveyed households at Aneityum Island

Source: Questionnaire survey

Survey results on the relationship between increase and decrease in coastal resources and income in the surveyed households at Anietyum Island are as follows. In Aneityum Island, 50% of the households answered that their income was largely or slightly decreased due to the decrease in coastal resources. Since the percentage of fishery accounts for the average income of male is 4%

both before disaster and now, income is considered to be declining overall, including tourism. Conversely, only 12% of households answered that income increased due to an increase in coastal resources.

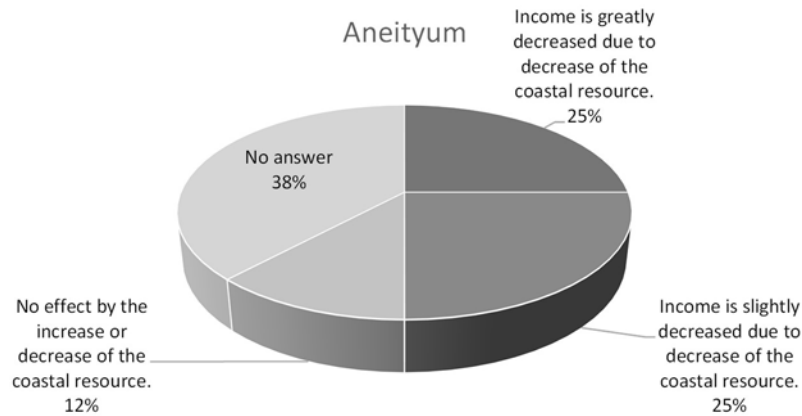


Figure 29: Relationship between increase and decrease in coastal resources and income in the surveyed households by questionnaire survey in Aneityum Island

Source: Questionnaire survey

Survey results on expenditure and its breakdown before disaster and now in the surveyed households at Aneityum Island are as follows. In Aneityum Island, expenditure at now is largely increased compared to before disaster. Looking at breakdown, food expenses have increased greatly. It is inferred that households that are difficult to self-sufficient for agricultural crops purchase from others because their gardens were damaged by cyclone Pam.

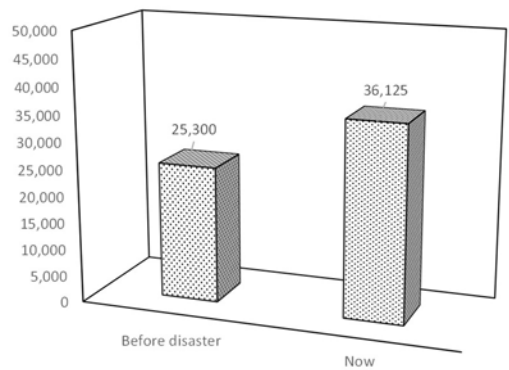


Figure 30: Expenditure before disaster and now in the surveyed households at Aneityum Island

Source: Questionnaire survey

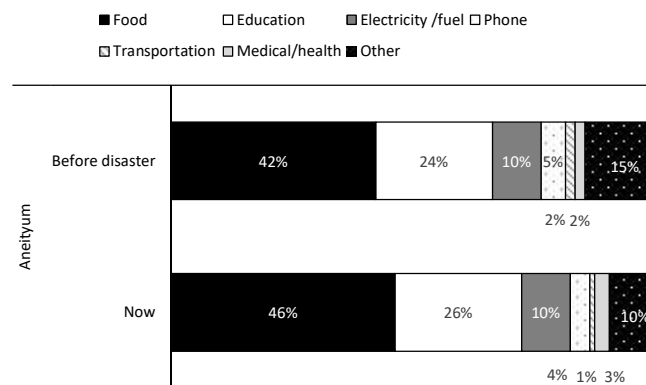


Figure 31: Breakdown of expenditure before disaster and now in the surveyed households at Aneityum Island

Source: Questionnaire survey

Appendix 2: Questionnaire

Sheet 1

Questionnaire For Household Survey

Project for Promotion of Grace of the Seas for Coastal Village in Vanuatu Phase III

Code Number	

1.0 Preliminary Information

1.1 Province _____

1.2 Village / Community _____

1.3 Name of Enumerator _____

1.4 Date of Interview _____

2.0 Profile of Household Representative

2.1 Name of representative: _____

2.2 Sex : ☐ 1. Men ☐ 2. Women

2.3 Age : _____ years old

2.4 Ethnicity : _____

2.5 Education ☐ 1. No school attendance ☐ 2. Primary school ☐ 3. Secondary school

Attainment : ☐ 4. High school ☐ 5. Collage / University ☐ 6. Other _____

2.6 Contact Phone Number _____

3.0 Resource and Environment Aspect

3.1 Awareness of the resource management

3.1.1 Do you know the resource management activities (Taboo area, season, species, limitation of operation time etc.) in the community?

☐ 1. Yes, I know

☐ 2. No, I do not know

3.1.2 Do you support the coastal resource management activities?

☐ 1. Yes

☐ 2. No

3.1.3 If the answer of 3.1.2 is "Yes", why do you support the coastal resource management in the community?

☐ Advice from Fisheries Department

☐ Resource is declining

☐ I want to help tourism development.

☐ I aware the situation of the coastal resource and actively support the activities.

☐ If I protect the resource, I may get economical benefit in the future.

☐ I do not have good market for fish/shellfish and not need to catch fish a lot.

☐ Since our chief ordered, I support the activities.

☐ Since there is some regulations/laws, I support the activities.

☐ Since other community members follows the rule/regulation.

☐ Since resource management was agreed in the groups or the management committee.

☐ Others [_____]

3.1.4 If the answer of 3.1.2 is "No", why don't you support the coastal resource management in the community?

☐ No alternative income

☐ I think that the coastal resource is rich here and it is not necessary.

☐ If I protect the resource, my income will be decreased.

☐ Since our chief did not order.

☐ Since I do not know any regulations/laws.

☐ Since other community members do not follow the rule/regulation.

☐ Since resource management has not agreed in the groups or the management committee.

☐ Others [_____]

- 3.1.5 Before the damage of cyclone PAM and now, other community members were involved in the resource management activities? Please check Yes or No.

	Before the damage	Now
Yes		
No		

- 3.1.6 Do you think that the coastal resource management activities in the community should be continued?

- ☐ 1. Yes
☐ 2. No
☐ 3. I do not know about the resource management at all.

- 3.1.7 Do you think that it is possible to sustain the coastal resources (reef fish, shellfish, sea cucumber, etc.) in this community

until the life period of your children or grand children?

- ☐ 1. It is possible at same level
☐ 2. It is possible but smaller level
☐ 3. It is difficult to sustain

4.0 Economy and Production Aspect

4.1 Household economy

What is the three main economic activities in your family before the damage of cyclone PAM, and now?

Before the damage

For husband	Economic activity		Main activities / products
No.1			
No.2			
No.3			
For wife	Economic activity		Main activities / products
No.1			
No.2			
No.3			

Now

For husband	Economic activity		Main activities / products
No.1			
No.2			
No.3			
For wife	Economic activity		Main activities / products
No.1			
No.2			
No.3			

*Economic activity: Please select from the following items.

1. Agriculture, 2. Fisheries, 3. Livestock, 4. Forestry, 5. Tourism, 6. Office work
7. Grass cutting. In case of others, please specify it.

- 4.2 If there is a change in the question 4.1, what is the cause of the change?

4.3 What is the average monthly income of your family before the damage of cyclone PAM, and now?

For husband Unit: Vatu/month

	Before the damage	Now
Average income of the household:		
by income source		
1. Agriculture		
2. Fisheries		
3. Livestock		
4. Tourism		
5. Remittance		
6. Other		

For wife Unit: Vatu/month

	Before the damage	Now
Average income of the household:		
by income source		
1. Agriculture		
2. Fisheries		
3. Livestock		
4. Tourism		
5. Remittance		
6. Other		

4.4 If there is a change in the question 4.3, what is the cause of the change?

4.5 If there is a change in the question 4.4, is there any effect by the increase or decrease in the coastal resource?

- ☐ 1. Yes. My income is greatly decreased due to decrease of the coastal resource.
- ☐ 2. Yes. My income is slightly decreased due to decrease of the coastal resource.
- ☐ 3. Yes. My income is greatly increased due to increase of the coastal resource.
- ☐ 4. Yes. My income is slightly increased due to increase of the coastal resource.
- ☐ 5. No effect by the increase or decrease of the coastal resource.

4.6 What is the average living cost of your family before and during the damage of cyclone PAM, and now?

Unit: Vatu/month

	Before the damage	Now
Average living cost of the household:		
By cost items		
1. Food		
2. Education		
3. Electricity / Fuel		
4. Phone		
5. Transportation		
6. Medical / Health		
7. Other		

5 Social and Cultural Aspect

5.1 If there is a activities for development project in the community, how do you contribute?

- ☐ I'm busy and I do not join the activities.
- ☐ I just participate the meetings
- ☐ I contribute the money when there is fund raising activities.
- ☐ I'll provide my labor force.
- ☐ I'll provide some materials.
- ☐ Others[]

5.2 Do you think that in this community the people generally trust one another in matter of lending and borrowing?

	Before the damage	Now
1. Yes, do trust		
2. No, do not trust		

5.3 If a community project does not directly benefit your neighbor, but has benefits for others in this community, then do you think you or your neighbor would contribute time for this project?

	Before the damage	Now
1. Yes, will contribute time		
2. No, will not contribute time		

5.4 Do you think that community's opinion including yours is reflected in the activities of the group/committee on the coastal resource management before the damage of cyclone PAM and now?

	Before the damage	Now
1. Strongly agree		
2. Agree		
3. Disagree		
4. Strongly disagree		

5.5 In your community, is the traditional clan system still functioned when the coastal resource management is conducted before the damage of cyclone PAM and now.

	Before the damage	Now
1. Strongly agree		
2. Agree		
3. Disagree		
4. Strongly disagree		

5.6 In your community, is there any lack of social equality before the damage of cyclone PAM and now?

	Before the damage	Now
1. Strongly agree		
2. Agree		
3. Disagree		
4. Strongly disagree		

If yes, what is the cause?

5.7 In your community, is there disparity between the sexes before the damage of cyclone PAM and now?

	Before the damage	Now
1. Strongly agree		
2. Agree		
3. Disagree		
4. Strongly disagree		

If yes, what is the cause?

- 5.8 Is there any groups/committee for the coastal resource management (such as MPA committee)? If Yes, do you think that it is functioned well?
- ☐ I do not know existence of the groups/committee for the coastal resource management in the community.
- ☐ Yes, there is and it is functioned perfectly.
- ☐ Yes, there is and it is functioned sometime.
- ☐ Yes, there is but it is not functioned well.

6 System and Governance Aspect

6.1 Chief system

- 6.1.1 Comparing with other community, do you think that the chief system in your community is functioned comparing with other village communities before the damage of cyclone PAM and now?

	Before the damage	Now
1. Strongly agree		
2. Agree		
3. Disagree		
4. Strongly disagree		

- 6.1.2 When your chief orders something how many percentage of the order do your community member follow?

	Before the damage	Now
1. They follow every orders		
2. They follow most of the order		
3. They follow half of the order		
4. They follow a part of the order		
5. They do not follow at all		

- 6.1.3 When you visit other village/community, how many percentage of the order the chief in the village/community do you follow?

how many percentage of the order do you follow

	Before the damage	Now
1. I follow every orders		
2. I follow most of the order		
3. I follow half of the order		
4. I follow a part of the order		
5. I do not follow at all		

- 6.1.4 Do you think that you have some opportunities to reflect your opinion to the chief's decision on the development of your community etc. before the damage of cyclone PAM and now.

	Before the damage	Now
☐ 1. Strongly agree		
☐ 2. Agree		
☐ 3. Disagree		
☐ 4. Strongly disagree		

6.2 Area council

- 6.2.1 Do you think that the Area Council in your area is functioned sufficiently before the damage of cyclone PAM and now.

	Before the damage	Now
☐ 1. Strongly agree		
☐ 2. Agree		
☐ 3. Disagree		
☐ 4. Strongly disagree		

- 6.2.2 Do you think that you have some opportunities to reflect your opinion to the Area Council's decision on the development of your community etc. before the damage of cyclone PAM and now.

	Before the damage	Now
☐ 1. Strongly agree		
☐ 2. Agree		
☐ 3. Disagree		
☐ 4. Strongly disagree		

- 6.2.3 Do you think that the budget for the Area Council is used properly before the damage of cyclone PAM and now?

	Before the damage	Now
☐ 1. Strongly agree		
☐ 2. Agree		
☐ 3. Disagree		
☐ 4. Strongly disagree		

7 Motivation for supporting the coastal resource management

- 7.1 Which side is more important to motivate you when you support the coastal resource management activities?

Left one if more important

Right one is more important

	4	3	2	1	0	1	2	3	4	
Awareness for decrease of the coastal resource, existence of the coastal resource management plan etc.										You or community's positive or negative economic benefit
Awareness for decrease of the coastal resource, existence of the coastal resource management plan etc.										Social solidarity, good management or activities of group/committee for the coastal resource management
Awareness for decrease of the coastal resource, existence of the coastal resource management plan etc.										Order of chief or Area Council, rules/regulations/law in the community/provincial/national government
You or community's positive or negative economic benefit										Social solidarity, good management or activities of group/committee for the coastal resource management
You or community's positive or negative economic benefit										Order of chief or Area Council, rules/regulations/law in the community/provincial/national government
Social solidarity, good management or activities of group/committee for the coastal resource management										Order of chief or Area Council, rules/regulations/law in the community/provincial/national government

Questionnaire for Cyclone PAM damage

Q1. How is the situation of the coastal resource just after expanding the taboo area, just before the cyclone PAM and now?

	Just after expanding the MPA	Just before the attack of cyclone PAM	Now
Reef fish	1. Increase drastically 2. Increase 3. Increase a little 4. Same level 5. Decrease	1. Increase drastically 2. Increase 3. Increase a little 4. Same level 5. Decrease	1. Increase drastically 2. Increase 3. Increase a little 4. Same level 5. Decrease
Shellfish	1. Increase drastically 2. Increase 3. Increase a little 4. Same level 5. Decrease	1. Increase drastically 2. Increase 3. Increase a little 4. Same level 5. Decrease	1. Increase drastically 2. Increase 3. Increase a little 4. Same level 5. Decrease
Others	1. Increase drastically 2. Increase 3. Increase a little 4. Same level 5. Decrease	1. Increase drastically 2. Increase 3. Increase a little 4. Same level 5. Decrease	1. Increase drastically 2. Increase 3. Increase a little 4. Same level 5. Decrease

Q2. When the MPA was open during the damage of cyclone PAM, what kind of fish did you catch?

☐ Reef fish ☐ Shellfish ☐ Octopus ☐ Crab ☐ Others

Q3. Before emergency aid arrived, how many days had you catch fish/shellfish in the taboo area?

☐ 1~5 days ☐ 6~10 days ☐ 11~20 days ☐ 21~30 days

Q4. Before emergency aid arrived, caught fish/shellfish in the MPA was for self-consumption or for selling?

☐ I ate everything ☐ I ate mostly and sold a little ☐ I ate half and sold half

☐ I sold mostly and ate a little ☐ I sold everything

Q5. If you ate fish/shellfish, how many quantity did you eat during the period?

☐ I ate only fish/shellfish ☐ I mostly ate fish/shellfish in my meal
☐ I ate fish/shellfish half of my meal ☐ I ate fish/shellfish a little

Q6. If you sold fish/shellfish during opening period of taboo area, what did you buy?

☐ Food ☐ Commodity ☐ Cloth ☐ Material for broken house/equipment
☐ School fee for my children ☐ Others

Q7. Do you agree that expansion of taboo area in the JICA's previous project has contributed to increase the coastal resource and to secure the food during emergency period?

☐ Yes, I completely agree ☐ Yes, I agree ☐ Yes, but I agree a little
☐ No, I do not agree ☐ I do not know the JICA's previous project/activities

Q8. Did you have a sense of food security during the emergency period before the cyclone PAM since there was a taboo area in the community?

☐ Yes, I completely had ☐ Yes, I had ☐ Yes, but I had a little
☐ No, I did not have

Q9. Do you have a sense of food security during the emergency period since taboo area was expanded in the JICA's previous project?

☐ Yes, I completely have ☐ Yes, I have ☐ Yes, but I have a little
☐ No, I do not have ☐ I do not know the JICA's previous project/activities

Appendix 3: Resource management activities implemented in the survey sites

1. Resource management activities in Emae before disaster

Major resource management in major villages of Emae Island before the damage of cyclone Pam was as follows.

Table 1: Major resource management activities before cyclone Pam in major villages of Emae Island

Cook Reef	Cook Reef which is off the northwest coast of the island belongs to Emae Island. There are restrictions on the following seven fish species at this reef. - Clam - Trochus - Sea cucumber (It was allowed to harvest only one month after cyclone Pam damage and sold to Chinese traders) - Lobster (Male only, 22 cm or more is possible to catch) - Conch shell - Green snail - Sea turtle (Applicable to VFD before custom ceremony and it is possible up to 2 per village) Fishing boats may come from Makira, Tongoa, Efate, too.
Makatea	There was a 3 km × 500 m taboo area that started in 2007. The taboo area is opened only at the ceremony of the chief. Even in the open area, collection of trochus and green snail is prohibited.
Tongamea	There was a taboo area of 500 m × 200 m.
Sangava	There are four land owners, but two people on the ocean side have established a taboo area of 400 m × 200 m in the meantime. It was set under the agreement of four chiefs. It was established in 1990, and it was opened temporarily in 1993. It was closed again in 2005.
Vaidini	The taboo area was established at the coastline about 800 m in the 1980's. It was temporarily opened in 1991, but it was closed in 2001. It is possible to catch fish, lobster, mangrove crab, sea turtles within the taboo area.



Figure 1: Taboo area in Emae around 2015

As a resource management group of Emae, there are the Vanua-tai committee members from each village and Fenua-tai oversees the entire island. Vanua-tai was a volunteer for turtle resource monitors arranged for the activities of NGO, Wan Small bag in the 1990s, but the Vanua-tai Committee was officially established in Emae Island as a group of coastal resource management in year 2000. In addition, one of the VFD officer supported the establishment of Feua-tai in order to disseminate the activities of the Project for Promotion of Grace of the Sea in the Coastal Village phase II. The main objective is protection of coastal resources and taboo areas. Ten representatives from 10 Fenua-tai committees are members. However, due to the end of support on an assistant of survey by IRD (counterpart could visit Emae frequently since travel allowance was paid), VFD has been unable to visit Emae regularly, and activities are somewhat declining after the damage by Cyclone Pam. Currently, reef cleanings etc. in several villages are the main activities, and meetings etc. are not held. There is no budget for carrying out activities.

A resource management plan has been prepared but it has stopped at the draft stage. Consultations in each village has been completed and consent has been obtained from the Chief Council and Area Council, so they are waiting for finalization.

2. Resource management activities in Lelepa Island and Mangaliliu before disaster

The taboo area and rules in Lelepa Island and Mangaliliu before the damage of Cyclone Pam were as follows. The area enclosed by the orange line was an existing one, and the area surrounded by red was the taboo area which local population had agreed and expanded at Project for Promotion of Grace of the Sea in the Coastal Village Phase II.



Figure 2: Taboo area in Lelepa Island and Mangaliliu

Source: Community Based Coastal Resource Management (CB-CRM) Plan for West Efate-
Lelema Area

Table 2: Prohibited matters in Taboo area

Management Area and location	Banned Species	Banned Fishing Method
Vatunmanko S17°37' 828" E168°12' 643" – Loubouluk S17°39' 176" E168°11' 266"	Trochus, Green Snail, Prawn, Land Crab, Sea Crab, Fish (including Aquarium fish) , Turtle, shells, Small Green Snail, Giant Clam, Chiton(Tamuruku), Sea cucumber, Clam shells and Octopus	- Dive fishing during day and night.
Vatunmanko S17°37' 828" E168°12' 643" - Toalima S17°35' 159" E168°14' 565"	Trochus, Giant Clam, shells, Land Crab, Sea Crab, Prawn, Clam Shell, Octopus, Chiton (Tamuruku), Sea cucumber Clam shells and Aquarium fish	- Dive fishing during day and night.
Loubouluk S17°39' 176"	Trochus, Green Snail, Land Crab, Sea crab, shells, Turtle, Giant Clam,	- Free take zone

E168°11' 266" – Tuktuk Bay S17°42' E168°10'	aquarium fish, Sea cucumber (Mamu) and Clam shells	
Lapos-Nangsum Rumta S17°36' 119" E168°13' 459" – Viltoka – Naurvatlap S17°36' 775" E168°12' 759"	Fish, Giant Clam, Clam Shell, shells, Green snail, Trochus, Sea cucumber, Octopus and Aquarium fish	- Dive fishing during night.
Lelepa Taboo area Auba S17°36' 775" E168°12' 759" - Lakposa S17°36' 119" E168°13' 459"	Giant Clam, Fish, Turtle, shells, Clam Shell, Octopus, Trochus, Green snail and Sea cucumber.	- Ban on all fishing activities - Conservation
Hat Island	Trochus, Green Snail, Prawn, Land Crab, Sea Crab, Fish (including Aquarium fish), Turtle, shells, Small Green Snail, Clam Shell, Tamaruku, and Sea cucumber (Mamu).	- Ban on all fishing activities - Conservation

Source: Community Based Coastal Resource Management (CB-CRM) Plan for West Efate-
Lelema Area

3. Resource management activities in Waisisi before disaster

In Waisisi, a small scale taboo area was established and the size was 150 m × 100 m (to the edge of the reef). Fishing in the taboo area is not prohibited, but using of spear gun etc. is prohibited in the taboo area and only line fishing is allowed to operate. In addition, female catch shellfish by the diving fishery, but it has been decided that they can dive only from 1st April to 30th September and they cannot dive for seven months.

4. Resource management activities in Aniwa before disaster

Resource management activities that had been carried out in Aniwa Island before the damage of cyclone Pam were a taboo area (50 m × 40 m) started in 2013 in Ikoukau and a taboo area in the lagoon in the northern part of the island. It was a ban on fishing from July to February every year. In addition, there were taboo areas in Ikoukau and Imatu which had been opened.

Table 3: Prohibited matters in Taboo areas in Aneityum Island

ZONE	BOUNDARY	Location	TABOO AREA (LANDMARK)	MANAGEMENT MESURE (Gear or species)
ZONE 1	Aniplithei to Analvinec	S 020°14'15,97" E169°48'54.97"	Aniplithei (river mouth) to	Trochus and Green snail
		S 020°14'06,72" E169°47'36.62"	Anijethuros (Rocks)	
ZONE 2	Analvinec to Anijijiau	S 020°14'06,72" E169°47'36.62"	Anijanumu (Reggea beach) to	Small hooks and cast net, gill net (4') – Seagrass area
		S 020°14'04,05" E169°46'07.96"	Blue water SDA (Tall coconut)	
ZONE 3	Anijijiau (SDA tall coconut) to Anithwunamaukuri	S 020°14'04,05" E169°46'07.96"	Anijijao (2 pine trees) to Uje bay (black stone)	Green snail and trochus
		S 020°12'55,88" E169°45'28.55"		
ZONE 4	Anithwunamaukuri to Anthwunabunmop (Coconut)	S 020°12'55,88" E169°45'28.55"	Ivahak to Anwaj bay	No take for all species Lobster by night diving
		S 020°10'19,00" E169°44'31.04"	Anabras to Anthwunabunmop	
ZONE 5	Mystery Island	S 020°14'37,04" E169°45'49.07"	Mystery and stone	No take for all species
Special zone		S 020°12'58,98" E169°44'38.90"	3 mile reef	No take for all species

Source: Community Based Coastal Resource Management (CB-CRM) Plan for Aneityum

**MINUTES OF MEETING
OF
ESTABLISHMENT OF THE LIAISON CONFERENCE
FOR
DEEP-BOTTOM FISH FISHERY MANAGEMENT IN SHEFA PROVINCE**

The meeting of establishment of the Liaison Conference for Deep-Bottom Fish Fishery Management (hereinafter referred to as "DBFFM") in Shefa Province was held in 26th October 2023 in Finonge, Emae with participation of representatives of deep-bottom fishers from Marae, Sangava, Tongamea, Makira and Mataso, Area Administrators of Emae, Makira and Mataso, representative of Vanuatu Fisheries Department (hereinafter referred to as "VFD") and a JICA expert of "The Project for Promotion of Grace of the Sea in the Coastal Villages" for discussion and making agreement of establishment of the Liaison Conference for DBFFM. As result of discussion, participants of the meeting agreed on the matters referred to in the document attached hereto.

3rd November, 2023



MOSES Daniel
Representative of Marae



ROBERT KALO
Representative of Sangava



WILLIE JACOB
Representative of Tongamea



MARK TAUKI
Representative of Makira



KEVIN HENRY
Representative of Mataso



Ms. Liah Kaltoi
Acting Secretary General
Shefa Province



Mr. Sompert Rena Gereva
Acting Director
Vanuatu Fisheries Department

ATTACHED DOCUMENT

1. The Liaison Conference was established to share information and build consensus among its participants for efforts of DBFFM. This will prevent conflicts among stakeholders and use fishery resources rationally, aiming for sustainable use of deep-bottom fish resources.
2. The Liaison Conference is consisted of the Shefa provincial government and the communities conducting deep-bottom fish fisheries in Emae, Makira, and Mataso. The VFD will also be responsible for any necessary technical assistance.
3. The Chairperson of the Liaison Conference will be elected by consultation of the conference members.
4. The Liaison Conference will set the Fishery Management Area to be managed for deep-bottom fish resources.
5. The Liaison Conference will discuss the development of the DBFFM management plan.
6. The Liaison Conference will consider monitoring methods for DBFFM.
7. Shefa province government or the communities that consist of the conference may call a meeting of the Liaison Conference as needed.
8. The VFD will provide necessary advice or technical assistance to the conference at the request of the conference members.
9. Other necessary considerations will be discussed and decided at the conference.

End

Attachment: List of attendance of the meeting

Attachment: List of attendance of the meeting

Name	Community/Title
<i>Shefa Province Government</i>	
Christopher Matariki	Emae-Area Administrator
Jacques Berry	Makira/Mataso- Area Administrator
<i>Representatives from the communities</i>	
Pedro Betsesai	Marae/Data Collector
Moses Daniel	Marae/Fisherman
Kennethy R	Sangava
Annie Daniel	Sangava/Fenuatai
Willie Jacob	Tongamea/Fisherman & Data Collector
Kalo Marak	Tongamea/ Emae Farmer
Kaloris Willie Kaltonga	Tongamea/Fisherman
Peter Wilson	Tongamea/Fisherman
Cameron Daniel	Siwo/Fisherman
Ambua K	Vatini
Worsen Atavi	Vaitini/Fisherman
Andrew Obed	Makira/Fisherman
Mark Tauki	Makira/Data Collector
Willie Robbie	Makira/Fisherman
Kevin Henry	Mataso/Fisherman
Robsen Firiam	Mataso/Fisherman
<i>Vanuatu Fisheries Department</i>	
Dimitri Keilala	Shefa Fisheries Development Officer
<i>JICA expert</i>	
ECGIGO Manabu	JICA Expert for GOSIII Project

FISH QUALITY & SPOILAGE TRAINING



Vanuatu Fisheries Department

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Brief Background

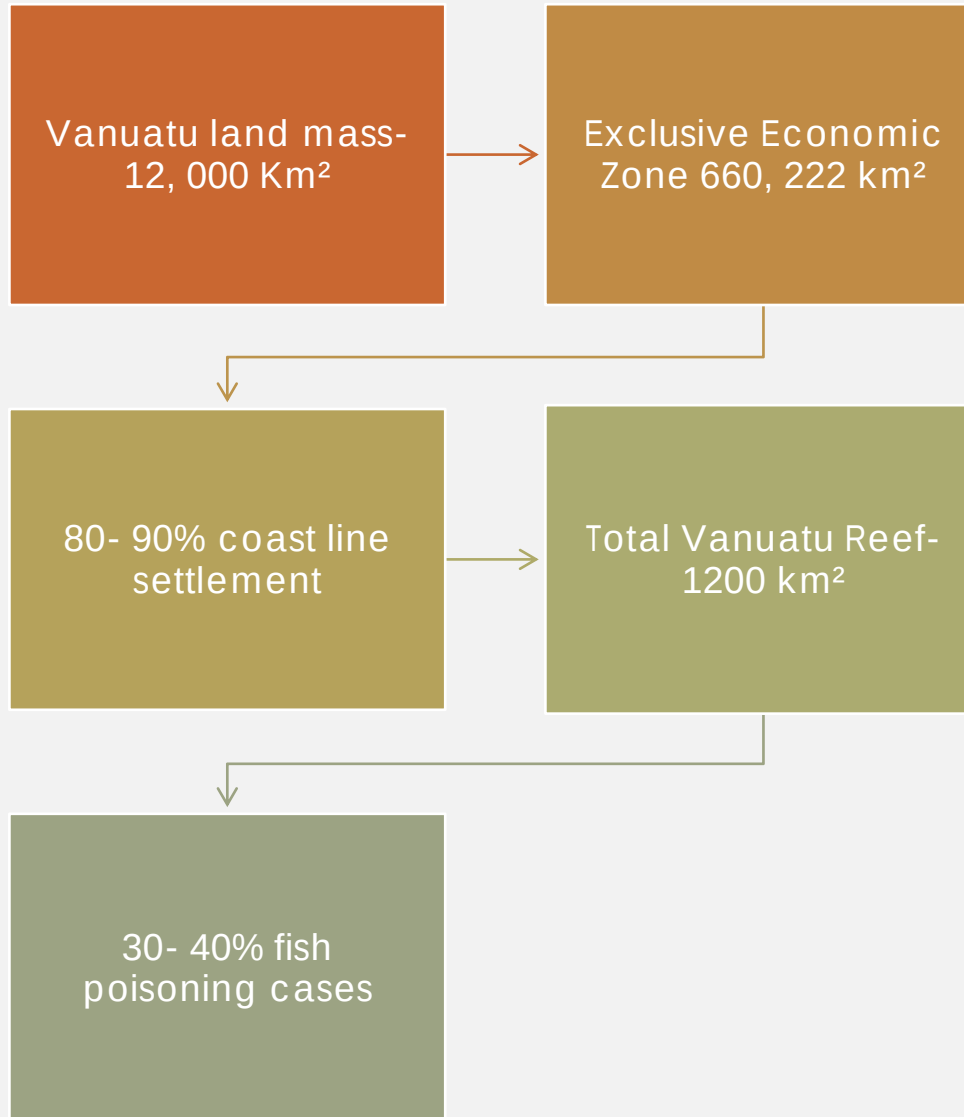
Training contents

Lecture

1. Personal hygiene
2. Hygienic requirements and safe practice for team before fishing
3. Hygiene and handling of long landing
4. Good quality frozen fish
5. Transport of fish
6. Fish market / vendor
7. Keeping your freezer / esky clean
8. A case of poisoning caused by seafood (Histamine poisoning and ciguatera poisoning)

Practice

I. BRIEF BACKGROUND



IMPORTANCE BLONG FISHERY RESOURCES

- Fishery resources hem ie wan lo ol primary resources blo kantri blo Vanuatu.



- Majority blo ol pipol blo Vanuatu oli earnem money mo kakai ol fis, shelfis mo ol nara marine, fres wota o farm species fishery species



Island
Efate
Pele
Lefepa
Ermae
Epi
Tongoa
Buniga
Makira



NATIONAL GOVERNMENT PRIORITY FOCUS



National
Fisheries Sector
Policy 2016-
2030 supports;

- SPO 3- Food & Nutrition Security allegation of NCD risk
- Improve access to sufficient & Safe seafood



The people's
plan;

- Society pillar
- Environmental Pillar
- Economy Pillar



MALFFB
Cooperate Plan;

- Improved production & Food Security

VANUATU SEAFOOD VERIFICATION AGENCY

Objective:

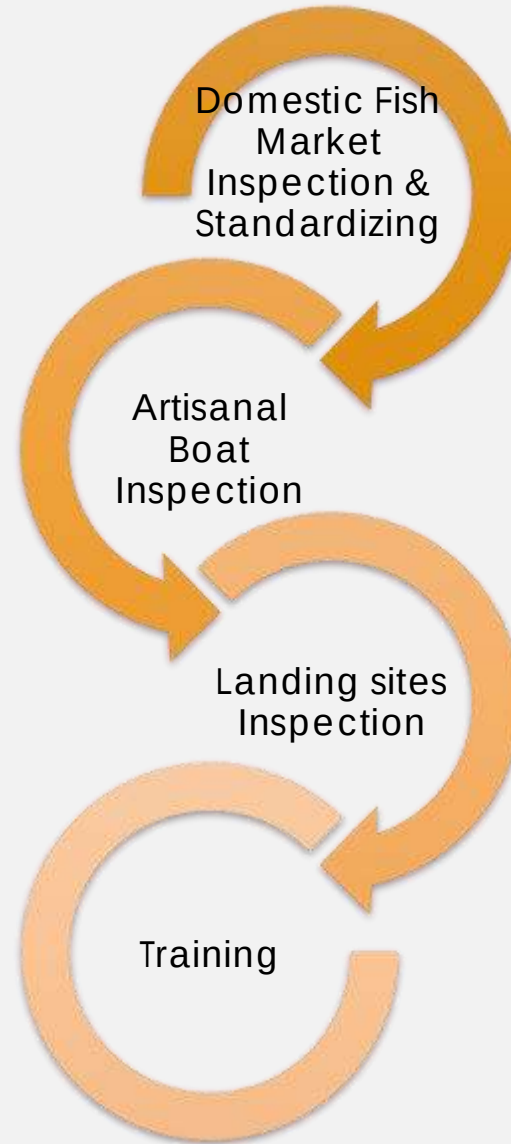
Fisheries Act No. 10 of 2014, Part 6

Verify and certify imports
and Export of seafood

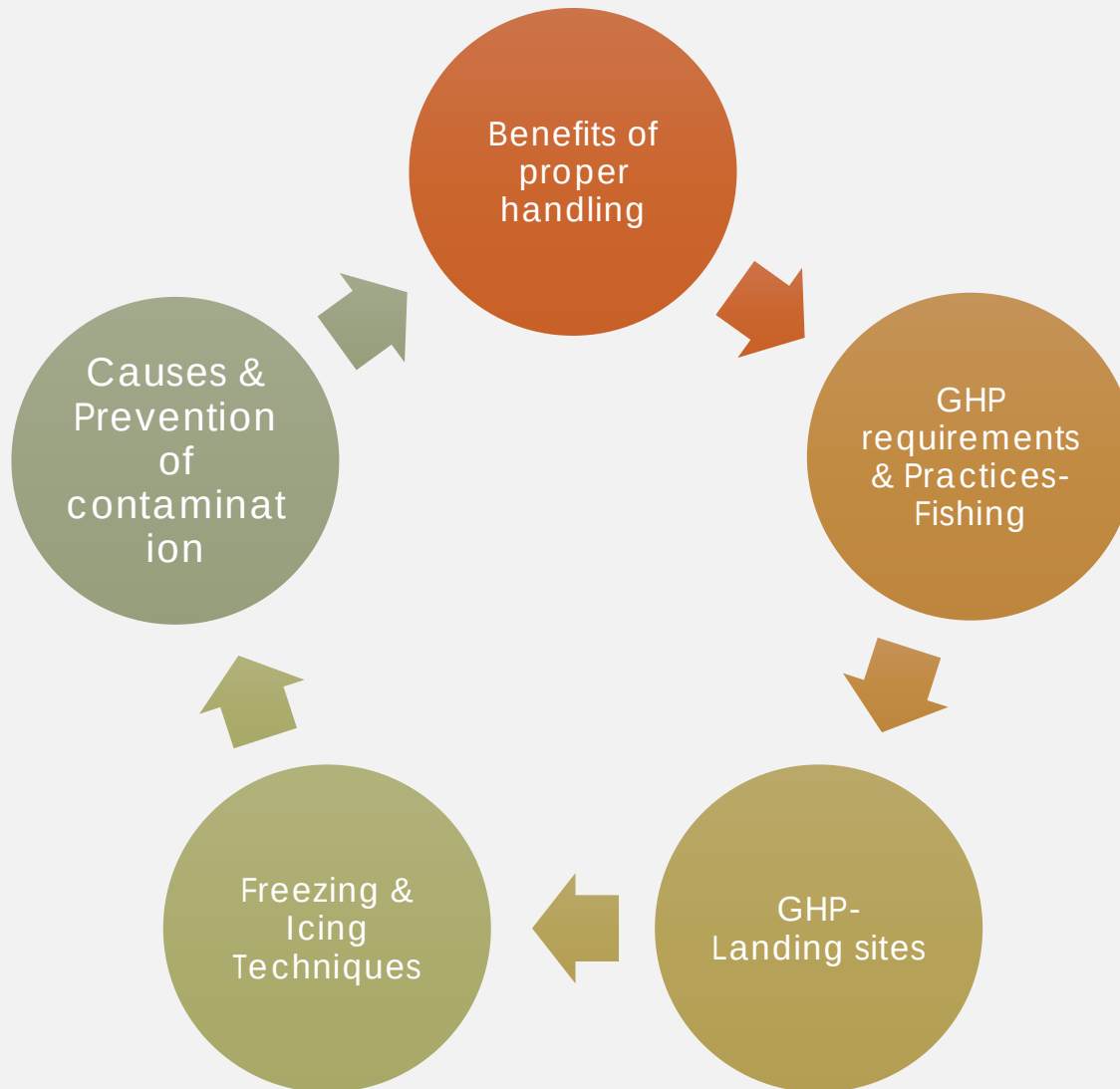
Appropriate quality
control measures and
seafood production

Facilitation of
exports from
Vanuatu of all
category of
seafood for
human
consumption

VANUATU SEAFOOD VERIFICATION AGENCY- COASTAL



TRAINING CONTENT



WORKSHOP GOALS

- **Workshop ia yu helpem yu blo;**
 1. Improvum olgeta ways blong yu save lukoutem gud fish start lo hook kasem plate.
 2. Kivim information about post-harvest loss wei e kasem affectem fisheries resources blong yumi.
 3. Save wanem nao ol Gud Hygiene Practices ia.
 4. Promotem mo appliem ol gud hygiene practices ia lo ol steps blo ol production chain.
 5. Mekem sua se seafood products ie mas ol safe mo oli stap lo gud quality blo wan man, woman or pikinini ie save kakai.



SHORT FILM

WANEM NAO QUALITI??

- Bodi kala blong fis (color)
- Taste blo fres flavor blo fis mo texture blo bodi blo fis e tastemgud taemyu kakai
- Safe taemyu kakai
- Fulap lo wetemgudfala nutritional value
- Pricing, value and sale service
- Consistency supply lo market



WANEM NAO GUDFALA SIDE FIS QUALITI??

Taem yumi lukoutem gud fis hemia hem ie sam benefits wei yumi save tekem aot lo hem:

- Tekem gud cash money lo sale
- Customer bai ie healthy mo happy
- Gudfala reputation
- Increasem shelf- life blo fis)
- Reducem fis borne sik



OL RAPIS SIDE BLONG NOGUD FIS??

- Yu salem fis blo yu lo wan lower price
- Bai fis ie no save stap longtaem, yu mas salem quick taem
- Bai fis ie nogud quick taem mo customer ie save sik Sipos ie kakai



HAO NAO YU SAVE SE FIS E NOGUD

- Taem fis ie ded, ie kat sam changes wei ie tekemples
 - Fis ie changem colour
 - Fis ie changem taste
 - Fis ie producem smel mo ie save ko sofsof hariap nomo
- Ol samting ia yumi save usumblo jajemqualiti blo fis mo ie save contribute o affectemprice. Sipos yumi no lukoutemgud fis blo yumi bai ie save kamnogud mo less valuable.
- Yumi spolemresource blo yumi(post- harvest loss)



I. PERSONAL HYGIENE

- Washem gud hand blong yu bifo mo afta yu holem fis
- Kipim yu klin everi taem yu deal wetem fis
- Kipim wok ples blong yu e klin oltaem



2. HYGIENIC REQUIREMENTS MO SAFE PRACTICE LO TAEM BLONG FISHING

- Poor handling ie save affectem fis wetem germs mo bacteria.
- Fisherman ie fail blo usumice / protectem fis lo sun.
- Poor handling taem yumi droppem fis lo deck blo boat o canoe

□ **Aim to handle fish with care so you don't:**

1. Damagem flesh, broken skins, smashed, soft, bruised)
2. Allow bacteria to contaminate
3. Three (3) potential hazards or risk: Biological, Chemical & Physical , bruised)
4. Allow bacteria to contaminate
5. Three (3) potential hazards or risk: Biological, Chemical & Physical



HYGIENIC REQUIREMENTS MO SAFE PRACTICE LO TAEM BLONG FISHING

SAM CONTRIBUTOR WEI IE SAVE SPOLEM QUALITI BLONG FIS;

- Lego fis ie stap long-taem lo sun mo warm temperature.
- Dirty boat.
- Dirty equipment's
- Long fishing trips
- Careless handling blo fis taem yu catchem lo high temperature blo dei.



OL RAPIS WEI BLO SAVE SPOLEM QUALITI BLO FIS LONG TAEM BLONG FISHING

- Ol santing wei ie save increasem mo spolem o causen damage wei ie save lead ie ko lo poor qualiti mo loa praes
- Ol way santing wei e save spolem fis blo yu;
 - *Enzymes*
 - *Partial freezing*
 - *Rapid Rigor Mortis*
 - *Bacteria*
 - *Rough Handling*
- Stanap lo fis
- Sakem fis o droppem fis
- Lego fis ie stap longtaem lo warmth temperature



3. HYGIENE MO HANDLING LONG LANDING

Samfala samting wei e save causem fish spoilage
long landing site;

- No Kipim fis e kolkol long taem blo landing, selling mo transfer e ko lo trak, narafala boat mo local solar fish outlet
- Delay blong tranferem fis long boat/ solar freezer outlet
- Rough handling olsem sakem fis out lo boat ko lo sand beach
- O droppem fis olboat lo sand beach/ grass



OL SAMTING TU WEI E SAVE MEKEM FIS E NO GUD/ NO SAFE BLO KAKAI YUMI SAVE FINEM TU LO LANDING SITE OLSEM;

- contamination blong fis wetem:
- Metal, glass mo wood
- Fuel, oil, cleaning chemical & exhaust smoke blo ol trak
- Surface contact wei fis e land lo hem e.g. floor
- Domestic animals mo pest
- Fish handlers
- Unclean water mo ice



SHORT FILMS



4. GUD QUALITI FROZEN FIS

Kipim Fish e kolkol;

- Yu mekemsua se fis e kolkol dtaem

(This is the best way to keep it fresh and to make sure it is good quality.)

Q weiswei yu save mekemblong Kipimfis e kolkol:

- ❖ putum ice long hem
- ❖ Putum long slurry (this is a mixture of ice and water)
- ❖ putum long solar freezer
- ❖ prosessem quick taem



IMPORTANCE BLONG ICE

- Ice e helpem fis blong e no nogud hariap
- Ice e slowem daon growth blong bacteria mo any activity blong enzymes.
- Ice e help blo Kipim fis e fres mo safe blong longtaem.



RAPIS FREEZING PRACTICE

- Rapis qualiti e ko insaed, Rapis qualiti e kam aot
- No over- loadem Eski mo solar freezer blong yu
- Fis ie stap lo warm air mo ie no stap lo ice.
- Fis e stap lo deck blo boat.
- Overloadem lo wan freeze mekem lid blo freezer ie no save close gud.
- Blo transportem fis ie ko lo airport mekem sua se putum fis insaed lo wan box.



TYPES OF ICE

Block Ice



Crush Ice



Flake Ice



5. TRANSPORT BLONG FIS

- Kipim fis lo Eski o containers
- Klinim gud trak o boat bifo yu usum blo transportem fis lo hem
- Eski o container wei yu usum e mas be strong, smooth mo easy blo klin
- mixim any domestic animal wetem fis



SHORT FILMS



HOW TO CONTROL THE QUALITY WITHOUT ICE

Block direct sunlight

Cover the fish with a cloth dampened with seawater



Remove gills and internal organs from fish



Put the fish in the case
(Prevent the fish from coming into contact
with the boat's engine oil)



Return to port after a certain amount of time

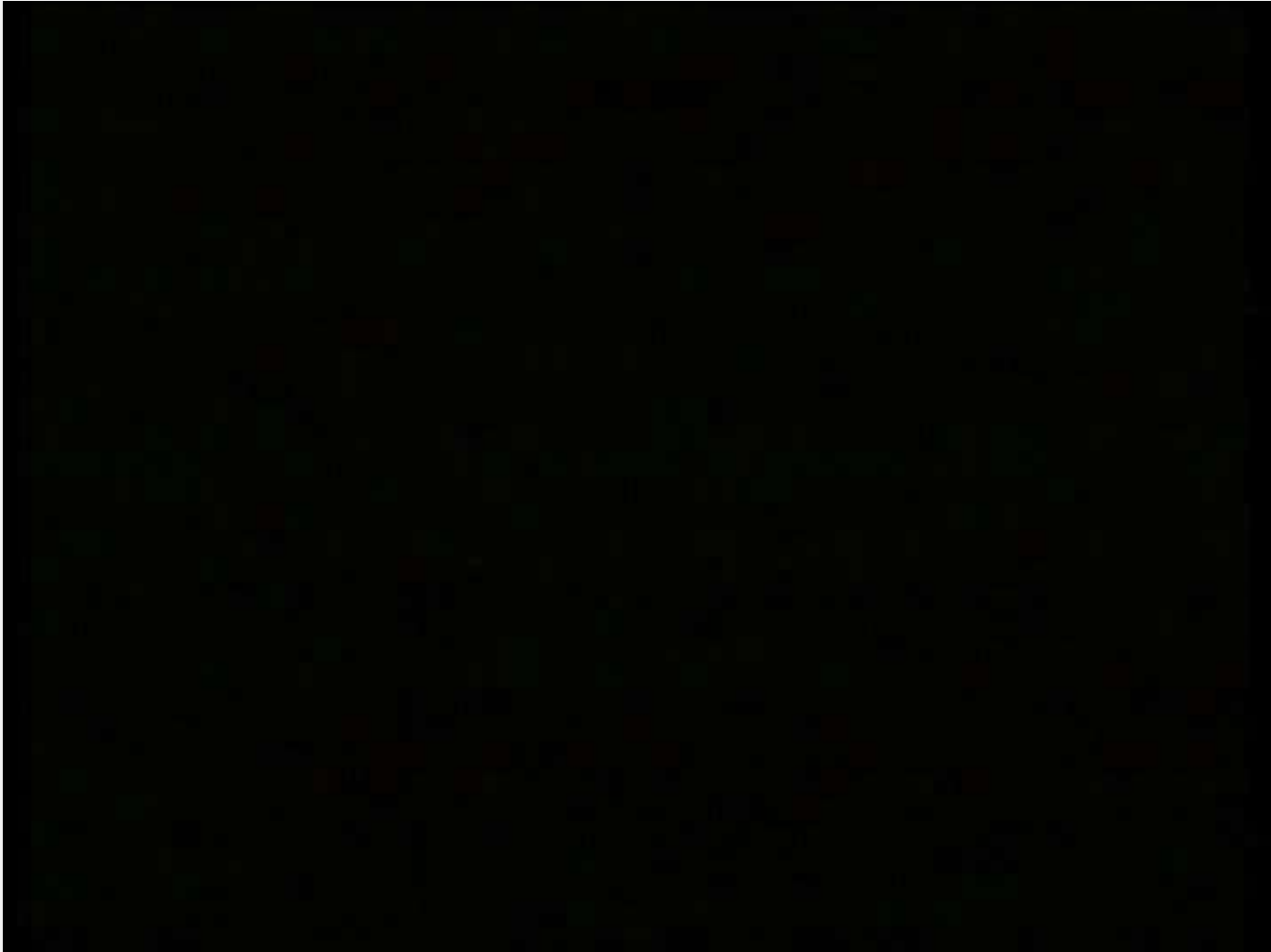


6. FISH MARKET/ VENDOR

- Kipim ol scale mo ol narafala equipment e always klin
- Yu mas be klin taem yu handelem fis
- Yu no smoke, cough, spet, sneezed ko lo fis, kakai o chewing taem yu stap salem fis
- Kipim ice wota aot lo Eski lo taem blong sell
- Taem yu feelim se yu sik yu no ko lo market
- Salem fis lo wan area wei ie protected lo sun heat mo ol nara weather condition.
- Washem gud ol equipments wei yu usum afta lo end blo day.



SHORT FILMS



FIS MARKET/ VENDOR

- Mekem ples blo salem fis blo yu ie kam wan gudfala environment wei ie attractem ol customers.
- ie gud blo display lo ol information lo customers. (poster blo fis mo sam nara information bakeken)
- Ol taem keepim fis lo wan cool, dust free, animal mo pest free environment.
- Ol taem keepim ol fis holder box antap lo ground.
- Handlem fis lo wan gud way NO sakem fis o putum lo ground.



SHORT FILMS



BAD FISH SALE PRACTICE



GOOD FISH SALE PRACTICES



• **Gizo, Solomon Islands**



• **Divisoria, Philippines**

GOOD FISH SALE PRACTICES IN PORT VILA



Plastic bottle ice



Fish without gut

CHECK YOUR STEPS: FOUR SIMPLE STEPS TO FOOD SAFETY



FOOD BUSINESS

- *Bad reputation.*
- *Loss of revenue.*
- *Business closure.*
- *Legal action and penalties.*

CONSUMER/ECONOMY

- *Productivity loss.*
- *Work absenteeism.*
- *Medical expenses.*
- *Hardship and suffering.*
- *Permanent disability.*
- *Death.*

**FOOD SAFETY
INVOLVES
EVERYBODY IN
THE FOOD
CHAIN.**



Mike Johanns
United States Senator

QUOTEHD.COM

Born 1950



Brianna Kriefall
3 year old
South Milwaukee in July
2000



Brianna died a week later after battling E. coli-related hemolytic uremic syndrome. Brianna, along with most of the other 140 people who were sickened in the outbreak, consumed watermelon that had been cross-contaminated with raw meat.

7.KEEPING YOUR FREEZER/ESKY CLEAN

- If the inside of the solar freezer is dirty, bacteria can grow and accelerate fish spoilage. Therefore, regular cleaning of the solar freezer is necessary.



Klinim sola friza oltaim(1 taem / 3 manis)

1.Swijim off sola friza



2.Openem lid taim yu sta klinim 3.Tekem aot fish mo ol nara samting lo friza



4.Tekem aot ice insaed lo sola friza



5.Tekem aot wota tru lo drain



*Afta we evri wota I kamaot, klosem drain

Wipem wetem Kaliko

6.Setem ap minimum level



*Afta sam hour is pas, Setem up stret level lo friza

Sapos sola friza I toti,
Usom sop blo wasem plate blo klinim friza, NO
USUM BLEACH!



8.A CASE OF POISONING CAUSED BY SEAFOOD - HISTAMINE POISONING -

- **Histamine**

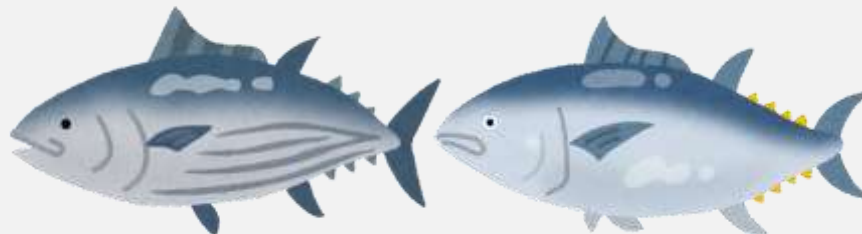
A chemical substance produced by the decomposition of histidine, an amino acid contained in fish meat, etc., by a certain type of bacteria.

Several species of bacteria that convert histidine to histamine adhere to the body surface and gills of fish. These bacteria do not reproduce while the fish is alive, but after the fish has died, these bacteria reproduce and decompose histidine in the fish meat to produce histamine.

- **Fish that tend to produce a lot of histamine**

Red-fleshed fish such as tuna and bonito originally contain a large amount of histidine in their muscles, so a large amount of histamine is also produced.

→ Be careful with "**Skipjack Tuna**" and "**Yellowfin Tuna**", which are often caught in Vanuatu!



8.A CASE OF POISONING CAUSED BY SEAFOOD - HISTAMINE POISONING -

- **histamine food poisoning**

Occurs after eating foods that contain high levels of histamine

- **Symptoms**

Symptoms such as flushing, headache, hives, and fever usually occur 30 to 60 minutes after eating

- **Histamine food poisoning case**

Australia: ~10 outbreaks per year from 2001 to 2013



8.A CASE OF POISONING CAUSED BY SEAFOOD - HISTAMINE POISONING -

- **Three points to prevent histamine poisoning**

- ① Low temperature control (ice, storage in ice water). *10°C or less
- ② Don't thaw at room temperature.
- ③ Don't leave fish at room temperature or refrigerated for a long time until cooking.

It can be considered that not increasing histamine is almost the same as maintaining freshness of all fisheries product.

→ The above three points apply to all fisheries products!



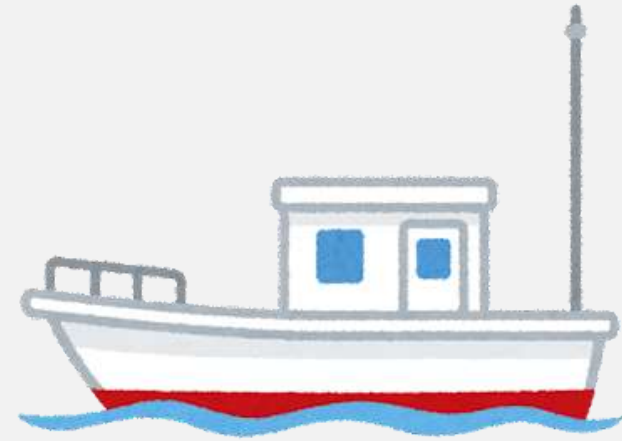
8.A CASE OF POISONING CAUSED BY SEAFOOD - HISTAMINE POISONING -

- **To prevent histamine poisoning**

Fishing boat: Always put ice in the fishing hold to cool the fish after catching.

✓ Land the caught fish as soon as possible

✓ Immediately apply ice to the landed fish, or put it in ice water and store it at a low temperature.



8.A CASE OF POISONING CAUSED BY SEAFOOD - HISTAMINE POISONING -

- **To prevent histamine poisoning**

Fish market: Always put ice in the fish box when displaying.

- ✓ Apply ice as soon as possible after landing, or store in ice water
- ✓ Keep fish cool by monitoring ice consumption and replenishing ice as needed



8.A CASE OF POISONING CAUSED BY SEAFOOD - CIGUATERA POISONING -

WANEM HEMI CIGUATERA?

Ciguatera hemi wan kaen posen we man o woman i save sik long hem taem hemi kakae rif fis we i karem posen ia insaed long hem. Ciguatera fis posen hemi stap long ol tropikel rigen we Vanuatu tu i pat blong hem.

CIGUATERA I KAM WEA?

Ciguatera hemi wan posen we i stap long ol smol smol animol we yu no save luk long neked ae blo yu mo animol ia i liv insaed long ol nalumlum. Oli mekem flao taem we korel rif i damej long taem blong wan najurel disasta (olsem saeklon, posen stafis aotbrek mo plante moa...), mo tu, ol aktiviti blong man long graon i save mekem fulap toti we i save kasem solwota long taem blong hevi ren mo tru long ol najurel riva mo strim. Ol toti ia taem we i kasem solwota i save mekem nalumlum i gru moa hariap mo namba blong smol animol ia i save kam antap plante.

8.A CASE OF POISONING CAUSED BY SEAFOOD - CIGUATERA POISONING -

HAO NAO FISH I KAREM POSEN IA?

Everi rif fis yumi save grupum olgeta long tu grup:

1. Ol rif fis we oli kakae nalumlum o kras blong solwota nomo
2. Ol rif fis we oli kakae nara rif fis bageken o mit nomo

I gat sam rif fis long grup **namba 1** yumi save kasem posen ia long olgeta taem oli kakae small nalumlum ia. Posen isave pas isi nomo taem we grup blong rif fis **namba 2** i kakae grup blong rif fis **namba 1**.

Man o woman i save kasem Ciguatera sipos hemi kakae eni fis long tufala grup ya. Be yu save sik bigwan moa taem yu kakae fis long grup **namba 2** we i karem posen.

Risen hemi from taem wan fis long grup **namba 1** i kakae nalumlum we smol animol istap karem posen blong Ciguatera istap long hem, bodi blong hem ikam posen. Naia taem wan fis long grup **namba 2** i kakae fulap long ol fis long grup **namba 1**, posen ia kam moa bigwan long hem. Hemia hemi from bodi blong fis ino save aotem posen ia long wan isi wei.

KOMON RIF FIS WE I KAREM POSEN

Andanit igat ol lis blong ol rif fis we i save posenem man wetem Ciguatera sipos oli kakae.

FIS GRUP NAMBA 1



Blak fis

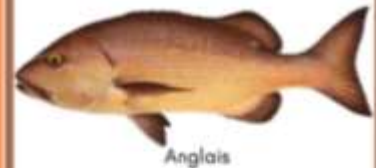
FIS GRUP NAMBA 2



Swirlip



Karong



Anglais



Los



Sawfis

8.A CASE OF POISONING CAUSED BY SEAFOOD - CIGUATERA POISONING -

FIS WE I KAREM POSEN?

Fis we i karem posen ya long bodi blong hem, man o woman i no save luk save long ae blong hem. Smel mo tes blong em i semak nomo long ol narafala fis. Liva mo hed blo fis nao i karem plante posen komperem wetem mit blong fis. Man o woman i save kukum rif fis, putum long aisbokis, be hemia tu bae i no save givhan blo karemaot posen long bodi blong fis.

OL SAEN BLONG CIGUATERA POSEN

Afta long 2 kasem 12 hao, man o woman we kakae posen rif fis, hemi save harem ifek blong hem.

Ol common saen:

- Bel i soa, yu save traot, sitsit wota
- Ol masel mo joen blong bodi i soa
- Hed i soa, yu taet mo swet
- Yu harem se yu kolkol
- Taem yu tajem wota, yu harem olsem sam samthing istap stikim han blong yu

8.A CASE OF POISONING CAUSED BY SEAFOOD - CIGUATERA POISONING -

TRITMEN

Ciguatera hemi gat limited tritmen long hospital blong yumi. Sipos yu ting se yu kasem Ciguatera posening, plis kontaktem wan Dokta o ko long hospital kwik taem. Igat ol tredisenol remidi tu we I provum plante taem se I save kurim man o woman we I kakae posen rif fis be igud yu ko long hospital blong oli jekem gud yu fastaem.

Practical Time!!

Practical- Proper
Fish cleaning and
Gutting

Fresh Chilled/
Frozen for Market



**TANKIO TUMAS LONG LISTENING
BLO YU!!**



Grace of the Seas in the Coastal Villages in Vanuatu Phase 3

Fisheries Department

Japan International Cooperation Agency / IC Net Limited

Nutrition improvement
by using fisheries product

Cooking trial for fish bone powder

Table

Vanuatu Fisheries Department activity(GOS project)

1.Nutritional status

2.Role of calcium

3.Effects of calcium deficiency

4.Fish bone

5.Method of taking fish bone(Commercial level, Household level, Aquaculture farmer level)

6.Nutrients of tuna bone powder

7.Nutrients of Reef fish bone

8.Nutrients of Tilapia

Ministry of Trade activity

Ministry of Health activity

Discussion

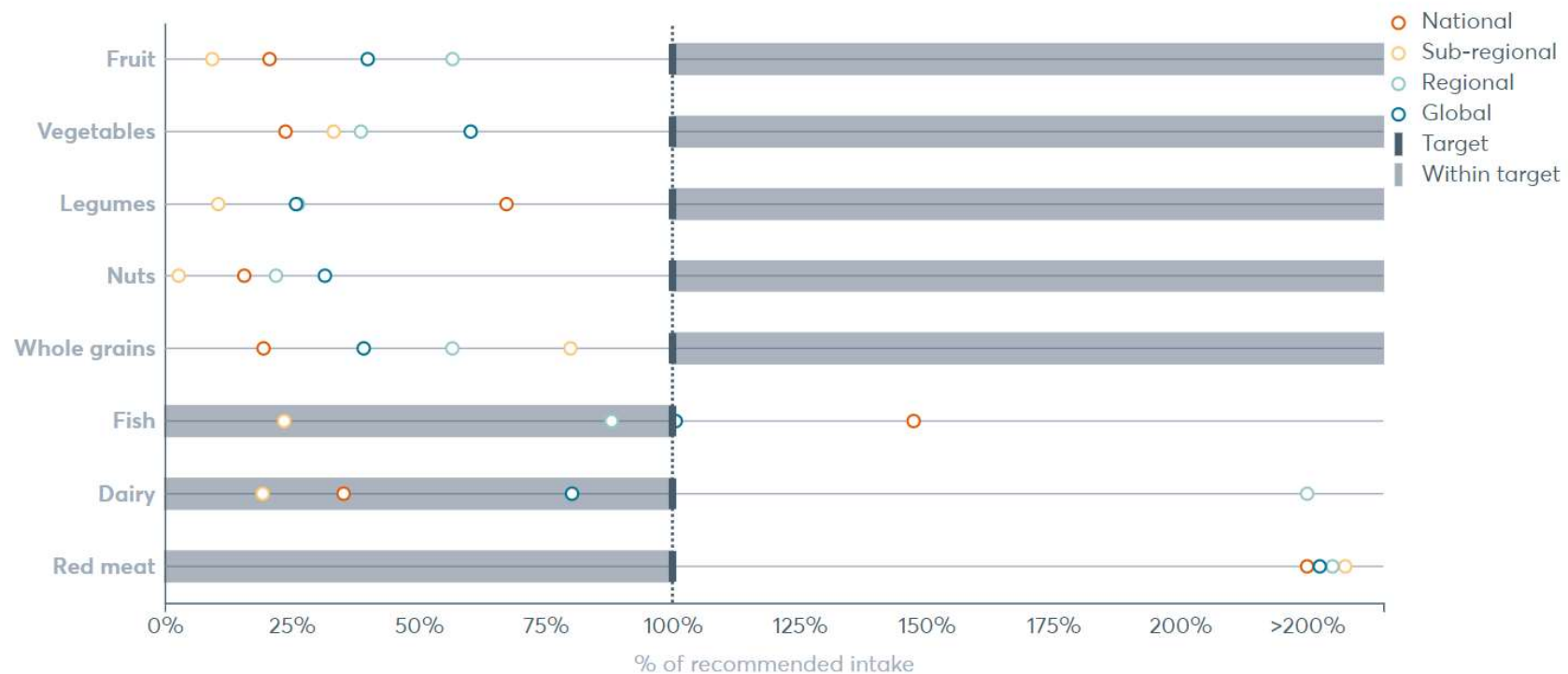
1. Nutritional status

Vanuatu consumes less than recommended amounts of dairy products, vegetables, seaweed, small fish and legumes. These foods are rich in calcium.

Vanuatu people are thought to be deficient in calcium intake.

Dietary intakes

Dietary intakes of key foods and nutrients in adults aged 20 years and over compared against minimum and maximum targets



2.Role of calcium

- Strengthen bones and teeth
- Helps blood clot to prevent bleeding
- Moves muscles/suppresses excitability
- Increase the contractile action of the myocardium
- Stabilize the nerves

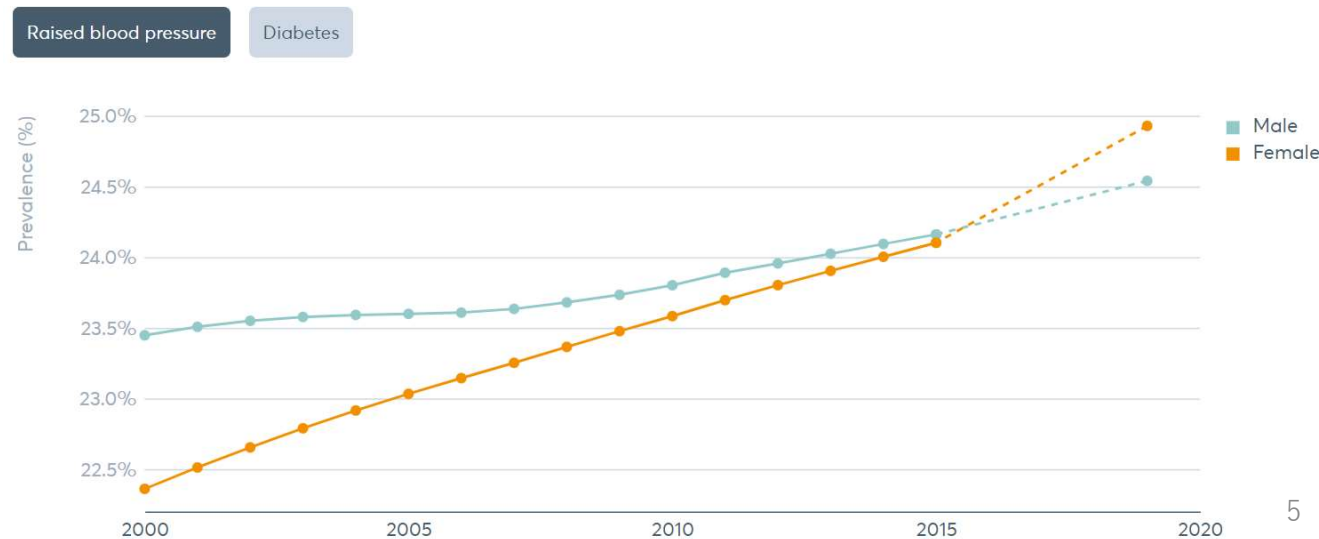


Essential for a healthy life!

3. Effects of calcium deficiency

- Affect growth
- Weakened bones and teeth
- Body goes numb
- Rough skin
- Osteoporosis
- High blood pressure
- Arteriosclerosis

About 25% of Adult in Vanuatu have high blood pressure!



4. Fish bone

- Fish bones, which are usually discarded, contain a lot of nutrients such as calcium, phosphorus, magnesium, vitamin D, iron, folic acid, and amino acids.

 Using fish bones leads to effective use of fisheries resources and improved nutrition for the nation!

5. Method of taking fish bone

(Commercial level, School meal) There is a possibility that we can use tuna bone from school meal preparation. We put the bone in oven to dry, then put the dried bone in blender to grind. In particular, by using it in school meal, children will understand the importance of calcium and contribute to regular intake of calcium.



5. Method of taking fish bone

(Household level) There is a possibility that we can use reef fish bone from each household. We just put the bone in oil to fry.



5. Method of taking fish bone

(Aquaculture farmer level) Slow-growing fingerlings are sometimes thinned out in order to retain good-growing fingerlings. There is a possibility that we can use thinned fingerlings from farmers. We just put the small fish in oil to fry.



6. Nutrients of tuna bone powder

Yellowfin tuna, Japan, fried, 15 minutes at 170° C

	Content(/100g)	WHO recommended intake (/Day) *Average	Intake in Vanuatu (/Day)
calcium	4730mg	Male 1133mg Female 1166mg	N/A
phosphorus	2660mg	Male and Female 883mg	N/A
magnesium	119mg	Male 385mg Female 311mg	N/A
Vitamin D	6.7 μ g	Male and Female 15 μ g	N/A
iron	2.3mg	Male 8.5mg Female 12.5mg	N/A
folic acid	12 μ g	Male and Female 383 μ g	N/A

6. Nutrients in tuna bone powder

Yellowfin tuna, Japan, fried, 15 minutes at 170° C

Essential amino acid	Content(/100g)	WHO recommended intake (/Day/50kg of body weight)	Intake in Vanuatu (/Day)
Tryptophan	400mg	200mg	N/A
leucine	3100mg	1950mg	N/A
lysine	3500mg	1500mg	N/A
valine	2200mg	1300mg	N/A
threonine	2100mg	750mg	N/A
phenylalanine	1700mg	1250mg	N/A
methionine	1200mg	750mg	N/A
isoleucine	1800mg	1000mg	N/A

*Essential amino acids: Amino acids that cannot be synthesized in sufficient amounts in the body of animals and must be ingested as nutrients.

Colum : Relationship between Calcium and Vitamin D

Vitamin D is synthesized in the skin when exposed to ultraviolet rays.

Vitamin D is a nutrient that promotes calcium absorption in the small intestine and is involved in normal bone development.

Therefore, sunbathing and moderate exposure to UV rays helps maintain bone health.

Calcium absorptance :
About 33%



7.Nutrients of Reef fish bone

Yellowfin tuna, [Vanuatu](#), [fried](#), 15 minutes at 170° C

	Content(/100g)	WHO recommended intake (/Day) *Average	Intake in Vanuatu (/Day)
calcium	5.96mg	Male 1133mg Female 1166mg	N/A
phosphorus	770mg	Male and Female 883mg	N/A
magnesium	138.02mg	Male 385mg Female 311mg	N/A
iron	2mg	Male 8.5mg Female 12.5mg	N/A

7.Nutrients of Reef fish bone

Yellowfin tuna, [Vanuatu](#), [Dried](#),

30 minutes at 200°C, 30 minutes at 250°C, 1 hour at 270°C

	Content(/100g)	WHO recommended intake (/Day) *Average	Intake in Vanuatu (/Day)
calcium	70mg	Male 1133mg Female 1166mg	N/A
phosphorus	76mg	Male and Female 883mg	N/A
magnesium	5.4mg	Male 385mg Female 311mg	N/A
iron	13.27mg	Male 8.5mg Female 12.5mg	N/A

7. Nutrients of Reef fish bone

Bluefis, Vanuatu, fried, 15 minutes at 170° C

	Content(/100g)	WHO recommended intake (/Day) *Average	Intake in Vanuatu (/Day)
calcium	1.78mg	Male 1133mg Female 1166mg	N/A
phosphorus	870mg	Male and Female 883mg	N/A
magnesium	151.62mg	Male 385mg Female 311mg	N/A
iron	1.85mg	Male 8.5mg Female 12.5mg	N/A

7.Nutrients of Tilapia

Tilapia, Vanuatu, fried, 10 minutes at 170° C

	Content(/100g)	WHO recommended intake (/Day) *Average	Intake in Vanuatu (/Day)
calcium	68mg	Male 1133mg Female 1166mg	N/A
phosphorus	60mg	Male and Female 883mg	N/A
magnesium	4.45mg	Male 385mg Female 311mg	N/A
iron	25.4mg	Male 8.5mg Female 12.5mg	N/A

Ministry of Trade activity : Farm to Table

Objectif : Before last year 2021, a new program called the “Farm-to-table” was established through the Vanuatu government/Ministry of Agriculture in partnership with other NGO. The program aims to promote local food in school kitchens and reduce the use of imported food.

Venue : Malapoa College plus Lycee School (The aim of this program is to use this process in all schools in Vanuatu. Currently 3 schools have already started this)

Contents of meal : From Monday to Sunday、 Lunch and dinner、 Local food (taro,kumala,Manioc + beef/fish/chicken、 No rice)

Ministry of health activity

Vanuatu Food Safety, Security & Nutrition Policy 2022-2030

Discussion

Good points to introduce fish bone powder

-
-

Challenges to introduce fish bone powder

-
-

Expectation for following organizations for introduce fish bone powder

- To Vanuatu Fisheries Department
- To Ministry of Trade
- To Ministry of Health



Issue 39 – April 2018

TRADITIONAL

Marine Resource Management and Knowledge
information bulletin



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Editor's note

This edition contains two articles that are both centred on Melanesian topics. The first, 'Catching names: Folk taxonomy of marine fauna on Takuu Atoll, Papua New Guinea', by Anke Moesinger, describes and analyses how the islanders of Takuu Atoll perceive and make use of their marine environment. This article also presents an analysis of the Takuu residents' descriptions and classifications of 200 local marine vertebrates and invertebrates.

The second article 'A field survey of the green snail (*Turbo marmoratus*) in Vanuatu: Habitat density, effects of transplantation, and villagers' motives for participation in transplantation and conservation activities', is authored by H. Terashima and colleagues. This article describes a field survey that was conducted by the authors in Vanuatu in 2017 for estimating the density of green snail on transplantation sites and surrounding areas. It then describes the procedures and gives results of a questionnaire survey that was conducted in order to understand the motives of villagers who participated in the green snail transplantation and conservation activities in selected villages in north-western Efate Island and eastern Malakula Island. An awareness survey was also conducted in villages with no experience of these transplantation and conservation activities. Information was collected from target villagers using a questionnaire based on 'Scheffe's pairwise comparisons test' to understand the most important motive for managing and conserving the green snail.

Kenneth Ruddle

Note:

In line with a worldwide trend to limit the impact of producing printed publications on the environment, SPC has decided to stop the production and distribution of printed copies of this and other information bulletins. The *SPC Traditional Marine Resource Management and Knowledge Information Bulletin* is only available in digital format since issue #36. All issues remain accessible from SPC's website at:

<http://coastfish.spc.int/en/publications/bulletins/traditional-management>

Catching names: Folk taxonomy of marine fauna on Takuu Atoll, Papua New Guinea

Anke Moesinger¹

Abstract

Folk taxonomies are a critical component for understanding resource use patterns and cultural, social and economic preferences on geographically remote Pacific atolls. To understand how people perceive and make use of their environment, 200 local names for marine vertebrates and invertebrates were collected and the hierarchical classification system was documented on Takuu Atoll in Papua New Guinea. The local nomenclature of the marine fauna of Takuu is based largely on shared fundamental morphological characteristics. Furthermore, all fish (*Te ika*) in the ocean are placed into one of five distinct groups in the hierarchical classification system. These include three functional groups that are categorised by ecological niche, whereas another group encompasses all fish that possess a certain behavioural trait. The fifth group is unique in that it is solely made up of fish that were previously targeted during local *Sii* fishing expeditions. This article presents an analysis of Takuu residents' descriptions and classifications of local fish and marine invertebrates.

Keywords

Folk taxonomy, Takuu Atoll, local knowledge, Polynesian outlier, folk hierarchical classification

Introduction

Takuu Atoll islanders are dependent on and inextricably linked to the marine environment that surrounds them, and fishing permeates almost every aspect of their lives. To gain an understanding of how the people of Takuu observe and make use of their environment, I collected local names for marine vertebrates and invertebrates. As has been shown throughout much of the Pacific region and beyond, folk taxa not only must be established as a baseline for further studies of local knowledge but can significantly aid in participatory monitoring and other conservation measures (Foale 1998; May 2005). This paper provides an examination of local nomenclature and the hierarchical classification system currently in use on Takuu Atoll.

Study area

At 157°E and 4.5°S, Takuu Atoll, also known as Mortlock, lies 273 km northeast of Buka, Bougainville, Papua New Guinea (PNG). Although politically part of PNG, Takuu Atoll is geographically and ecologically part of the Solomon Islands archipelago. The

atoll is one of only three Polynesian outliers found in PNG. The others include Nukuria, also known as Fead Island, which is located 160 km to the northwest of the atoll, and Nukumanu, or Tasman, which is situated 315 km to the east. The islanders reside on the small village island of Nukutoa, although the largest island of the atoll ring is Takuu, from which the atoll derives its name. Takuu is uninhabited and serves as a garden plot for the atoll's population. The total land area covers around 90 ha.

The population has decreased markedly over the last few decades. Although the atoll recovered after an unknown ailment that reduced the number of people to 64 in the 1880s, the population steadily increased over the next century, reaching 508 by the time of the 1980 census (Churchill 1909; National Statistical Office of Papua New Guinea 2003). The current population is 316. A variety of factors such as employment opportunities and secondary education on the mainland, lack of adequate shipping services and health concerns are motivating people to relocate from the atoll. All the elders who were interviewed for this paper claimed that this has had a tremendous negative impact on local knowledge

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Figure 1. Takuu Atoll, Autonomous Region of Bougainville, Papua New Guinea.

systems that are critical for survival on the atoll. Despite being prominently featured in the film *There once was an Island*, from which the atoll gained international attention as being on the front lines of climate change, Takuu islanders are not at present relocating due to any negative effects of environmental change.

The Takuu language is Polynesian and belongs to the Ellicean group (Moyle 2011). It comprises 11 consonants, namely f, h, k, l, m, n, p, r, s, t, and v, as well as the vowels a, e, i, o, and u. In addition to the atoll's residents, there are an estimated 1750 Takuu speakers worldwide and the language is not considered endangered.

A combination of methods was used to ascertain local names of the marine fauna. Examining fresh specimens caught and brought back by fishers after their daily trips provided many of the names that are included in Appendix 1. When I was uncertain about the correct scientific name, I took photographs and documented meristic features, such as the number of scale rows and dorsal rays. Interviews with village elders and fishers also yielded many of the local names. Reef fish and reef creature identification guides were used for informal interviews and discussions, and the names that were provided by the locals were cross-checked with a minimum of eight peo-

ple to ensure accuracy (Allen et al. 2012; Humann and Deloach 2010). There was much debate about the names of certain fish – especially those that are rarely caught or observed, thereby the names of marine fish and invertebrates are only included in Appendix 1 if a consensus was reached. After most the names were documented, I conducted focus groups to discuss the hierarchy and relationships of the marine fauna. Two focus group discussions were held with eight participants and a further two were conducted with seven different participants. Due to the shallow nature of *mee ttai* (literally (lit.) sea thing) taxonomy, we focused largely on the groupings of fish. We were thus able to create the hierarchical graph, which is depicted in Figure 2.

Results

Takuu nomenclature

Humans think in highly structured ways, and the habit of organising and classifying surroundings is claimed to be universal (Brown 1991; Atran 1998). In order to interact with and make extensive use of their environment, Takuu islanders have an established lexicon to distinguish disparate types of marine fauna. As in most cultures, the system for nomenclature on Takuu is based on shared, fundamental characteristics (Foale 1998; Ono and Addison 2009). The classification of organisms that are found

is based on salient morphological attributes such as colour and shape and also on behavioural patterns and habitat. Appendix 1 provides 200 distinct Takuu marine taxa combined with the corresponding English and scientific name(s).

The Takuu system is based on shared basic characteristics between organisms, and there is an extensive overlap with the system that is employed by scientific biological classification. However, unlike scientific classification, if something does not fulfil a biologic, economic, or socio-cultural need or purpose, it is far less likely to possess a name in Takuu. This trend is seen in the various species of Holothuridae (sea cucumbers). Takuu remains, in part, a subsistence economy as it is geographically remote and shipping services are intermittent. Prior to the moratorium that was enacted by the PNG National Fisheries Authority (NFA) in 2009 on the harvesting of sea cucumbers, one of the few ways to benefit economically from their atoll environment was to gather, dry and sell sea cucumbers (beche-de-mer) to Asian markets. Although most marine invertebrates are referred to by a local family name such as *Siakorokoro* (various species of cuttlefish) and *Te ura* (lobsters), sea cucumbers are collectively termed *Naa* (multiple) *lori* and are further divided into seven distinct species; these are *Kavatuitui*, *Lori sarau*, *Saratea*, *Tikava*, *Takusana*, *Kukupu* and *Muripata*.

Fish often possess two names. The first is a generic term that often denotes the family to which an organism belongs whereas the second refers to a descriptive qualifier. *Simu moana* or *Simu kanae* are both classified in the Linnaean system as belonging to the family Balistidae, or Triggerfish (Allen et al. 2012). *Simu* denotes a group of pelagic marine vertebrates, namely fish, that all have a compact, oval-shaped body, a large head, small eyes and strong jaws with large teeth. *Naa simu* have a set of spines on top of their head to deter predators or lock themselves into crevices in the reef. These spines are the reason why they are colloquially referred to as triggerfish, as the spines may pop up or trigger when sensing danger, often inflicting painful injuries to fishers. *Simu moana* is so named because it is blue, large and found deeper on the reef or slightly offshore in the ocean (*Moana*). *Simu kanae* carries its name due to a slight yet obvious physical similarity to the flathead grey mullet (*Mugil cephalus*). In English-language speaking countries, *Simu moana* and *Simu kanae* are classified as the Oceanic Triggerfish (*Canthidermis maculatus*) and the Blue Triggerfish (*Pseudobalistes fuscus*), respectively. While the Linnaean system has identified a collective 40 species of Triggerfish in the family Balistidae, there are 18 types of *Simu* known on Takuu today.

Table 1. Fish and cephalopod names for various developmental phases.

Growth stages for marine vertebrates					
Family	Scientific name	Juveniles	Small size	Adult size	Extra-large size adult
Balistidae	<i>Balistoides viridescens</i>		Pareparekaina	Simu taia uri	
Balistidae	<i>Pseudobalistes flavimarginatus</i>		Pareparekaina	Simu taia mmea	
Carangidae	<i>Caranx lugubris</i>		Lluhe	Tahauri	Sukimana
Carangidae	<i>Caranx sexfasciatus</i>	Kainarupo	Taahaki > kaipaa	Matapuku	Paratoko
Carangidae	<i>Elegatis bipinnulata</i>			Kamai	Nanauri
Carcharhinidae	<i>Galeocerdo cuvier</i>		Riinapa	Kauaerua	Urupou
Cheloniidae	<i>Chelonia mydas</i>		Romu	Una mea	Te peva
Exocoetidae	various spp.		Ssipa	Ssahe	
Lutjanidae	<i>Aprion virescens</i>		Kamautu	(Te) Utu	
Lutjanidae	<i>Lutjanus bohar</i>		Tahanamea	Hanamea	
Lutjanidae	<i>Lutjanus gibbus</i>		Rupaia	Taea	
Mugilidae	<i>Liza vaigiensis</i>		Kokotarina	Tarina	
Mugilidae	<i>Mugil cephalus</i>	Aua	Kokoaua	Kanae	
Mullidae	<i>Mulloidichthys vanicolensis</i>	Karokilla	Karo	(Te) Vete	
Scrombidae	<i>Thunnus albacares</i>		(Te) atu Iliki	(Te) Atu	Lamaoto > Maraorao
Growth stages for marine invertebrates					
Family	Scientific name	Juveniles	Small size	Adult size	Extra-large size adult
Octopodidae	various spp.	Piripiri	Sinavere	Toka	
Sepiidae	<i>Sepia latimanus</i>		Pukuoho	Siakorukoru	

Identifying the growth or developmental stages of fish on Takuu is more open to interpretation and is not as static as individual fish nomenclature. Fish sizes, or stages of growth, were indicated to me by a fisher who extended out his arm, hand opened, and showed sizes corresponding to the length between one of his fingertips and his chest or beyond using the other hand. A fish, such as the yellowfin tuna (*Te atu*), that is brought back and agreed on as measuring more than 1 m in length is considered to be a *Lamaoto* (an extra-large adult) and especially valuable. The fisher who catches one wins respect among the other fishers and community as a whole. A list of growth stages is shown below in Table 1.

The presumption among Takuu elders is that there were many more types of classified marine vertebrates and invertebrates in past generations. However, due to increased inter-island mobility and migration of locals to urban centres in Papua New Guinea, many of the names that were once employed on the atoll are no longer being widely used or shared. As the village elders pass away and certain factors drive residents from Takuu, much of the folk taxonomy appears to be fading from the collective memory.

The Takuu hierarchical classification system

Naa mee tipu ttai literally means ‘everything that can be found in the ocean’. The hierarchical classification system is depicted in Figure 2, on next page. Takuu islanders distinguish between *Te ika* (fish) and *Mee ttai* (sea thing), and all marine organisms can be divided into one of these two groups. A *Mee ttai* is anything not deemed to be a fish, such as sea cucumbers, brittle stars and corals. Stony corals, or *Harero*, are thought to be non-living rocks that simply grow. This is a common belief throughout much of Melanesia and Polynesia (S. Foale, pers. comm.) The only distinction made is between stony corals (*Harero*) and branching corals, referred to as *Harero mananamana* (lit. coral with fingers). Takuu islanders do, however, refer to coral fragments on land as *Te hatu* (stone). Although I noticed *Harero* and *Te hatu* being used interchangeably at times, the discrepancy seemed to be mainly based on where the coral was located. Most *Mee ttai* do not have extensive hierarchical classifications or distinctive names. Sea stars, for example, are collectively classified as *Te hetuu*.

Te ika, or fish, are further classified into five groups of shared characteristics: *Te ika te akau* (lit. reef fish), *Te ika hatu* (lit. stone fish), *Te ika te moana* (lit. ocean fish), *Te ika ttoro* (lit. crawling fish), and *Ika ttea* (fish targeted during *Sii* fishing expeditions). As discussed below, the first three are functional groups consisting of fauna that share an ecological

niche, whereas the *Te ika ttoro* is grouped based on its behavioural traits. *Ika ttea* has the exception that this group consists solely of fish targeted during a ceremonial type of fishing known as *Sii*, which is conducted on extremely large (7 m or more) carved wooden canoes known as *Vakasii* (Figure 3). The aim of this group fishing method is to catch prestigious fish such as *Te atu* (yellowfin tuna), *Kamai* (rainbow runners) and various other large pelagic game fish. It is this functional group that contains many *Ika ttea* without family names. These fish are of such great cultural importance to the community that the majority of these fish names stand on their own. *Sii* fishing is not currently in practice on Takuu, but many schooling fish caught by other means, such as *Paataki* (trolling), are nevertheless still commonly referred to as *Ika ttea*.

Te ika te akau consists solely of reef fish. These fish are shallow water reef fish found on the patch, fore and back reefs of the atoll. Some *Ika te akau*, such as the *Tikuu* (Damselfishes) and *Tipitipi* (Butterflyfishes) are ornamental and not consumed on Takuu. Women and children target other families like *Parani* (Rabbitfishes and Sergeant Majors) as they cast their lines from the beach or off the seawall. *Te ika hatu* (lit. stone fish) refers to a functional group of reef fish that are able to hide in coral. They are distinguished from *Te ika te akau* because they are generally larger and live deeper along the reef slope. Women or children do not commonly catch these types of fish, unless a male fisher takes his wife or teenage son on a fishing trip. These include *Te ume* (Unicornfishes), *Hiloo* (Emperors) and *Natara* and *Tai ava* (Groupers).

Oceanic pelagic fish are collectively referred to as *Te ika te moana*. It includes the families *Manoo* (sharks), *Te paru* (deep sea groupers), *Te hai* (stingrays) and *Tahoraa* (whales). Several members of this functional group do not belong to a family, as they are distinctive in character and appearance. Many are also considered prestigious fish that are only caught by highly skilled fishers. Three members of sharks, *Manoo tea*, *Manoo ava* and *Moemoeatu* (the blacktip reef shark *Carcharhinus melanopterus*, the whitetip reef shark *Triaenodon obesus* and the tawny Nurse shark *Nebrius ferrugineus*, respectively) fall into the functional group of *Te ika te akau* because they are always found in shallow reef areas and never in the open ocean. *Kimaota*, or Dolphinfinch (*Coryphaena hippurus*) and *Sakuraa*, colloquially known in English-speaking countries as Swordfish (*Xiphias gladius*) are two such distinctive *Tka te moana* without family names. Sea turtles, like *Una mea* (the Green Turtle *Chelonia mydas*) and the critically endangered *Masana* (the Hawksbill Turtle *Eretmochelys imbricata*), are also placed into this hierarchical level owing to their migration patterns.

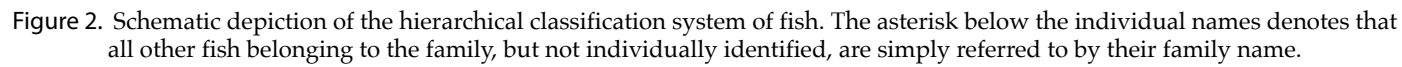




Figure 3. Takuu elder carving a new large fishing canoe (*Vakasii*) used to target *ika ttea* during *Sii* expeditions on the southern tip of Nukutoa Island.

Te ika ttoro are the functional group consisting of ‘crawling fish’. *Te ari* (flounders and soles) are both thought to crawl along the seafloor and are the only family of *Te ika ttoro* that are consumed on Takuu. The rest of this functional group does not have family names; they are thought to taste bitter and are often simply referred to by their group name. *Karaho*, *Kaarapa* and *Panoko* are types of blennies and gobies that perch themselves on corals with their large pectoral fins and appear to crawl rather than swim.

Interestingly, three of the four species of giant clam regularly consumed on the atoll are considered to be *Te ika te akau* (reef fish). Giant clams, particularly *Nakohu* (*Tridacna gigas*) feature prominently in Takuu mythology. It was believed that *Nakohu*, along with *Vaasua* (*Hippopus hippopus*) and *Te nie* (*Tridacna squamosa*) are capable of separating themselves from their shell and swimming to and settling in another shell at a more desirable location. *Nakohu*, *Vaasua* and *Te nie* are highly prized and are farmed in family plots belonging to female community members in designated areas of the lagoon (Moir 1989). As giant clams also play a prominent role in various ceremonies on the atoll, this elevates them to the status of prestigious fish. The smallest version of the giant clam that is consumed, *Te kunu* (*Tridacna crocea*) is curiously placed into the *mee ttai*, or sea thing, category. A possible explanation for this is that *Te kunu* is the only giant clam gathered solely by woman and teenagers, often together in groups. Fishing is predominately the role of the men, so *Te kunu* is simply thought of as a ‘sea thing’ that is gleaned from the patch reefs at low tide. *Naa kunu* are also considered of lesser importance and valued mainly as a change of diet when the temptation arises.

Both *Natara* and *Tai ava* are groupers placed in the functional group *Te ika hatu*, but they are further divided based on their observable morphology. Although they share the same habitat that is denoted by the functional group, *Natara* are rather bleak coloured spotted groupers with brown, grey and black hues. *Tai ava*, like the *Tai ava kanukanu* (*Plectropomus oligacanthus*) and *Huahua* (*Plectropomus leopardus*), exhibit a more colourful morphology with shades of red, reddish brown, purple, often with blue spots. *Tai ava* are congruent with several species of the genus *Plectropomus*.

Discussion

Takuu nomenclature and hierarchical classification, much like all local knowledge, has changed significantly through time. The introduction of the *Sii* fishing practice from Manus Island during the late-1800s led to previously unnamed fish being targeted. New economic opportunities, such as the sale of valuable lollyfish and white teat sea cucumber, also necessitated distinctions between multiple species. Thus, there is a strong reliance on identification and separation of *Naa lori* of Takuu. Where a local name was not previously established, common English names were adopted to differentiate between various species of sea cucumber.

While the beche-de-mer trade was the most lucrative economic opportunity for decades on Takuu, the islanders faced a major financial burden from the ongoing nationwide ban that was put in place in by the PNG NFA in 2009. Thus, the residents of Takuu are currently dependent almost entirely on remittances. Inadequate and unpredictable ship-

ping services result in islanders obtaining large surpluses of store bought goods, such as rice, flour and tinned fish when a ship does arrive. After a ship comes to the atoll, there is a marked decline in all fishing practices. Several months after the supply ship leaves, however, the islanders return entirely to a subsistence lifestyle for short periods. The island is in a constant state of flux, and many atoll residents have thus decided to resettle in other parts of Papua New Guinea. Poor healthcare services as well as education and employment opportunities also currently drive people away from Takuu. Even in the late-1970s Johannes (1981) noted that increasing connectedness and westernisation of Pacific cultures had accelerated the disappearance of local knowledge during the previous century. While Takuu fishing methods are rapidly disappearing and changing, detailed descriptions of these processes are beyond the scope of this paper. However, I observed that the same effect is taking place on the local taxonomy. The dependence on imported goods leads to less engagement with the island's marine resources. Many of the fish names collected from community elders and fishers could not be identified by most members of the community who were below 30 years of age. The island's youth often cited family names despite the specimen having an established name of its own.

Studies of local knowledge of marine ecosystems necessitate a working lexicon of the marine fauna. Marine folk taxonomy is also especially useful for conservation management planning (Drew 2005). A thorough understanding of local knowledge on Takuu can additionally be used to alleviate some stresses from future rapid environmental change. Furthermore, an analysis of marine organisms provides valuable insight into cultural, social and economic interests of the atoll's population. In sum, the data presented in this paper provides insight into knowledge systems of Takuu as well as establishing a solid foundation for further inquiry.

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Appendix 1

Takuu names of marine vertebrates and invertebrates with the corresponding scientific and English designations. Source: Takuu grammar and dictionary 2011 (names with an asterisk were previously recorded in the Takuu dictionary and verified through this research).

Takuu name	Scientific name	English name
<i>Te ika</i>		Fish
<i>Te ika te akau</i>		lit. Reef fish
<i>Tikuu*</i>	Pomacentridae	Damselfishes
<i>Te nnahu</i>	multiple spp.	spp. of damselfish
<i>Te nnuu*</i>	<i>Pygoplites diacanthus</i>	Regal angelfish
<i>Kokoto*</i>	Pomicentridae	Sergeant majors
<i>Kokoto*</i>	<i>Abudefduf</i> spp.	spp. of sergeant majors
<i>Kokoto pua</i>	<i>Abudefduf sordidus</i>	Blackspot sergeant
<i>Parani*</i>	Acanthuridae + Siganidae	Surgeonfishes + rabbitfishes
<i>Te umoa</i>	<i>Acanthurus nigricans</i>	Whitecheek surgeonfish
<i>Te maa</i>	<i>Acanthurus olivaceus</i>	Orangeband surgeonfish
<i>Te api*</i>	<i>Acanthurus guttatus</i>	White-spotted surgeonfish
<i>Paaua*</i>	<i>Siganus canaliculatus</i>	White-spotted rabbitfish
<i>Pannoo*</i>	<i>Siganus guttatus</i> and <i>Siganus lineatus</i>	Golden rabbitfish and lined rabbitfish
<i>Te maarama*</i>	<i>Siganus virgatus</i> and <i>Siganus puellus</i>	Virgate rabbitfish and masked rabbitfish
<i>Kukupini*</i>	<i>Acanthurus lineatus</i>	Striped surgeonfish
<i>Te ika uri*</i>	<i>Acanthurus</i> spp. and <i>Siganus</i> spp.	All black surgeonfish and rabbitfish
<i>Tipitipi*</i>	Chaetodontidae + Zanclus cornutus	Butterflyfishes and Moorish Idol
<i>Urutuki*</i>	Cirrhitidae	Hawkfishes
<i>Uhu*</i>	Scaridae	Parrotfishes
<i>Uhu vela</i>	<i>Scarus frenatus</i>	Bridled parrotfish (initial phase)
<i>Te urahi</i>	<i>Hipposcarus longiceps</i>	Pacific longnose parrotfish
<i>Marena (variant maraepuku)*</i>	<i>Bolbometron muricatum</i>	Bumphead parrotfish
<i>Paaseri</i>	<i>Cetoscarus bicolor</i>	Bicolour parrotfish
<i>Uhu paaheri</i>	<i>Cetoscarus ocellatus</i>	Spotted parrotfish
<i>Tama te komokomo*</i>	Pomacentridae (and Amphiriopron spp.)	Anemonefishes
<i>Malari</i>	Labridae	Wrasses
<i>Malari hailama</i>	<i>Halichoeres hortulanus</i>	Checkerboard wrasse
<i>Marihana*</i>	<i>Thalassoma hardwicke</i>	Sixbar wrasse
<i>Sipopu purapura*</i>	<i>Cheilinus fasciatus</i>	Redbreasted wrasse
<i>Sarakamu</i>	<i>Halichoeres ornatismus</i>	Oriental wrasse
<i>Marau*</i>	Holocentridae	Soldierfishes and squirrelfishes
<i>Marau</i>	<i>Sargocentron tiere</i>	Tahitian squirrelfish
<i>Marau kuru</i>	<i>Myripristis berndti</i>	Big-scale soldierfish
<i>Marau muu</i>	<i>Myripristis adusta</i>	Shadowfin soldierfish
<i>Marau taratasi</i>	<i>Neoniphon samara</i>	Spotfin squirrelfish
<i>Marau roa</i>	<i>Neoniphon aurolineatus</i>	Gold-lined squirrelfish
<i>Taamarau</i>	<i>Sargocentron spiniferum</i>	Sabre squirrelfish
<i>Simu*</i>	Balistidae	Triggerfish
<i>Simu rena*</i>	<i>Balistapus undulates</i>	Orange-lined triggerfish

<i>Simu tua*</i>	<i>Rhinecanthus rectangulus</i>	Wedgetail triggerfish
<i>Simu ila*</i>	<i>Rhinecanthus verrucosus</i>	Blackpatch triggerfish
<i>Simu tai*</i>	<i>Rhinecanthus aculeatus</i>	Picasso triggerfish
<i>Simu rautaro*</i>	<i>Melichthys niger</i>	Black triggerfish
<i>Simu matariki*</i>	<i>Balistoides conspicillum</i>	Clown triggerfish
<i>Simu moana*</i>	<i>Pseudobalistes fuscus</i>	Blue triggerfish
<i>Simu sue*</i>	<i>Cantherhines pardalis</i>	Honeycomb filefish
<i>Simu kiore*</i>	<i>Melichthys vidua</i>	Pinktail triggerfish
<i>Simu paopao</i>	<i>Amanses scopas</i>	Broom filefish
<i>Simu taia mmea</i>	<i>Pseudobalistes flavimarginatus</i>	Yellowmargin triggerfish
<i>Simu taia uri</i>	<i>Balistoides viridescens</i>	Titan triggerfish
Kanae	Mugilidae	Mullets
<i>Kanae*</i>	<i>Mugil cephalus</i>	Flathead grey mullet
<i>Kamakamanii*</i>	<i>Polydactylus plebeius</i>	Common threadfin
<i>Tarina</i>	<i>Liza vaigiensis</i>	Diamond-scale mullet
<i>Kiokio*</i>	<i>Albula vulpes</i>	Bonefish
Manoo te akau	Carcharhinidae and Ginglymostomatidae	lit. Reef shark
<i>Manoo tea*</i>	<i>Carcharhinus melanopterus</i>	Blacktip reef shark
<i>Manoo ava</i>	<i>Triaenodon obesus</i>	Whitetip reef shark
<i>Moemoeau</i>	<i>Nebrius ferrugineus</i>	Tawny nurse shark
Sue	Tetraodontidae	Pufferfish
<i>Sue kaarevareva</i>	<i>Arothron mappa</i>	Map puffer
<i>Sue natara</i>	<i>Arothron stellatus</i>	Stellate puffer
Ika te akau without family names		
<i>Manii*</i>	<i>Acanthurus triostegus</i>	Convict surgeonfish
<i>Tauaroro</i>	<i>Fistularia commersonii</i>	Cornetfish
<i>Tautu*</i>	<i>Diodon hystrix</i>	Porcupinefish
<i>Akiaki</i>	<i>Scolopsis margaritifer</i>	Pearly monacle bream
<i>Moomoa (variant Matuanataa)</i>	<i>Ostracion cubicus</i>	Yellow boxfish
<i>Rikaha*</i>	<i>Platax teira</i>	Longfin spadefish
<i>Te matu</i>	<i>Gerres oyena</i>	Blacktip silver biddy
<i>Saaripo</i>	<i>Lutjanus fulvus</i>	Blacktail snapper
<i>Saiara</i>	<i>Pterocaesio digramma</i>	Double-lined fusilier
<i>Matakivi</i>	<i>Scolopsis bilineatus</i>	Bridled monacle Bream
<i>Vaelo (variant Te matu vaelo)</i>	<i>Gerres oblongus</i>	Oblong silver biddy
<i>Nakohu*</i>	<i>Tridacna gigas</i>	Giant clam
<i>Te Nai*</i>	<i>Tridacna squamosa</i>	Fluted giant clam
<i>Vaasua*</i>	<i>Hippopus hippopus</i>	Bear paw clam
<i>Tuna</i>	<i>Gymnothorax javanicus</i>	Giant moray
Te ika te hatu		lit. Stone fish
Te ume*	Naso spp.	Unicornfish
<i>Te ume atu</i>	<i>Naso hexacanthus</i>	Sleek unicornfish
<i>Te ume rei</i>	<i>Naso lituratus</i>	Orangespine unicornfish
<i>Te ume ava</i>	<i>Naso vlamingii</i>	Bignose unicornfish
<i>Te keru*</i>	<i>Naso annulatus</i>	Whitemargin unicornfish
<i>Te lapiau</i>	<i>Naso unicornis</i>	Bluespine unicornfish

<i>Ipiipi</i>	<i>Naso brachycentron</i>	Humpback unicornfish
<i>Nutuhelo</i>	<i>Naso brevirostris</i>	Spotted unicornfish
Nanue	Kyphosidae	Sea chubs
<i>Nanue</i>	<i>Kyphosus cinerascens</i>	Topsail drummer
<i>Nanue paaua</i>	<i>Kyphosus vaigiensis</i> and <i>Kyphosus bigibbus</i>	Lowfin drummer and grey drummer
Hiloo	Lethrinidae	Emperors
<i>Hiloo</i>	<i>Lethrinus xanthochilus</i>	Yellowlip emperor
<i>Natura</i>	<i>Lethrinus olivaceus</i>	Longface emperor
<i>Karisouna</i>	<i>Lethrinus harak</i>	Thumbprint emperor
<i>Saratea</i>	<i>Lethrinus obsoletus</i>	Orange-striped emperor
<i>Matakutukutukuto a</i>	<i>Lethrinus ornatus</i>	Ornate emperor
<i>Matakutukutukuto a harero</i>	<i>Lethrinus erythropterus</i>	Longfin emperor
<i>Te lona</i>	<i>Lethrinus rubrioperculatus</i>	Spotcheek emperor
Natara	Serranidae	Groupers
<i>Natara mokopiri*</i>	<i>Anyperodon leucogrammicus</i>	Slender grouper
<i>Natara heo</i>	<i>Epinephelus melanostigma</i>	One-blotch grouper
<i>Kainataa</i>	<i>Epinephelus polyphekadion</i>	Camouflage grouper
<i>Natara ppaa</i>	<i>Aethaloperca rogaa</i>	Redmouth grouper
Tai ava	Serranidae	Groupers
<i>Tai ava</i>	<i>Plectropomus maculatus</i>	Spotted coral grouper
<i>Tai ava kanukanu</i>	<i>Plectropomus oligacanthus</i>	Highfin coral grouper
<i>Tai ava uri</i>	<i>Plectropomus laevis</i>	Blacksaddle coral grouper (only dark variation)
<i>Huahua tau matahana</i>	<i>Plectropomus laevis</i>	Blacksaddle coral grouper (only pale variation)
<i>Huahua</i>	<i>Plectropomus leopardus</i>	Leopard coral grouper
<i>Tono</i>	<i>Plectropomus areolatus</i>	Squaretail coral grouper
Ika hatu without family names		
<i>Heata*</i>	<i>Epinephelus fuscoguttatus</i>	Brown-marbled grouper
<i>Kurapo</i>	<i>Gymnocranius satoi</i>	Blacknape large-eye bream
<i>Taea*</i>	<i>Lutjanus gibbus</i>	Humpback snapper
<i>Takape*</i>	<i>Lutjanus kasmira</i>	Bluestripe snapper
<i>Tausena</i>	<i>Lutjanus rufolineatus</i>	Gold-lined snapper
<i>Taaeva</i>	<i>Lutjanus argentimaculatus</i>	Mangrove red snapper
<i>Hootua</i>	<i>Lutjanus monostigma</i>	Onespot snapper
<i>Tapurei*</i>	<i>Lutjanus semicinctus</i>	Black-banded snapper
<i>Tanahaa</i>	<i>Plectorhinchus albivittatus</i>	Giant sweetlips
<i>Hanamea*</i>	<i>Lutjanus bohar</i>	Red snapper
<i>Sanapiki</i>	<i>Lutjanus rivulatus</i>	Blubberlip snapper
<i>Kanani</i>	<i>Macolor macularis</i>	Midnight snapper
<i>Ssina</i>	<i>Symphoricarthus spilurus</i>	Sailfin snapper
<i>Te muu*</i>	<i>Monotaxis grandoculis</i>	Humpnose bigeye bream
<i>Te muu harero*</i>	<i>Monotaxis heterodon</i>	Redfin bream
<i>Te peka</i>	<i>Cephalopholis argus</i>	Peacock grouper
<i>Tamat marino</i>	<i>Cephalopholis urodeta</i>	Flagtail grouper
<i>Kurakura</i>	<i>Cephalopholis spiloparaea</i>	Strawberry grouper
<i>Mataere</i>	<i>Cephalopholis miniata</i>	Coral grouper
<i>Taupatu</i>	<i>Cephalopholis sonnerati</i>	Tomato grouper
<i>Peepee</i>	<i>Cromileptis altivelis</i>	Barramundi

<i>Velovelo</i>	<i>Variola louti</i> and <i>Variola albimarginata</i>	Yellow-edged lyretail and white-edged lyretail
<i>Te ika te moana</i>		lit. Ocean fish
<i>Manoo*</i>	Carchacharhinidae, Sphyridae and <i>Rhina ancylostoma</i>	Sharks and shark ray
<i>Manoo hai*</i>	<i>Rhina ancylostoma</i>	Shark ray
<i>Looke*</i>	<i>Negaprion acutidens</i>	Sicklefin lemon shark
<i>Maamaatarina</i>	<i>Shpyrna mokarran</i>	Great hammerhead
<i>Paru</i>	Various species of fish targeted during Kkuu fishing	
<i>Paru marau</i>	<i>Pinjalo lewisi</i>	Slender pinjalo
<i>Paramea*</i>	<i>Lutjanus sebae</i>	Red emperor snapper
<i>Te hai*</i>	Dasyatidae, Myliobatidae and Mobulida	Stingrays
<i>Hai haarua*</i>	<i>Manta birostris</i>	Manta ray
<i>Hai manu*</i>	<i>Aetobatus narinari</i>	Spotted eagle ray
<i>Saruano</i>	<i>Urogymnus asperrimus</i>	Thorny stingray
<i>Tahoraa</i>	Various (order Cetacea)	Whales
<i>Ika moana</i> without family names		
<i>Kimaota*</i>	<i>Coryphaena hippurus</i>	Dolphinfish
<i>Lavena*</i>	<i>Katsuwonus pelamis</i>	Skipjack tuna
<i>Te kaso*</i>	<i>Acanthocybium solandri</i>	Wahoo
<i>Takua</i>	<i>Istiophorus platypterus</i>	Indo-Pacific sailfish
<i>Te karo*</i>	<i>Mulloidichthys</i> sp.	Species of goatfish
<i>Kanapure</i>	<i>Selar crumenophthalmus</i>	Bigeye scad
<i>Sarii (variant Te Nehu)</i>	<i>Atherinomorous lacunosus</i>	Robust silverside
<i>Sakuraa*</i>	<i>Xiphias gladius</i>	Swordfish
<i>Samono</i>	<i>Stenella longirostris</i>	Spinner dolphin
<i>Simu kanae</i>	<i>Canthidermis maculatus</i>	Oceanic triggerfish
<i>Una mea*</i>	<i>Chelonia mydas</i>	Green sea turtle
<i>Masana</i>	<i>Eretmochelys imbricata</i>	Hawksbill sea turtle
<i>Te mmusa*</i>	<i>Epinephelus lanceolatus</i>	Giant grouper
<i>Te uri</i>	<i>Caeso cuning</i> and <i>Caesio teres</i>	Yellowtail fusiler and blue and yellow fusiler
<i>Tama uriuri te manoo*</i>	<i>Echeneis naucrates</i>	Sharksucker (dark variation)
<i>Tama uriuri te una mea*</i>	<i>Echeneis naucrates</i>	Sharksucker (pale grey variation)
<i>Te hoo</i>	Various	Collective name for all fry fish
<i>Ika ttea</i>		Various spp. of jacks and needlefish. Fish caught during 'Si' fishing.
<i>Aku*</i>	Belonidae	Needlefishes
<i>Matapuku</i>	Carangidae	Trevallies
<i>Matapuku</i>	<i>Caranx sexfasciatus</i>	Bigeye trevally
<i>Urua</i>	<i>Caranx ignobilis</i>	Giant trevally
<i>Maapilo</i>	<i>Carangoides orthogrammus</i>	Yellow-spotted trevally
<i>Malauseri</i>	<i>Caranx melampygus</i>	Bluefin trevally
<i>Tahauri</i>	<i>Caranx lubricus</i>	Black jack
<i>Matapai</i>	<i>Carangoides fulvoguttatus</i>	Gold-spotted trevally
<i>Araara</i>	<i>Carangoide ferdau</i>	Blue trevally
<i>Marakaraka</i>	<i>Alepes djedaba</i>	Shrimp scad
<i>Sapela</i>	<i>Carangoides gymnosthetus</i>	Bludger trevally
<i>Kosihu (variant kumoso)</i>	<i>Gnathanodon speciosus</i>	Golden trevally

<i>Maarahe</i>	<i>Caranx bucculentus</i>	Bluespotted trevally
Ika ttea without family names		
<i>Kamai*</i>	<i>Elagatis bipinnulatus</i>	Rainbow runner
<i>Te atu (hailama)*</i>	<i>Thunnus albacares</i>	Yellowfin tuna
<i>Laueva</i>	<i>Katsuwonus pelamis</i>	Skipjack tuna
<i>Hoehoe</i>	<i>Euthynnus xanthochilus</i>	Yellowlip emperor
<i>Naenae</i>	<i>Grammatorcynus bilineatus</i>	Double-lined mackerel
<i>Te ono*</i>	<i>Sphyræna jello</i>	Pickhandle barracuda
<i>Te moratu</i>	<i>Gymnosarda unicolor</i>	Dogtooth tuna
<i>Tapaturi</i>	<i>Sphyræna barracuda</i>	Great barracuda
<i>Tapatuu</i>	<i>Sphyræna forsteri</i>	Bigeye barracuda
<i>Te tenaa</i>	<i>Rastrelliger kanagurta</i>	Long-jawed mackerel
<i>Te ature akau</i>	<i>Selar boops</i>	Oxeye scad
<i>Uruperuperu</i>	<i>Decapterus macarellus</i>	Mackerel scad
<i>Tikava</i>	<i>Sphyræna obtusata</i>	Yellowtail barracuda
<i>Kanekanehatu</i>	<i>Trachinotus blochi</i>	Snubnose pompano
<i>Tama te puusau</i>	<i>Alectis ciliaris</i>	African pompano
<i>Te lai</i>	<i>Scomberoides lysan</i>	Double-spotted queenfish
<i>Lailai</i>	<i>Trachinotus blaillonii</i>	Small-spotted dart
<i>Maapusa</i>	<i>Aphareus furca</i>	Small-toothed dogfish
Ika ttoro*		lit. Crawling fish
Te ari*	Bothidae and Solidae	Flounders and soles
Ika toro without family names		
<i>Panoko</i>	<i>Paraplotosus albilabris</i>	Whitelipped eel catfish
<i>Te nnehu*</i>	<i>Synanceia verrucosa</i>	Reef stonefish
<i>Karisittai</i>	<i>Malacanthus latovittatus</i>	Blue blunquillo
Mee ttai		
Lori*	Holothuroidea	lit. Sea thing
Lori sausau	Thelenota anax	Sea cucumbers
<i>Muripata</i>	<i>Stichopus chloronotus</i>	Amberfish sea cucumber
<i>Saratea</i>	<i>Actinopyga miliaris</i>	Greenfish sea cucumber
<i>Tikava</i>	<i>Actinopyga palauensis</i>	Hairy blackfish sea cucumber
<i>Takusana</i>	<i>Holothuria atra</i>	Panning's black sea cucumber
<i>Kavatuitui</i>	<i>Thelenota ananas</i>	Lollyfish sea cucumber
<i>Kukupu uri</i>	<i>Holothuria nobilis</i>	Pineapple sea cucumber
<i>Kukupu</i>	<i>Holothuria fuscogilva</i>	Black teatfish sea cucumber
		White teatfish sea cucumber
Mee ttai without family names		
<i>Hare urahi</i>	<i>Nautilus pompilius</i>	Emperor nautilus
<i>Komokomo*</i>	Order Actiniaria	Various species of sea anemones
<i>Hatuke</i>	<i>Heterocentrotus trigonarius</i>	Dark slate-pencil urchin
<i>Te fanka</i>	<i>Diadema setosum</i>	Black longspine sea urchin
<i>Te pamu</i>	Sipunculidae	Large species of peanut worm
<i>Te upo</i>	Sipunculidae	Species of peanut worm
<i>Te kina</i>	Sipunculidae	Species of peanut worm
<i>Te ura</i>	<i>Panulirus versicolor</i>	Painted spiny lobster

<i>Siakorukoru*</i>	<i>Sepia latimanus</i>	Broadclub cuttlefish
<i>Toka</i>	Order Octopoda	Various species of octopuses
<i>Karea*</i>	Order Gastropoda	Various species of gastropods
<i>Karea manamana</i>	<i>Lambis scorpius</i>	Scorpion spider conch
<i>Taniope</i>	Suborder Balanomorpha	Various species of acorn barnacles
<i>Aramea*</i>	<i>Acanthaster planci</i>	Crown-of-thorn starfish
<i>Te hetuu</i>	Asteroidea	All species of sea stars except crown-of-thorn sea star
<i>Te ane*</i>	<i>Millepora</i> spp.	Various species of fire coral
<i>Harero*</i>	Order Scleractinia	Various species of boulder corals
<i>Harero manamana*</i>	Order Scleractinia	Various species of branching corals
<i>Hare tui</i>	Class Polychaeta	Species of polychaete worm (possibly <i>Diopatra</i> sp.)
<i>Kaipea*</i>	Infraorder Brachyura	Various species of crabs
<i>Varo</i>	<i>Odontodactylus scyllarus</i>	Peacock mantis
<i>Te kunu</i>	<i>Tridacna crocea</i>	Boring giant clam
<i>Hare atu*</i>	Class Hydrozoa	Various species of stinging hydroids
<i>Hare tui*</i>	Amphinomidae	Various species of bristle worms
<i>Hatu mata*</i>	<i>Ovula ovum</i>	Common egg cowrie

A field survey of the green snail (*Turbo marmoratus*) in Vanuatu: Density, effects of transplantation, and villagers' motives for participation in transplantation and conservation activities

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Abstract

After summarising previous studies in Vanuatu of the green snail (*Turbo marmoratus*), this article describes a field survey conducted by the authors in Vanuatu in 2017 to estimate the density of green snails on transplantation sites and surrounding areas. As a result, the density of green snails was found to be much higher in sites where transplantation had occurred, thereby highlighting its positive effect. The main reason for the high density of green snails at transplantation sites is thought to be self-seeding, with eggs and larvae having been retained in the spawning ground, and contributing to the increased population. The article then describes the field survey analyses and gives the results of a questionnaire survey that was conducted in order to understand the motives of villagers who participated in green snail transplantation and conservation activities on Lelepa Island, in the village of Mangaliliu in north-western Efate Island, and in Uripiv Island, located in the east of Malakula Island. An awareness survey was also conducted in villages with no experience of green snail transplantation and conservation activities.

Keywords

Green snail, Vanuatu, snail transplantation, conservation, villager participation

Introduction

In the Republic of Vanuatu, a Japan International Cooperation Agency (JICA) technical cooperation project, 'The Project for Promotion of Grace of the Sea in the Coastal Villages (Grace of Sea project) – Phase 1 (2006–2009)' and 'Phase 2 (2011–2014)', was implemented in cooperation with the Vanuatu Fisheries Department (VFD) and local coastal fishers to promote community-based coastal resources management. As one of its activities, the project undertook the enhancement of the green snail (*Turbo marmoratus*) resource, which is in danger of extinction in Vanuatu. This species, which is distributed in the tropical and subtropical zones of the Indo-Pacific region, is one of the largest marine snails, growing to more than 20 cm in shell height. Green snails contain a high quality pearl layer inside the shell, and have been used for mother-of-pearl inlay. It is therefore expensive – especially in China and Japan. Recently, however, the resource

has drastically decreased worldwide. In Vanuatu, local resources were also endangered so green snail fishing has been banned nationwide since 2005.

For conservation and propagation of the resource, the project team transplanted adult green snails to a community-based marine protected area ('taboo area'). Research institutions, such as the French Institute for Research and Development (IRD) and the Pacific Community (SPC), as well as VFD, then conducted marine resource surveys around these transplantation areas. According to them and to comments of villagers living around the transplantation areas, the population of green snails seemed to have increased and their population size seemed to be larger where they were transplanted and protected, compared with areas in which no such activities occurred. This is regarded as a positive effect of the 'community-based coastal resources management' activity that was implemented in collaboration with local fishers and staff of VFD.

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However, the contribution of the green snail transplantation to the resource enhancement had not been analysed quantitatively before the survey that described here.

Summary of previous studies

The Project for Promotion of Grace of the Sea in the Coastal Villages (Grace of Sea project) – phases 1 and 2

To conserve green snail populations endangered by overfishing, VFD has banned green snail fishing for 15 years, from 2005–2020. Furthermore, the Grace of the Sea Project Phase 1 provided technical assistance related to aquaculture development for shellfish, including green snails, as an initial activity of the coastal marine resources management by VFD with coastal fishers. It then set up the model site for implementing community-based coastal resources management in Efate Island (Figure 1), where the VFD headquarters are located.

As a result of this activity, techniques of seed production and intermediate breeding were transferred to VFD staff, and, in the model site, activity for the establishment of the community-based coastal resources management approach occurred. As part of the activities that were run by the project, 1200 adult green snails were transferred from Aneityum Island (Figure 1) – which still has a rich resource in a large rearing tank – to Efate Island. Some individuals were then stocked in coastal waters of Mangaliliu and Lelepa islands, which are close to Efate Island, in order to form a breeding population. Green snail transplantation records are shown in Table 1.

To confirm the effect of the formation of the mother population, a field survey was conducted in the coastal waters of Mangaliliu in February 2013. Two young green snails were found after 30 minutes of observation. This is assumed to be a result of reproduction by the transplanted green snails. The underwater surveys of green snail presence were



Figure 1. Map of Vanuatu.

subsequently implemented in several transplantation areas, and young individuals were found each time, except on Moso Island.

In October 2013, during Phase 2, SPC conducted a field survey to confirm the reproductive condition of green snails that were transplanted during Phase 1 in the area of north Efate. Young green snails were found in the transplanted area, which might be the result of the breeding of the mother population that was transplanted during Phase 1.

Survey by SPC and VFD

Green snails have been one of the most heavily exploited marine products of Vanuatu. Under these circumstances, a survey was undertaken from September to October 2013 by SPC and VFD to (1) understand the condition of the resource on Aneityum Island, where green snails are still abundant; (2) estimate the resources' recovery; and (3) evaluate the importance of green snail poaching activities on Efate Island (Pakoa et al. 2014).

Table 1. Records of green snail transplantation.

Transplantation site	Name of location	No. of individuals	Year of transplantation
North Efate	Kotoa	205	2007–2008
	Mangaliliu village	262	
	Lelepa Is.	195	
	Moso Is.	150	
	Total:	812	
East Uripiv		299	2012

Source: Final report of the Grace of Sea Project – Phase 2

The results are described below.

- a) *Amount of green snail resource on Aneityum:* At six survey locations around Aneityum Island, 29 and 46 stations were set-up at 3–12 m water depth and 0–3 m water depth, respectively. For the former, two divers moved along the reef at five-minute intervals and recorded the number of green snails and other macro invertebrates that were observed. For the 0–3 m water depth, a belt transect method was used. A total of 667 individual green snails were observed. The survey confirmed that green snails were abundant around Aneityum.
- b) *Amount of green snail resources in Efate:* A diving survey was done to estimate the amount of green snail resources at five locations in north-western Efate. A total of 38 individuals were observed, indicating that the number of green snails was extremely low when compared with Aneityum. During the 2003 survey that was conducted in the area by SPC, however, no green snails had been observed. It was suggested, therefore, that the green snail resource was recovering gradually in Efate. It was also suggested that the recovery was due to the reproduction of local stocks, as well as to the group transplanted from Aneityum.
- c) *Green snails confiscated by VFD:* Data on poached green snails that were confiscated by VFD has not been recorded by VFD. The staff members of the research department of VFD noted that it was necessary to record such data in future. However, some records of green snails that were confiscated in the Port Vila market can be found in Pakoa et al. (2014) as shown in Figure 2.

Efficiency of taboo areas in Vanuatu (EFITAV) project

In Vanuatu, since the 1990s the traditional no-fishing zone (taboo area) has been revived as one management measure for coastal resources. This is considered effective for invertebrates with low mobility, such as conches or sea cucumbers. This survey was conducted by IRD to confirm the effect of these taboo areas for coastal resources at north-western Efate and, as a control site, at Aneityum where the green snail resource was still rich (Dumas et al. 2012).

The results showed that the density of green snails was very low in Efate Island, and it was suggested that serious disruption of the local population of green snails had occurred (Table 2).

However, the results also showed that the density of green snails inside the taboo area was considerably higher than those outside, and it was suggested that fishery control by the traditional taboo area enabled a slow recovery of green snails. The density of green snails at Mangaliliu was particularly higher than that of other survey areas in Efate. The small-size individuals observed in Mangaliliu suggested that multiple generations of green snails inhabited the area. The Mangaliliu area was a transplantation site of green snails during the Grace of Sea Project – Phase 1 and the report concluded that transplantation had probably been effective in raising the green snail density in the area.

As described above, the survey that was conducted suggested that green snail resources in north-western Efate had recovered. Also, it suggested that this recovery was due to transplantation as well as

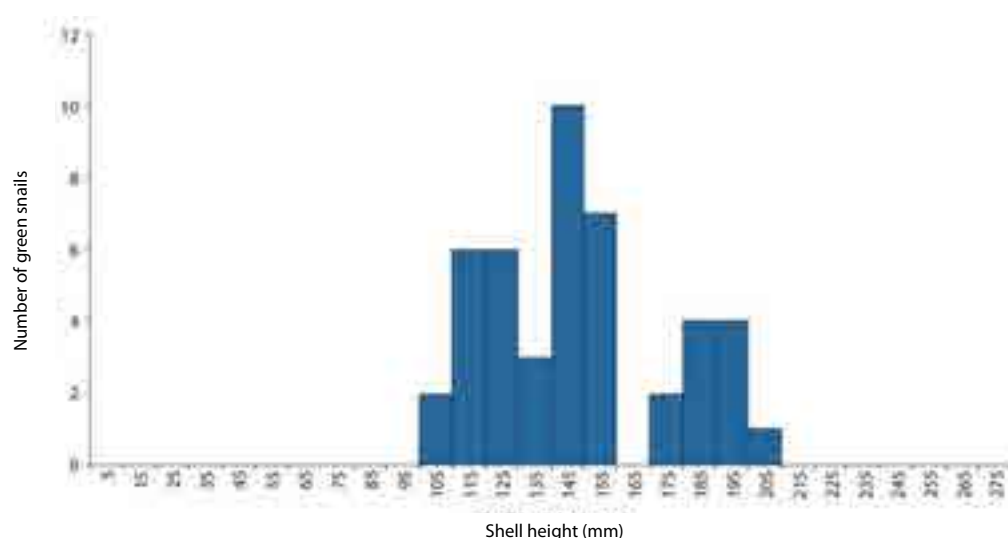


Figure 2. Shell height of green snails (n = 45) confiscated in Port Vila Central Market (Source: Pakoa et al. 2014).

Table 2. Density of green snails at survey sites (Excerpted from Dumas et al. 2014).

Community name	Number of individuals per hectare inside taboo area	Number of individuals per hectare outside taboo area
Efate		
Marou	0.00	0.00
Takara	9.38	2.00
Mangaliliu	21.42	6.00
Aneityum		
Anelcowat	147.10	2.00
Mystery Island	12.80	2.00

conservation activities, such as a fishing ban and the setting-up of a taboo area. However, there had been few detailed statistical surveys and analyses to verify the effect of the transplantation and conservation activities.

Given this situation, the purpose and aims of this survey were adopted, as described below.

Purpose and aims of the survey

This survey aimed to verify the effects and benefits of the transplantation and conservation activities, as well as to analyse the motives of the villagers who participated actively in green snail transplantation and conservation activities.

To achieve these aims, three surveys were conducted as follows:

- A field survey to estimate habitat density of green snails in the transplantation sites and surrounding areas.
- A questionnaire survey to understand the motives of villagers participating in green snail transplantation and conservation activities.
- An awareness survey of the resource management in communities that have no experience of transplanting green snails.

In conducting each survey, the following objectives were applied for collection and analysis of the data.

- Field survey for estimation of habitat density of green snails on the transplantation sites and surrounding area:* The Grace of the Sea Phase 3 team decided on the survey sites, including the transplantation site for green snails and the surrounding areas, and implemented the survey to estimate the number of individuals per unit-area, record the size of each individual observed, and then analyse the effect of resource enhancement activities, such as transplantation and protection. It was hoped that the survey would confirm that transplantation and following conservation

activities contribute to resource enhancement of green snail. The survey method used was a method mastered by VFD staff, following training done by experts from Japan, France and SPC.

- Questionnaire survey for understanding the motive of the villagers participating in transplantation and conservation activities for green snail:* We conducted a questionnaire survey in communities where the transplantation of green snails had been undertaken, and analysed the motives of villagers for their participation in transplantation and conservation activities for green snail.
- Awareness survey for green snail resource management in communities having no experience of green snail transplantation activities:* In fishing villages in eastern and southern Efate Island that have not implemented transplantation and conservation activities of green snail, we conducted additional interviews with chiefs and leaders of communities to estimate the status of the green snail population in their area. At the same time, we attempted to understand the ideas of interviewees regarding the transplantation and conservation of green snail. The target fishing village for the survey was determined by discussions with VFD staff.

The survey methods, results and discussions for each survey mentioned above are shown in the following sections.

Field survey to estimate the density of green snails in transplantation sites and surrounding areas

Survey sites

In recent years, green snails have been reported as being present in several locations around Efate Island. This may represent an increase of the green snail resource, as the species was strikingly absent a few years back. It is believed that this increase is associated with the transplantation of green snails in the area. However, to verify the real effect of

transplantation and the following conservation activities, it was necessary to precisely estimate the green snail resource status at transplantation sites and their surrounding areas. Accordingly, the restocking areas for green snails and their surrounding areas on the north-western coast of Efate and the outer coast of Uripiv Island and nearby north coast of Uri Island, which is located in the eastern region of Malakula Island, were selected in collaboration with VFD's Research Division, as survey areas of approximately 5 km outer perimeter (Figure 3). In each survey area, two to five sites were established; a total of 26 survey sites were surveyed.

For survey sites, we selected the transplantation sites of green snails and surrounding areas that were known as being green snail habitats by local fishers before the depletion of the resource occurred (Figures 4 and 5).



Figure 3. The survey areas for the estimation of density of green snails in north-western Efate Island and Uripiv and Uri islands.

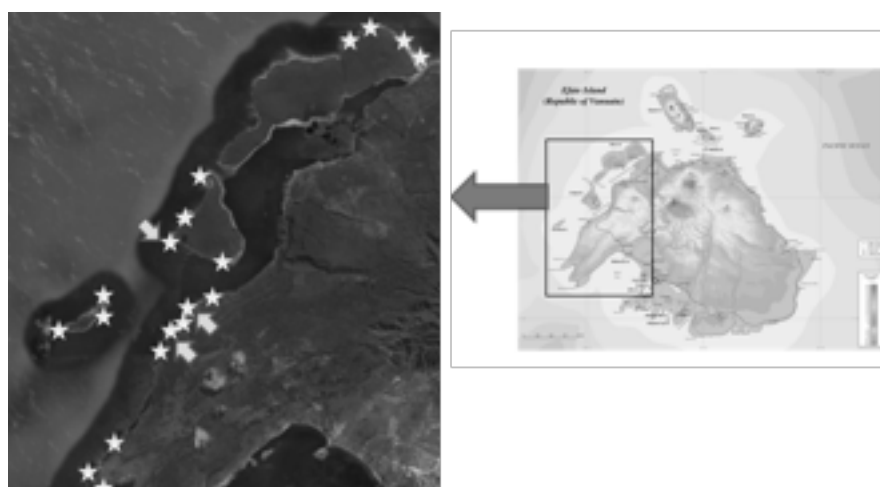


Figure 4. Survey sites in north-western Efate (arrows show transplantation sites).

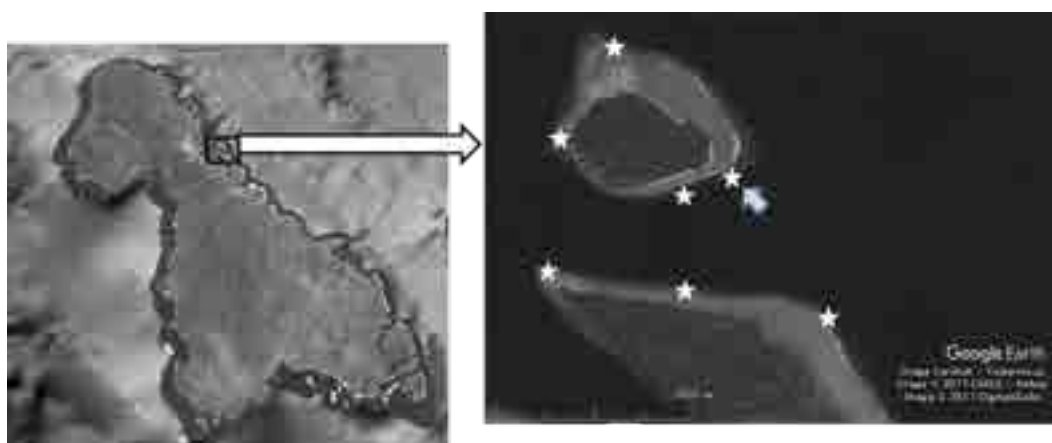


Figure 5. Survey sites of the Uripiv and Uri islands off the north-eastern coast of Malakula Island (arrow shows the transplantation site).

Methods

The survey was conducted using the following procedures:

1. We identified sites that should be good habitats for green snails around transplantation sites, following discussions with VFD staff and local fishers.
2. Based on information provided by VFD staff and local fishers, we surveyed the substrate of the areas by skin-diving, and set the survey sites on bedrocks that were likely habitat of green snails. To facilitate the survey work, each survey site was selected in 0.5–3.0 m water depth.
3. For each survey site, we set up five 50 m long belt transect lines spaced every 50 m along the shoreline (Figure 6).

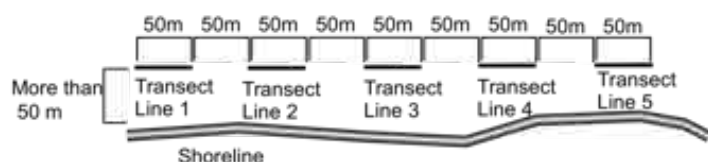


Figure 6. Set of belt transect lines at each survey site.

4. We recorded GPS positions of the start points and azimuth direction of each transect. We also took photos and recorded a video of the bottom conditions.
5. Two free divers made observations of the 2 m wide area along each side of the transect line, counting and recording the number of green snails (Figure 7). Divers checked for green snails beneath rocks and boulders. Simultaneously, they measured with callipers and recorded the shell height of each green snail found (Figure 8).

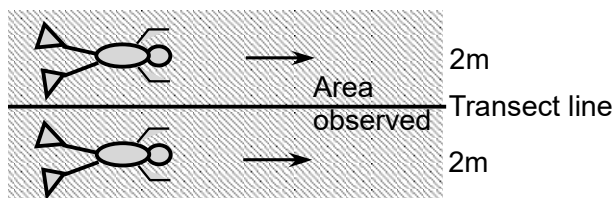


Figure 7. Belt transect.



Figure 8. Estimating the size of green snails using callipers.

6. To understand the relationship between green snail distribution and the substrate, we recorded the substrate cover beneath each transect line, as shown in Figure 9. The substrate cover was grouped into categories viz. bedrock, coral, boulder, dead coral, soft coral, gravel, and sand.

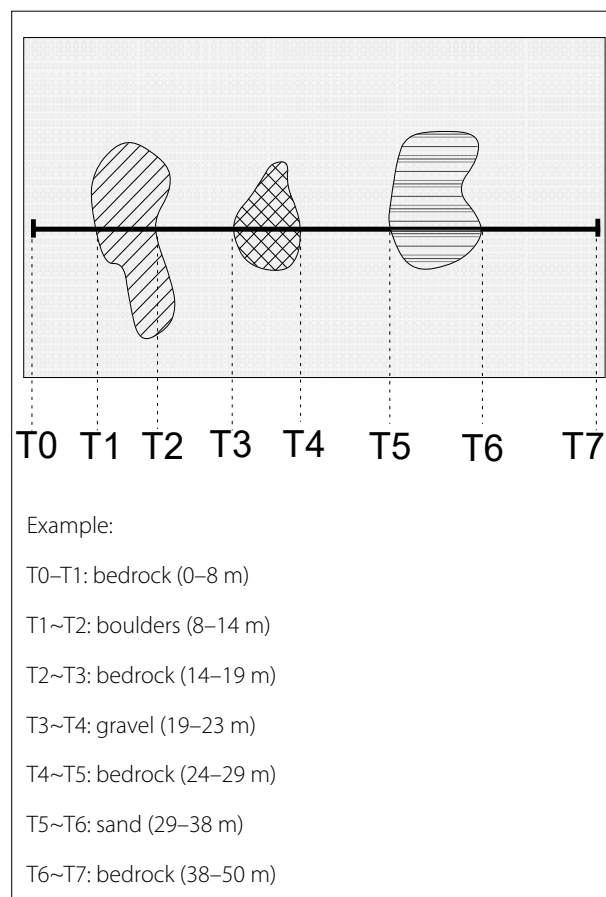


Figure 9. Example of a substrate cover record.

7. Numbers of individuals of green snails recorded in the research sites were analysed statistically using the analysis of variance method (ANOVA) to estimate the density differences between a restocking area and surrounding areas.
8. When a significant difference appeared through ANOVA, we analysed it by multiple comparison analysis (Post-hoc test), to identify the survey site where a significant difference occurred.
9. Where possible, the data collected were compared with those from previous research conducted by IRD and SPC.
10. We estimated relations between the substrate cover and the frequency of appearance of green snails.

Results and discussion

We conducted surveys from May to June 2017. Exact dates and times of surveys are shown in Table 3.

Table 3. Dates and times of green snail surveys in May and June 2017.

Date of survey	Time	Location	Depth
12-May-17	12:00–16:30	Lelepa	0.5–5.5 m
15-May-17	12:00–16:30	Mangaliliu	0.5–2.0 m
17-May-17	12:00–15:00	Moso	0.5–3.0 m
25-May-17	11:00–14:00	Hat	0.5–4.0 m
25-May-17	14:30–15:30	Mangaliliu	1.0–4.0 m
2-Jun-17	10:30–14:00	Tukutuku Pt.	0.5–6.0 m
8-Jun-17	8:00–14:00	Uripiv and Uri	0.5–6.0 m
15-Jun-17	11:00–15:00	Uripiv and Uri	0.5–2.5 m
16-Jun-17	8:00–11:00	Uripiv and Uri	0.5–2.0 m

Efate Island survey sites are shown in Figure 10. The Uripiv and Uri islands sites are shown in Figure 11.

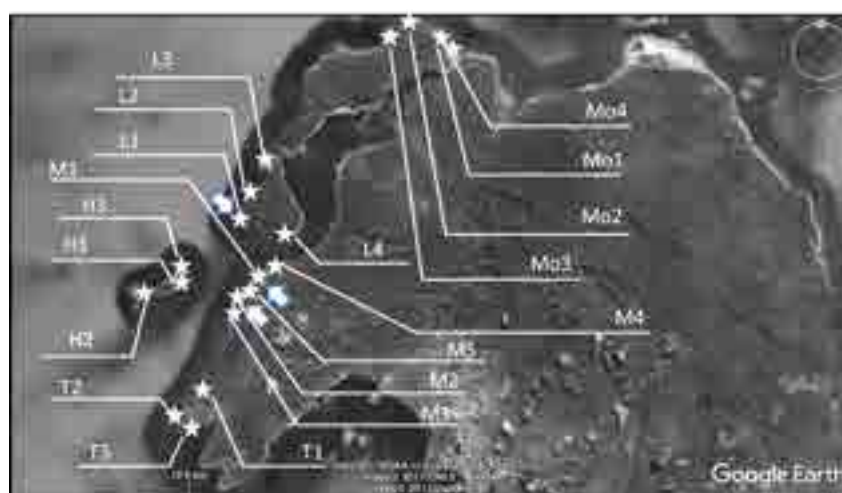


Figure 10. Sites on Efate Island (the arrows show transplantation sites).



Figure 11. Sites on Uripiv and Uri islands (the arrow shows transplantation site).

Based on the data collected, the mean number of individuals per 100 m² on each survey site was estimated. The mean shell height of green snails observed on each survey site was also estimated. We also categorised the substrate cover under the transect line of each survey site.

The summary of the status of each survey site in the north-western part of Efate Island and Uripiv and Uri islands is shown below.

North-western Efate

The mean number of individuals observed per 100 m² at each site, the distribution pattern of shell height and the mean shell height of green snails observed in north-western Efate are shown in Figures 12, 13 and 14, respectively.

The substrate cover of each survey site was categorised and then each mean value was estimated. The result is shown in Figure 15.

Summaries of the occurrence status of green snails and the substrate cover of each survey site are given below.

Lelepa Island

On Lelepa Island, four sites were surveyed, each one covering a 1000 m² area (50 m x 4 m x 5 transect lines). All of Lelepa Island is designated as a taboo area and all coastal fisheries are restricted. According to the local fishers who participated as data collectors in the survey, the green snail had not been observed in the coastal area until its transplantation was conducted.

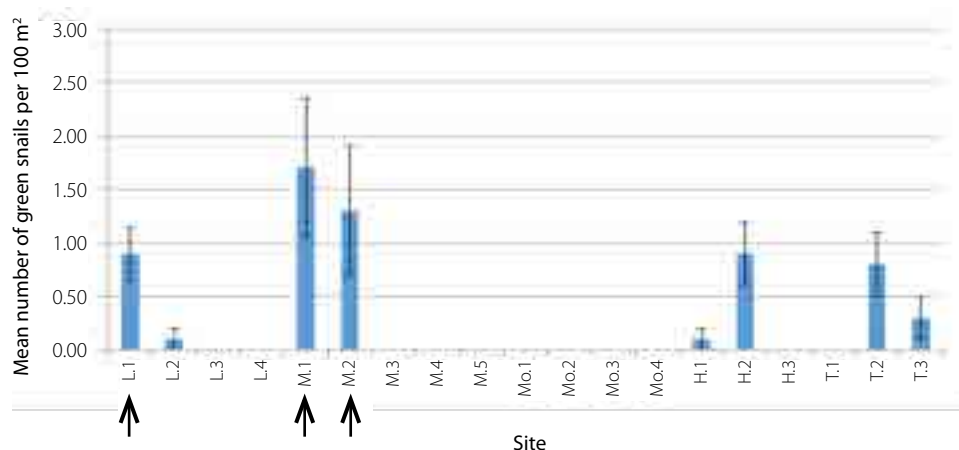


Figure 12. Mean number of green snails per 100 m², and standard error, in each survey site of north-western Efate Island (arrows indicate transplantation sites).

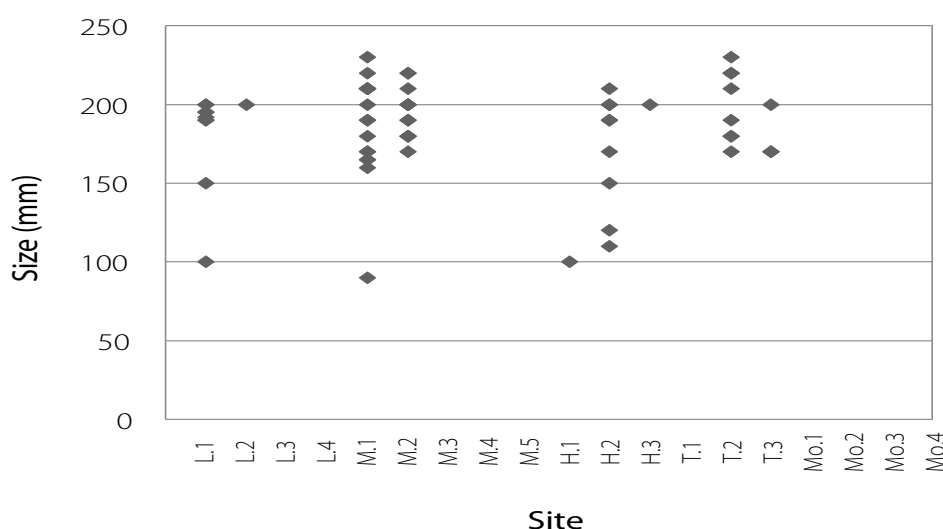


Figure 13. Distribution pattern of shell height of green snails observed in each survey site of north-western Efate Island.

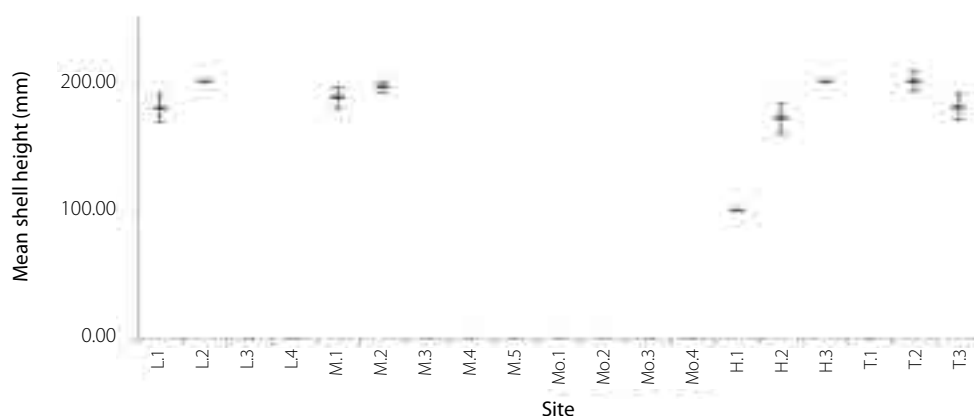


Figure 14. Mean shell height and standard error of green snails observed in each survey site of north-western Efate Island.

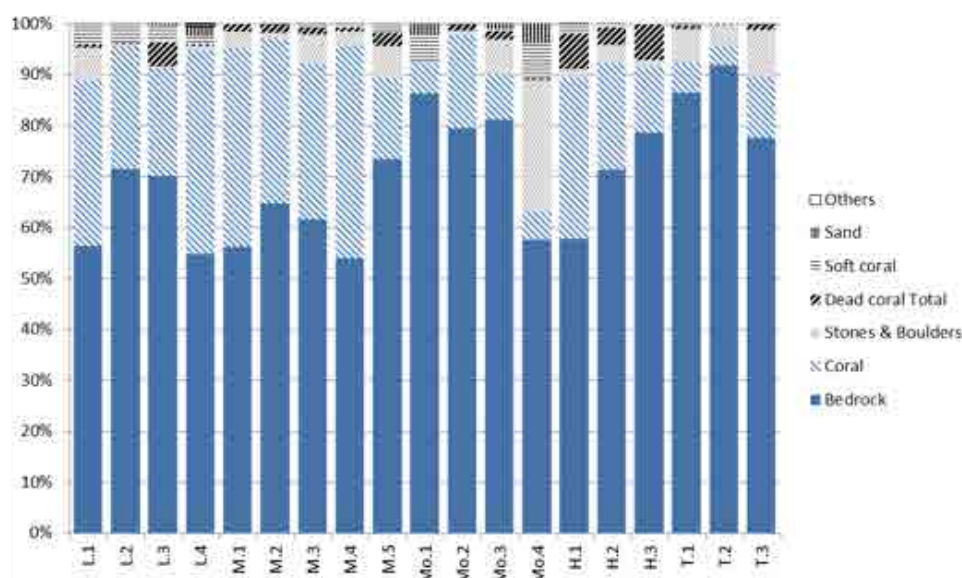


Figure 15. Bottom condition of each survey site of north-western Efate Island.

In L.1 (Figure 10), 195 green snails were transplanted in 2007. A total of nine were observed and the mean number of individuals per 100 m² was 0.90 (SE = 0.24). When compared with other survey sites of Lelepa, this site showed a high occurrence ratio of green snails. The range of shell height of green snails observed was 100–200 mm, and the mean shell height was 179.11 mm (SE = 11.11 mm). The survey site substrate was mainly composed of flat bedrock (>50 %) and coral (>30%), and did not include gravel or sand.

In L.2 (Figure 10), approximately 1 km distant from L.1, only one green snail was observed. The mean number of individuals per 100 m² was 0.10 (SE = 0.10). The shell height of the green snail observed was 200 mm. The survey site substrate was mainly composed of flat bedrock (>70 %) and coral (<25%).

In L.3, located (Figure 10) approximately 1 km distant from L.2, no green snail was observed. The survey site substrate was mainly composed of flat bedrock (>70 %) and coral (≈25%).

In L.4, located approximately 2.6 km west of L.1 (Figure 10), no green snail was observed. The survey site substrate was mainly composed of flat bedrock (>70 %) and coral (≈20%), and did not include either gravel or sand.

As stated above, the highest occurrence of green snails was found in L.1, the transplantation site. Two or more generations probably existed there owing to the size range. Only one individual was observed in L.2, and no green snail was found in L.3 and L.4. Consequently, it is obvious that the green snail resources had increased around the transplantation

site, although the distribution area of green snails was still limited to a very narrow range.

Mangaliliu

In Manzgaliliu, five sites were surveyed, each covering a 1000 m² area (50 m x 4 m x 5 transect lines). The whole area of Mangaliliu is a taboo area implying various fishery restrictions. The green snail fishery, as in all other Vanuatu waters, is closed due to a moratorium until 2020 (Fisheries Act). According to local fishers, the green snail had not been observed in the surrounding area before transplantation took place.

In M.1 (Figure 10), 262 green snails were transplanted in 2007. During this survey, 17 individuals were observed, and the mean number of individuals per 100 m² was 1.70 (SE = 0.64). It was a relatively high occurrence ratio in comparison to those of other sites. The range of shell height of green snails observed was 90–230 mm, and the mean shell height was 187.06 mm (SE = 8.02 mm). There are hardly any data for the growth curve of the green snail anywhere in the world. According to Kakuma (2017), however, in the Amami Islands, of southern Japan, green snail sizes are as follows:

- 1 year old: around 30 mm;
- 2 years old: around 70 mm;
- 3 years old: around 120 mm;
- 4 years old: around 160 mm; and
- 5 years old: around 200 mm.

Generally, the growth of invertebrates, such as conches, is highly influenced by the local environment. It should therefore be expected that green snail growth would be faster in Vanuatu than in Okinawa and Amami, because water temperature is usually higher in Vanuatu. Nevertheless, the range of green snail shell heights observed in the survey sites suggests that several generations occupy these sites. Three individuals had marks indicating that they had been transplanted. These individuals were approximately 10 years old. The survey site substrate was mainly composed of flat bedrock (>50 %) and coral (≈40%), and did not include gravel or sand.

In M.2 (Figure 10), 205 green snails were transplanted in 2007. In this survey, 13 individuals were observed, and the mean number per 100 m² was 1.30 (SE = 0.60). This showed a relatively high occurrence ratio compared with other survey sites, except for M.1, another restocking site. The range of shell height of green snails observed was 180–220 mm, and the mean shell height was

195.38 mm (SE = 4.33 mm). The survey site substrate was mainly composed of flat bedrock (>60 %) and coral (≈30%), and did not include gravel or sand.

In M.3 (Figure 10), located approximately 2 km from M.1 and approximately 800 m south of M.2, no green snail was observed. The survey site substrate was composed mainly of flat bedrock (>60 %) and coral (≈30%); it did not include gravel or sand.

In M.4 (Figure 10), located approximately 1 km northeast of M.1, no green snail was observed. The survey site substrate was mainly composed of flat bedrock (≈50 %) and coral (≈40%); it did not include gravel or sand.

M.1, M.2, M.3 and M.4 substrates showed no major differences.

In M.5 (Figure 10), located between M.1 and M.2, approximately 500 m from both sites, no green snail was observed. The survey site substrate was mainly composed of flat bedrock (≈73 %) and coral (≈15%); it did not include gravel or sand. Topographically, when compared with those of other sites, M.5's bedrock ratio was larger, and that of coral was lower.

As stated above, many green snails were observed in M.1 and M.2, which were transplantation sites and no green snail was found in other sites. In particular, green snails did not occur in M.5, the mid-way point between the two transplantation sites. Meanwhile, in M.1 and M.2, two or more generations probably co-existed, considering the size differences. It was therefore deduced that green snail resources are limited in distribution to a small range, although they had settled successfully around the transplantation sites.

Moso Island

In Moso Island, four sites were surveyed. In 2007, 150 green snails were transplanted in front of Sunae Village. However, according to the VFD staff who conducted the activity, there was no accurate information about the location of the transplantation. The method of transplantation was to sprinkle the green snails from the boat in waters of about 10 m depth. This was different from the transplantation method used in Lelepa Island and Mangaliliu.

The survey method used in Moso had to be the same than this used in Lelepa and Mangaliliu – a survey method targeting areas of 0.5–3.0 m water depth. Therefore the survey could not be done at the 10-m deep transplantation site. We decided to conduct surveys of the transplantation area at a later date. No taboo area has been declared on Moso Island.

Mo.1 (Figure 10) was the nearest site to the transplantation site, according to VFD staff. However, we could not estimate the distance between the two sites because of the lack of the information about the exact location of the transplantation site. We could not find any green snails there. The survey site substrate was composed mainly of flat bedrock (> 85 %) coral (≈5%) and soft coral (≈5%). The coverage of bedrock was extremely high in this site.

In Mo.2 (Figure 10), approximately 2 km from Mo.1, no green snail was observed. The survey site substrate was mainly composed of flat bedrock (≈80 %) and coral (≈18%). The coverage of bedrock was high in this site, as in Mo.1.

In Mo.3 (Figure 10), approximately 700 m west of Mo.2, no green snail was observed. The survey site substrate was composed mainly of flat bedrock (≈80 %), coral (≈10%) and boulders (≈10%). The coverage of bedrock was also high in this site.

In Mo.4 (Figure 10), approximately 800 m southwest of Mo.1, no green snail was observed. The survey site substrate was mainly composed of flat bedrock (≈60 %), boulders (25%), soft coral (≈7%) and coral (≈6%). The coverage of boulders was relatively high compared with other sites on Moso Island.

At Moso Island survey sites, substrate was dominated generally by bedrock, and few coral colonies were observed. It suggested that the area is always subject to strong wave action, which may influence the green snail distribution.

Hat Island

Although the transplantation of green snails had not been conducted around Hat Island, it was one of the good fishing grounds for green snails before the enforcement of the moratorium on the fishery, and was known as good habitat for green snails. The area is located approximately 5 km from the transplantation sites of Lelepa and Mangaliliu. VFD staff expected Hat Island to be good habitat for young snails produced during spawning events at Lelepa and Mangaliliu transplantation sites, and which could have drifted during their larval stages. All coastal waters around Hat Island were established as a taboo area and green snail fishing was banned.

On Hat Island, three sites were surveyed, each one covering an area of 1000 m² (50 m x 4 m x 5 transect lines). In H.1 (Figure 10) located on the northeast coast of the Island, one green snail was found. The mean number of individuals per 100 m² was therefore 0.10 (SE = 0.10). The shell height of the green snail observed was 100 mm, and it was considered

to be a young individual. The survey site substrate was composed mainly of flat bedrock (≈60 %), coral (≈30%) and dead coral (≈7%).

H.2 (Figure 10) is located on the west coast of Hat Island. According to local fishers, the area was usually difficult to approach because of high waves. In H.2, nine green snails were found and the mean number of individuals per 100 m² was 0.90 (SE = 0.29); the same density was found at L.1 site on Lelepa Island. The green snail shell height range was 110–200 mm, and the mean shell height was 171.11 mm (SE = 12.18 mm). The high range of shell heights suggests the presence of multiple generations at the site. The survey site substrate was mainly composed of flat bedrock (>70 %) and coral (≈20%).

H.3 (Figure 10), located in northern point of the Island, is usually difficult to approach because of high waves. In H.3 (Figure 10), one green snail was found. The mean number of individuals per 100 m² was therefore 0.10 (SE = 0.10). The shell height of the green snail observed was 200 mm. The survey site substrate was composed mainly of flat bedrock (>80 %), coral (≈10%) and dead coral (≈7%).

On Hat Island, although the transplantation of green snails had not been conducted, a number of green snails were observed, especially in H.2. Besides, the high range of shell heights of green snails observed suggests the existence of multiple generations in the area.

According to VFD staff, no survey targeting green snails had previously been conducted in Hat Island. However, no green snails were observed in 2012, when they conducted other surveys around Hat Island. Therefore, it was deduced that the green snail resource had increased over the last 4–5 years.

Tuku Tuku Point

The transplantation of green snails had not been done around Tuku Tuku Point. Like Hat Island, the area was a green snail fishing ground before the enforcement of the moratorium, and the area was known originally as a good habitat for green snails. Tuku Tuku Point is located 6–8 km from transplantation areas of Mangaliliu and Lelepa. VFD staff estimated the distance suitable for bottom settlement of suspended larvae spawned at transplantation sites of Mangaliliu and Lelepa. Coastal waters around Tuku Tuku point were also a taboo area.

At Tuku Tuku Point, three sites were surveyed, each covering an area of 1000 m² (50 m x 4 m x 5 transect lines).

At T.1 (Figure 10), located 2 km north of the tip of Tuku Tuku Point, no green snail was observed. The survey site substrate was mainly composed of flat bedrock (>85 %), boulders ($\approx 7\%$) and coral ($\approx 6\%$).

At T.2 (Figure 10), located 1.5 km north of T.1, the sea was rough and strong currents were flowing at the time of the survey. At T.2, eight green snails were observed and the mean number of individuals per 100 m² was 0.80 (SE = 0.30). The range of shell height of green snails observed was 170–230 mm, and the mean shell height 200.00 mm (SE = 8.02 mm). The survey site substrate was mainly composed of flat bedrock (>90%), coral ($\approx 4\%$) and boulders ($\approx 4\%$). The bedrock ratio was very high, suggesting the constant presence of strong waves.

At T.3, located on the east coast of Tuku Tuku Point, seas were rough and strong currents were flowing during the time of the survey. At T.3, three green snails were found and the mean number of individuals per 100 m² was 0.30 (SE = 0.20). The range of shell height of green snails observed was 170–200 mm, and the mean shell height was 180.00 mm (SE = 10.00 mm). The survey site substrate was mainly composed of flat bedrock (>80%), coral ($\approx 10\%$) and boulders ($\approx 10\%$).

Because of rough seas, the survey could not be carried out at the tip of Tuku Tuku Point. According to VFD staff, the density of green snails at the tip might be higher than at T.2, because it was a good fishing ground for green snails before the enforcement of the moratorium.

Based on those results, comparative densities of each area are shown in Figure 16.

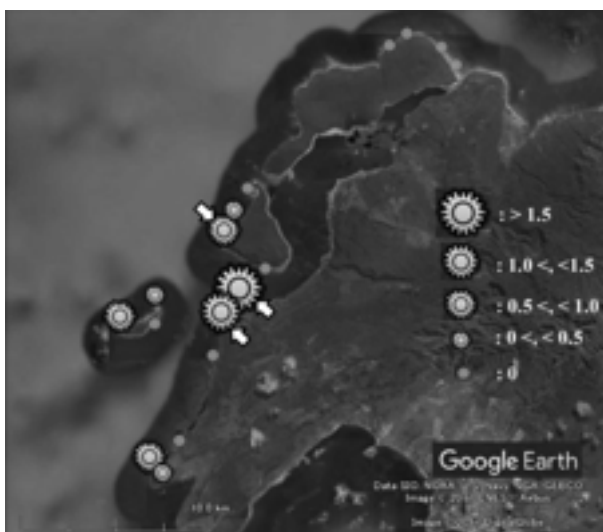


Figure 16. Mean number of individuals per 100 m² at each station in north-western Efate (arrows indicate restocking sites).

As described above, the density of green snails in all transplantation sites was quite high. At the time of the present survey, no survey focusing on the effect of transplantation of green snails had been conducted. One of the aims of the present survey was to scientifically evaluate if transplantation of green snails contributed to the resource increase. To do so, an analysis of variance (ANOVA) was used to evaluate the variation of the green snail population at each survey site.

However, when using normal ANOVA, no equality of variance was detected among the data. When no compared group shows an equality of variance, it is advisable to adopt a non-parametric technique that does not require the assumption of the population distribution. Therefore, we used the Kruskal-Wallis test, a non-parametric ANOVA, rather than the normal ANOVA. Each test detected a significant difference ($p < 0.05$). Therefore, we then performed the Tukey HSD test to examine the difference between each survey site. As a result, we detected a significant difference between M.1 and other survey sites without green snails, but we could not detect significant differences between M.1 and other sites with green snails such as M.2, L.1, H.2, H.3, T.2 or T.3. M.2 and L.1 showed significant differences in the number of green snails, but it was difficult to detect any significant difference between other survey sites. However, it should be noted that transplantation of green snails probably contributes to the resource enhancement, as the density of green snails was high in all transplantation sites.

The survey sites of the transplantation at Mangaliliu were almost the same sites used in the study conducted by IRD, mentioned above, although the range of the surveys was different. Therefore, we compared the results of this survey and the IRD study, as shown in Table 4. It revealed that the green snail density in the transplantation sites that we surveyed is extremely high compared with the results of IRD, although a simple comparison should not be made, because of the difference in survey ranges.

In another study, Kakuma (2017) concluded that the density of green snails in transplantation sites arises from the broodstock created by either transplantation or wild stocks. He concluded further that the transplantation sites in Mangaliliu showed relatively high densities compared with surrounding areas because the transplantation of green snails contributed to the increase of the broodstock and resources in the area, although this was difficult to quantitatively verify.

Also, there were places where green snails were present 4–6 km away from the transplantation

Table 4. Comparison of the results by the IRD and this survey.

Green snail density per hectare			
Results from IRD's 2012 study		Results from this survey	
Inside of taboo area	Outside of taboo area	M.1 site (inside taboo area in 2012)	M.2 site (outside of taboo area in 2012)
21.42 ind. ha ⁻¹	6.00 ind. ha ⁻¹	170.00 ind. ha ⁻¹	130.00 ind. ha ⁻¹

site, including at Hat Island and Tuku Tuku Point, whereas almost no green snails were found in sites 400–500 m away from transplantation sites. There may be two sources for the many green snails found at Hat Island and Tuku Tuku Point. The first is the reproduction of wild populations that remain there, and the second is the drifting larvae from broodstock of transplantation sites that reach Hat Island and Tuku Tuku Point 1–2 days after being spawned. On the north-western coast of Efate, a southward flowing current is dominant, according to information provided by local fishers and VFD staff. Thereby, larvae produced in Lelepa Island and Mangaliliu possibly drift southward and settle at Hat Island and Tuku Tuku Point.

In future research, it will be important to monitor tidal currents of coastal waters to better understand green snail population dynamics.

Uripiv Island and Uri Island

The mean number of individuals observed per 100 m² at each site, the distribution pattern of shell height and the mean shell height of green snails observed in Uripiv and Uri islands are shown in Figures 17, 18 and 19 respectively. The location of each survey site is shown in Figure 11.

The substrate cover of each survey site was categorised. The result is shown in Figure 20.

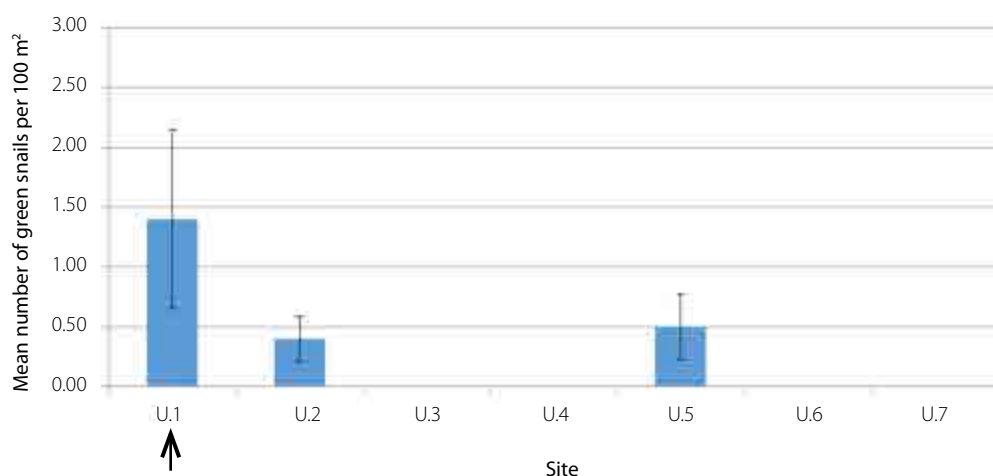


Figure 17. Mean number of green snails per 100 m² (±SE) at each station in Uripiv and Uri islands (arrow shows restocking site)

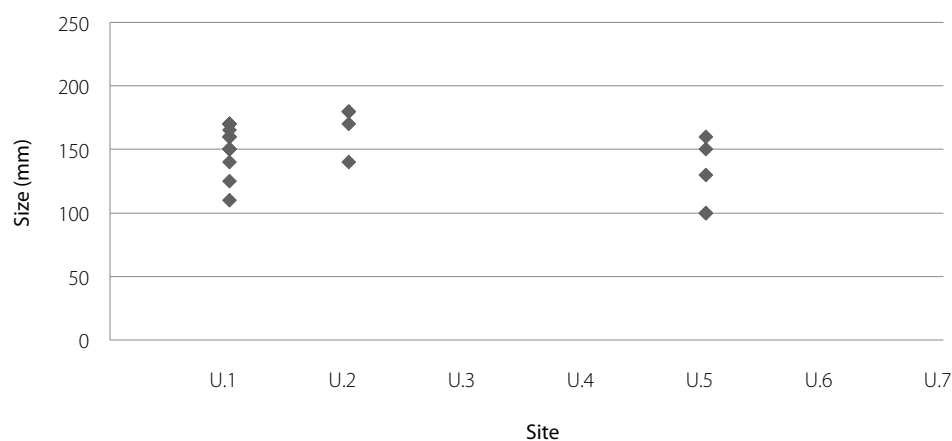


Figure 18. Shell height distribution pattern of green snails found at each survey site in Uripiv and Uri islands.

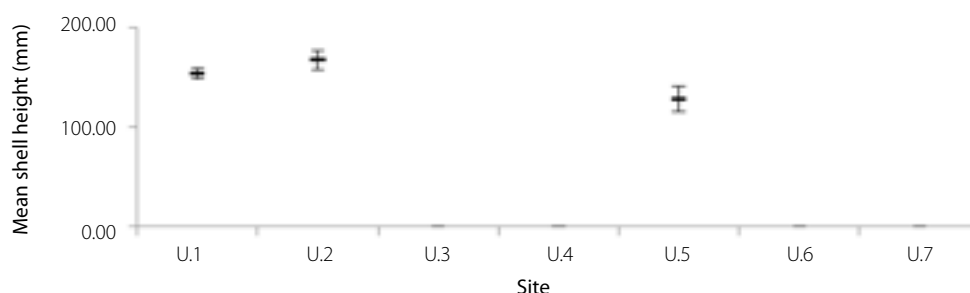


Figure 19. Mean green snail shell height ($\pm$ SE) recorded at each survey site in Uripiv and Uri islands.

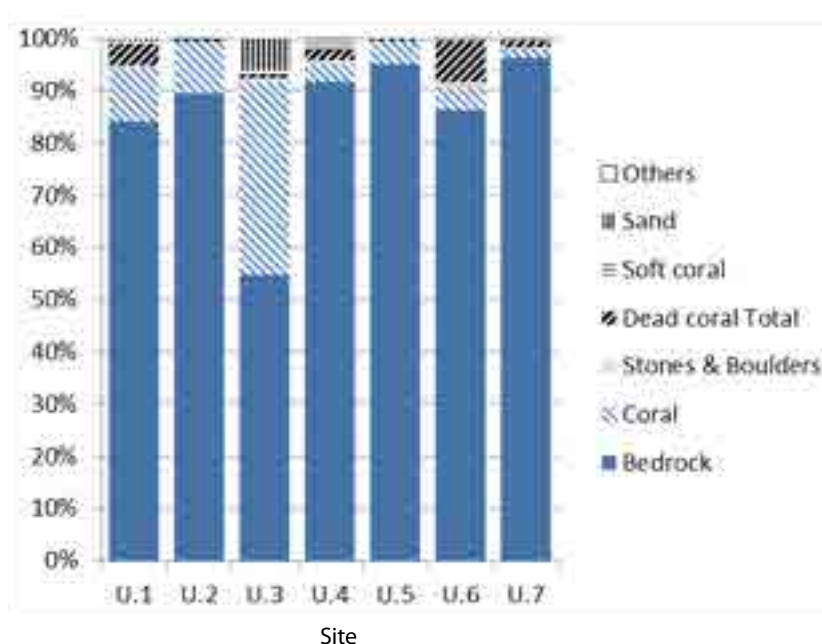


Figure 20. Substrate composition of each survey site in Uripiv and Uri islands.

Brief overviews of the occurrence status of green snails and the substrate cover of each survey site are given in the following section.

Uripiv Island

Uripiv is a small island with a population of 300–400 people located off the northeast of Malakula Island, at a straight line distance of approximately 2.5 km. Four sites, each covering an area of 1000 m² (50m x 4m x 5 transect lines), were surveyed on Uripiv Island, of which three (U.1, U.2 and U.3 – Figure 11) were taboo areas where fishing activities had been banned. According to local VFD staff, green snails had not been seen for 20 years in the coastal waters of Uripiv until transplanted was implemented.

In U.1 (Figure 11), located at the east end of Uripiv Island, 299 and 28 green snails were transplanted in 2012 and 2013, respectively. The individuals transplanted had been kept in a water tank at VFD for several years, although the growth rates of these snails were poor. In 2012, the average shell height of individuals transplanted was 56 mm. In 2013, 20 and eight individuals had shell heights of 80 mm and 60 mm, respectively.

In U.1, 14 green snails were found and the mean number of individuals per 100 m² was 1.40 (SE = 0.75). The green snail density was relatively high when compared with all survey sites. The range of green snail shell heights observed was 110–170 mm, and the mean shell height was 153.57 mm (SE = 4.84

mm). These sizes were relatively small in comparison to those observed in Efate. The survey site substrate was mainly composed of flat bedrock ($\approx 85\%$) and coral ($\approx 10\%$). No gravel or sand was observed.

In U.2, located at the northern tip of the island and 1.6 km northeast of U.1 (Figure 11), four green snails were found; the mean number of individuals per 100 m² was 0.40 (SE = 0.19). The range of green snail shell heights observed was 140–180 mm, and the mean shell height was 167.50 mm (SE = 9.46 mm). The survey site substrate was mainly composed of flat bedrock ($\approx 90\%$) and coral ($\approx 10\%$).

In U.3, located on the western side of the island and 1.0 km southwest of U.2 (Figure 11), no green snail was found. The survey site substrate was composed mainly of flat bedrock ($\approx 55\%$) and coral ($\approx 40\%$). In this site, coral coverage was relatively high in comparison to those of U.1 and U.2.

U.4 is located on the southern side of the island and at a 300 m direct distance from U.1 (Figure 11). This site was selected in the hope that it would host young green snails issued from individuals transplanted in U.1. But, no green snail was found in U.4. The survey site substrate was composed mainly of flat bedrock ($\approx 90\%$) and coral ($\approx 3\%$).

As stated above, a relatively high number of green snails occurred in U.1, which was a transplantation site. Multiple generations probably existed in the site owing to the high range of sizes. In sites where no transplantation occurred, only four individuals were observed in U.2 on the north side, but none were observed in U.3 and U.4. It was therefore deduced that green snail resources had increased in the transplantation site, although their distribution was limited to a small range.

Uri Island

Uri is a small island located to the south of Uripiv Island. The shortest distance between Uri and Uripiv islands is approximately 1 km. On Uri Island, transplantation of green snails had not been conducted. However, since the island was close to Uripiv Island, three survey sites were set on the northern coast, facing Uripiv Island. According to local VFD staff, green snails had not been observed around the northern coast for 20 years.

U.5 is approximately 1.5 km from U.1 of Uripiv Island, which is located in the outer edge of the reef flat that extended along the east side of the island (Figure 11). In this survey, five green snails were found. The mean number of individuals per 100 m² was 0.50 (SE = 0.27). The range of green snail shell heights was 140–180 mm, and the mean shell height

was 128.00 mm (SE = 12.41 mm). As at U.1, these sizes were relatively small in comparison to those recorded in Efate. The survey site substrate was mainly composed of flat bedrock ($\approx 95\%$) and coral ($< 5\%$). No gravel or sand was observed.

U.6 is approximately 1.2 km north-west of U.5 and approximately 1.5 km from U.1 of Uripiv Island (Figure 11). In U.6, no green snail was observed. The survey site substrate was composed mainly flat bedrock ($> 85\%$), dead coral ($\approx 8\%$) and coral ($\approx 4\%$).

U.7 is located on the north-west coast approximately 600 m southwest of U.6 and approximately 2 km from U.1 of Uripiv Island (Figure 11). In U.7, no green snail was observed. The survey site substrate was composed mainly flat bedrock ($> 95\%$) and coral ($< 2\%$).

As stated above, no green snail was found at U.6 and U.7, but five were found at U.5, which is located on the outer edge of reef flat that extends along the east side of the island. As no green snail had been found in the northern coast of Uri Island for 20 years, it may be considered that the U.5 green snails may be related to those transplanted at U.1.

Based on these results, green snail densities (average number of individuals per 100 m²) are summarised in Figure 21.



Figure 21. Mean number of green snails per 100 m² at each station in Uripiv and Uri islands (arrow indicates restocking site).

As in Efate Island, the highest green snail density in Uripiv Island was found in the transplantation site. We then conducted an analysis of variance (ANOVA) to evaluate if green snail densities in the different sites were significantly statistically different. Equality of variance was not detected among the data. Thereby, we used the Kruskal-Wallis test

again. Each test detected a significant difference ($p < 0.05$). Therefore, we used the Tukey HSD test to examine the difference between each survey site. We detected a significant difference between U.1 and survey sites where no green snails were found (U.3, U.4, U.6 and U.7). But we could not detect significant differences between U.1 and other sites where green snails were found (U.2 and U.5). No significant difference was detected when comparing the densities of U.2, U.3, U.4, U.5, U.6 and U.7. Thus it can be concluded that the green snail density of the transplantation site (M.1) was the only one that was significantly higher than those of other survey sites. This suggests that the transplantation of green snails was likely to have contributed to resource enhancement of green snails in Uripiv and Uri islands.

In U.2 and in U.5, approximately 1.6 km north-west and 1.5 km south-east from the transplantation site (U.1) (Figure 11), green snails were found for the first time in 20 years. It is possible that green snail larvae produced in U.1 drifted with the current through the east bank of Uripiv and Uri islands and settled in U.2 and U.5. It would be useful to monitor

the currents in the region in order to confirm this hypothesis and better understand green snail population dynamics in the area.

Relationships between the density of green snails and the substrate

The relationship between the number of green snails found and the coverage of bedrock in each site surveyed is given in Figure 22.

The relationship between the number of green snails found and the coverage of coral in each site surveyed is given in Figure 23.

As shown in Figures 22 and 23, no close correlation was found between the number of green snails and the coverage of bedrock. Neither was a close correlation between the number of green snails and the coverage of coral. In the sites where the number of green snails was 0 or 1, it was assumed that larvae could not survive. Therefore, these areas were excluded. The coefficient of correlation became (R) = -0.5791 between the number of green snails and the coverage of bedrock in the

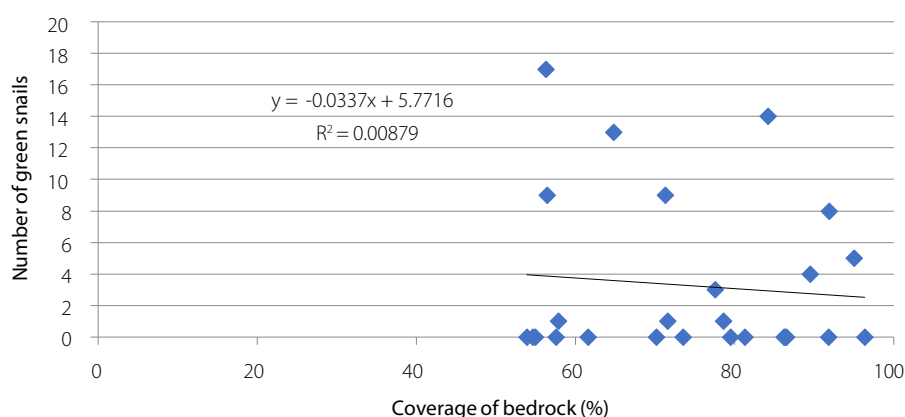


Figure 22. Relationship between the number of green snails and the coverage of bedrock.

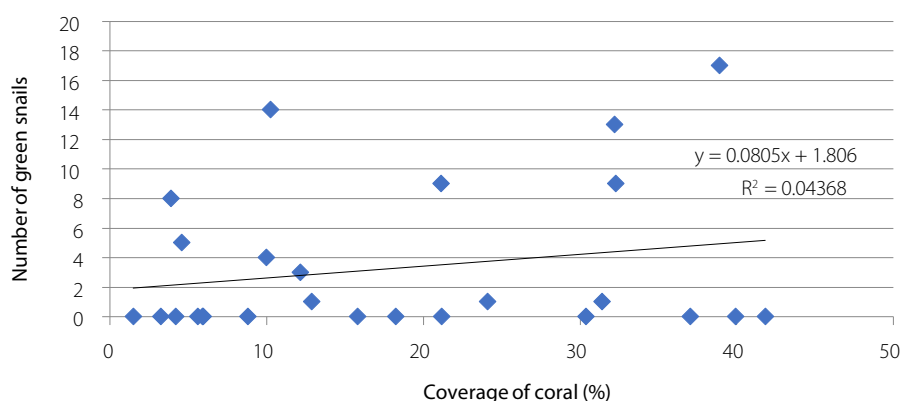


Figure 23. Relationship between the number of green snails and the coverage of coral.

range of 50–100%. Likewise, the coefficient of correlation (R) = 0.6510 between the number of green snails and the coverage of coral was in the range of 0–50%.

The common criterion of the coefficient of correlation is given in Table 5. Therefore, each relationship is thought of as a moderately strong correlation when more than one green snail appeared.

Table 5. Coefficient of correlation and correlation strength.

Coefficient of correlation	Correlation strength
$R = 0.7-1$	strong correlation
$R = 0.4-0.7$	moderately strong correlation
$R = 0.2-0.4$	weak correlation
$R = 0-0.2$	no correlation

As shown in the Figures 24 and 25, there is a moderately strong negative correlation between the number of green snails and the coverage of

bedrock, in the range of 50–100% and, there is a moderately strong positive correlation between the number of green snails and the coverage of coral, in the range of 0–50%, in sites where more than one green snail occurred.

In addition, this survey suggests that the suitable habitat of green snails is very limited, since it did not occur at sites close to the transplantation site. Usually, the green snail inhabits a substrate of bedrock and does not occur on gravel and sandy bottoms.

It is also considered that the area with abundant bedrock with rugosity (irregularities and dimples) is a suitable habitat for green snails. Furthermore, it is expected that locations with abundant microalgae as feed would be a preferred habitat for green snails. Because of time limitations, we were unable to collect data on the rugosity of the bedrock and the availability of microalgae as feed for green snails. It would be necessary to collect topographical details and distribution pattern of microalgae and correlate them with occurrence of the green snail to understand its optimal habitat conditions.

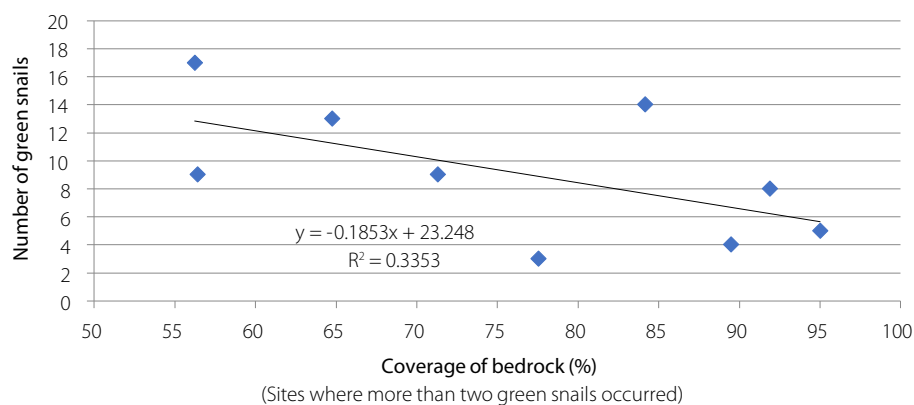


Figure 24. Relationship between the number of green snails and the coverage of bedrock in the range of 50–100%.

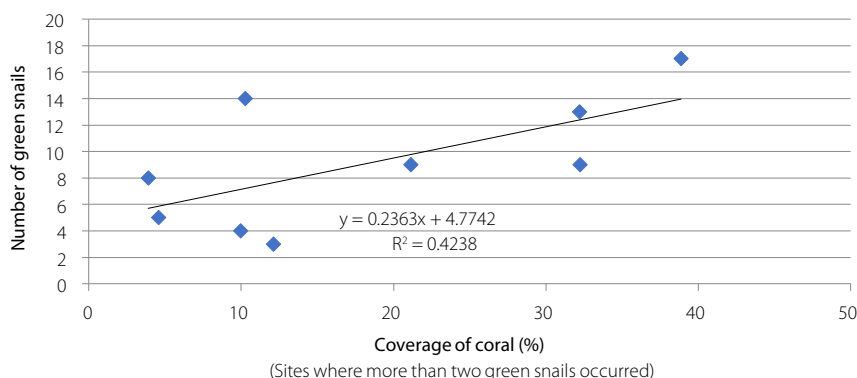


Figure 25. Relationship between the number of green snails and the coverage of coral in the range of 0–50%.

Questionnaire survey for understanding the motives of villagers participating in green snail transplantation and conservation activities

Survey site

The targets were the people in communities who were conducting the transplantation of green snails. These were the inhabitants of villages on Lelepa, Mangaliliu and north-western Efate, and the village of Uripiv Island, located in eastern Malakula Island.

Methods

Information was collected from target villagers using a questionnaire, calibrated by age and gender (Table 6). The questionnaire survey was based on 'Scheffe's pairwise comparisons test', a comparative method used in marketing research, to understand the most important motive for managing and conserving the green snail and as a reference in conducting future similar resource management. On

the survey form, we gave examples of motives and received the information regarding the most important motive from each respondent. For example, A) *Because I know (or learned) that it's important and necessary to protect the green snail as a valuable resource;* B) *Because I will be able to make a profit when green snail fishing is re-opened;* C) *Because we decided in a community meeting not to catch green snails;* and D) *Because we have to follow the law and custom that imposed a ban on green snail fishing.*

The data collected in the survey was arranged by age group and gender, and analysed by pairwise comparison to understand the most important factor in the community.

We then compared the results of the questionnaire administered in each community using pairwise comparisons and analysed the results by ANOVA and multiple comparison tests, to estimate the most important motive among these of A–D, for the villagers of each community implementing transplantation of green snail.

Table 6. Questionnaire administered for understanding the villagers' motives for participating in green snail transplantation and conservation activities.

Information on respondent	
Village/community (if we have the information)	
Name of enumerator (if we have the information)	
Date of interview (if we have the information)	
Name of interviewee (if we have the information)	
1. Age	
2. Gender (m = male, f = female)	
3. Usual number of hours of fishing per day	
4. The group activity you participate periodically in the village	
General knowledge on green snails	
5. What do you know about green snail?	
5.1 The resources have been endangered since the 1990's owing to overfishing. (y = Yes, n = No)	
5.2 Green snail fishing has been banned since 2005 by national law. (y = Yes, n = No)	
5.3 Green snails are rare and an expensive worldwide. (y = Yes, n = No)	
5.4 Green snails were exported previously from Vanuatu as a raw material for ornamentations. (y = Yes, n = No)	
5.5 Green snails seem to be increasing recently. (y = Yes, n = No)	
5.6 Other.	
6. Were you taught about green snails by your family, community elders or school teachers? (y = Yes, n = No)	
7. If you selected 'Yes' on question 6, what kind of topic and from whom did you receive it?	
8. How large does a green snail become, and in how many years?	
Attitude to conservation activity for green snails	
9. Did you catch green snails until the fishing ban of 2005? (y = Yes, n = No)	
10. If you selected 'Yes' on question 9, how many did you find in your area around 2005? a = 0. b = Less than 5 within a day's dive. c = Less than 10 within a day's dive. d = 10 or more within a day's dive.	

Table 6 (continued).

11. Did you participate in the restocking activities for green snails organised by JICA? (y=Yes, n=No)																																																																														
12a. If you selected 'Yes' on question 11, what was the reason for your participation? a = Because I thought it was a meaningful activity. b = Because I was ordered to by a village chief or leader. c = Because I was invited by friends or acquaintances. d = Other. If 'Other', write the answer here:																																																																														
12b. If you selected 'No' on question 11, what was the reason for your non-participation? a = Because I didn't know about the activity. b = Because I was too busy with other things. c = I was not interested in the activity. d = Other. If 'Other', write the answer here:																																																																														
13. Do you think the restocking of green snails is a good activity in order to protect and increase the green snail population? (y=Yes, n=No)																																																																														
14. Do you think surveillance is needed to protect green snail resources from now on? (y=Yes, n=No)																																																																														
15a. If you selected 'Yes' on question 14, how do you think you should carry on the surveillance or monitoring activities?																																																																														
15b. If you selected 'No' on question 14, why do you think you do not have to do surveillance or monitoring activities?																																																																														
Motive for conservation activities of green snails																																																																														
16. What is the most important reason for protection of green snail populations? Respondents replies must be graded from highly positive (+4) through neutral (0) to highly negative (-4).																																																																														
	<table border="1"> <thead> <tr> <th></th> <th>+4</th> <th>+3</th> <th>+2</th> <th>+1</th> <th>0</th> <th>-1</th> <th>-2</th> <th>-3</th> <th>-4</th> <th></th> </tr> </thead> <tbody> <tr> <td>A) Because I know (or learned) that it's important and necessary to protect green snail as valuable resource.</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>B) Because I will be able to make a profit when green snail fishing is opened after its resource increases in the future.</td> </tr> <tr> <td>A) Because I know (or learned) that it's important and necessary to protect green snails as valuable resource.</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>C) Because we decided in a community meeting not to catch green snails. (Social linkage – perspective of Socio-culture)</td> </tr> <tr> <td>A) Because I know (or learned) that it's important and necessary to protect green snail as a valuable resource.</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>D) Because we have to obey the law and custom commandment that banned green snail fishing.</td> </tr> <tr> <td>B) Because I will be able to make a profit when green snail fishing is opened after its resource increases in the future.</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>C) Because we decided in a community meeting not to catch green snails.</td> </tr> <tr> <td>B) Because I will be able to make a profit when green snail fishing is opened after its resource increases in the future.</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>D) Because we have to obey the law and custom commandment that banned green snail fishing.</td> </tr> <tr> <td>C) Because we decided in a community meeting not to catch green snails.</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>D) Because we have to obey the law and custom commandment that banned green snail fishing.</td> </tr> </tbody> </table>		+4	+3	+2	+1	0	-1	-2	-3	-4		A) Because I know (or learned) that it's important and necessary to protect green snail as valuable resource.										B) Because I will be able to make a profit when green snail fishing is opened after its resource increases in the future.	A) Because I know (or learned) that it's important and necessary to protect green snails as valuable resource.										C) Because we decided in a community meeting not to catch green snails. (Social linkage – perspective of Socio-culture)	A) Because I know (or learned) that it's important and necessary to protect green snail as a valuable resource.										D) Because we have to obey the law and custom commandment that banned green snail fishing.	B) Because I will be able to make a profit when green snail fishing is opened after its resource increases in the future.										C) Because we decided in a community meeting not to catch green snails.	B) Because I will be able to make a profit when green snail fishing is opened after its resource increases in the future.										D) Because we have to obey the law and custom commandment that banned green snail fishing.	C) Because we decided in a community meeting not to catch green snails.										D) Because we have to obey the law and custom commandment that banned green snail fishing.
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Results and discussion

The number of respondents to the questionnaire in each community, with the information of age and gender, is given in Table 7, daily fishing hours of those who responded is in Table 8, and the number of respondents by group activity is in Table 9.

Based on these data, the general knowledge and attitude toward conservation activity for green snails were reviewed, and the motive for transplantation and conservation activities for green snails was described by the communities in Lelepa, Mangaliliu and Uripiv Islands.

Table 7. Number of respondents to the questionnaires in each community by age and gender.

		≤ 20	≥21 and ≤40	≥41 and ≤60	≥61	Total
Lelepa	Female	2	18	12	2	34
	Male	6	18	17	6	47
	Sub-total	8	36	29	8	81
Mangaliliu	Female	3	11	5	2	21
	Male	4	17	5	1	27
	Sub-total	7	28	10	3	48
Uripiv	Female	2	18	5	0	25
	Male	4	21	10	2	37
	Sub-total	6	39	15	2	62
Total:						191

Table 8. The daily fishing hours of respondents.

		No fishing activity	1–3 hours	3–6 hours	More than 6 hours	Total
Lelepa	Female	3	13	8	10	34
	Male	1	1	13	30	47
	Sub-total	4	14	21	40	81
Mangaliliu	Female	3	1	9	8	21
	Male	0	6	18	3	27
	Sub-total	3	7	27	11	48
Uripiv	Female	5	19	1	0	25
	Male	10	26	1	0	37
	Sub-total	15	45	2	0	62

Table 9. Number of respondents by community group activity (multiple answers allowed).

		Religious group	Female group	Livelihood improvement group	Sport team	Junior chamber	Others	Total
Lelepa	Female	23	6	8	3	2	0	42
	Male	12	0	10	12	5	6	45
	Sub-total	35	6	18	15	7	6	87
Mangaliliu	Female	17	10	2	0	2	0	31
	Male	13	0	3	9	3	1	29
	Sub-total	30	10	5	9	5	1	60
Uripiv	Female	14	0	4	4	0	2	24
	Male	23	0	4	8	0	3	38
	Sub-total	37	0	8	12	0	5	62

Lelepa Island

Many respondents on Lelepa Island knew that the green snail was very valuable although its population had decreased owing to overfishing. It was commonly perceived that the resource had been abundant until the early-1990s, but then suddenly decreased and were hardly found when the total ban on green snail fishing was enforced, in 2005. The information about the resource recovery of recent years had not been shared widely enough. Furthermore, many respondents, both men and women, recognised the green snail was globally expensive, and therefore rare. However, many respondents did not know that Vanuatu had exported many green snails as raw materials for making accessories.

In addition, many male respondents replied that they had been taught about green snails by teachers and their family members. In particular, all the male respondents aged 20 years or younger admitted to getting the information either at school or at home. This might indicate that in recent years, education regarding the coastal resources has advanced. In contrast, many female respondents replied that they had not been taught about it. Thus a contrast occurred by gender.

The commonest information learned from family members was that the shell of green snails was very expensive; therefore, consuming its meat first then selling the shell was recommended. Regarding the population of green snails before a fishing ban was imposed, many responded that they found less than five individual green snails per day when diving. This suggested that the size of populations was formerly very small.

Many respondents felt that the transplantation activity of green snails was useful for its resource enhancement and conservation. Respondents who participated in the transplantation activities of green snails conducted by the Grace of Sea Project felt the activity was meaningful in that it would lead to an increase of green snail resources. Thus, it is inferred that the understanding of the transplantation activity was advanced among those villagers. Furthermore, many respondents felt that villagers must press ahead with monitoring and surveillance activities for the conservation of green snail resources. Such awareness building might be attributed to the activities undertaken through the Grace of the Sea Project.

Mangaliliu

In Mangaliliu, many respondents lacked a basic knowledge of the green snail and did not know that it was very valuable, that it had decreased because of overfishing and that it had been subject to a fishing ban since 2005. Also, there were few

respondents who had conducted green snail fishing before the ban. This might indicate that green snail fishing was not carried out actively in Mangaliliu, or it may suggest that most of respondents do not know of the days when the green snail was abundant, since most were aged in their 20s to 40s. Few recognised that the population of green snails seemed to have increased.

However, many responded that they had been taught about the green snails by their school teachers and family members. Owing to several workshops organised by the Grace of the Sea project, some responded that they learned that the green snail resource would contribute to improvement in their lives if it were to increase in the future. This could be one result of the awareness activity for resource management of the green snail. Regarding the population of green snails before its fishing was banned, a few responded that they found less than five individuals in one day of diving. This suggested that the population size was very small.

Like the respondents on Lelepa Island, those who had participated in the transplantation activities of green snails conducted by the Grace of the Sea project felt that the activity was meaningful, since it would lead to an increase in green snail resources. Many responded that surveillance activity was required for effective conservation of the green snail, and that they would consider cooperating with future activities.

Uripiv Island

On Uripiv Island, it was widely known that the green snail was very valuable, but that it had decreased due to overfishing, that it had been subject to a fishing ban since 2005 and that it was globally rare and so expensive. However, information about the resource recovery and the history of the green snail fishing had not been well shared.

Many respondents had learned that green snail meat was edible and that the shell was expensive from their teachers, chief and family members. However, a few responded that they had conducted regular green snail fishing before the fishing ban. This might suggest that the green snail had not been abundant on Uripiv for a long time.

For those respondents who had participated in the green snail transplanting activity conducted by the Grace of the Sea project, the major motive for participation was that they were members of the community. Besides, most of respondents considered that the transplantation activity of green snails was useful for resource enhancement and conservation of the resource. This attitude could demonstrate that the understanding of the transplantation

was advanced among the villagers. In contrast, a few responded that surveillance activity to protect green snail resources was unnecessary, since the fishing ban was already legally established and no villagers would break the law by poaching. It might be that because Uripiv is a very small island, there is a high trust among community members because strangers do not often visit.

The ranking order of the four motives for participating in the transplantation and conservation activities exemplified above were analysed statistically using Scheffe's pairwise comparisons test. Results for each community are given in Tables 10 to 12.

Table 10. Order of the motive of villagers in Lelepa Island for transplantation and conservation of green snails.

Lelepa Island			Number of samples	Order of the strength of the motive (the higher the number, the stronger the motive)			
				1 st	2 nd	3 rd	4 th
In total:			81	B: 1.373	D:0.015	A: -0.012	C: -1.377
Breakdown	Gender	Female	34	B: 1.331	D:0.110	A: -0.294	C: -1.147
		Male	47	B: 1.404	A: 0.191	D:0.053	C: -1.543
	Age group	x <= 20	7	B: 1.857	A: 0.679	D:-0.286	C: -2.250
		20< x <= 40	37	B: 1.372	D:-0.074	A: -0.135	C: -1.311
		40< x <= 60	29	B: 1.302	D:0.000	A: -0.207	C: -1.095
		60< x	8	B: 1.219	D:0.063	A: 0.656	C: -1.938

A) Because I know (or learned) that it is important and necessary to protect the green snail as valuable resources.

B) Because I will be able to make a profit when green snail fishing is opened after its resource increases in the future.

C) Because we decided in a community meeting not to catch green snails.

D) Because we have to follow the law and custom commands that banned of green snail fishing.

Table 11. Order of the motive of villagers in Mangaliliu for transplantation and conservation of green snail.

Mangaliliu			Number of samples	Order of the strength of the motive (the higher the number, the stronger the motive)			
				1 st	2 nd	3 rd	4 th
In total:			49	D: 0.959	B: 0.643	A: 0.296	C: -1.898
Breakdown	Gender	Female	21	D: 1.345	B: 1.012	A: 0.393	C: -2.750
		Male	28	D: 0.670	B: 0.366	A: 0.223	C: -1.259
	Age group	x <= 20	7	D=1.821	A: 0.000	B: -0.250	C: -1.571
		20< x <= 40	29	D: 1.198	B: 0.966	A: 0.517	C: -2.681
		40< x <= 60	9	B: 0.472	A: 0.111	C: -0.278	D: -0.306
		60< x	3	A: 0.500	B: 0.000	C: -0.250 D: -0.250	

A) Because I know (or learned) that it is important and necessary to protect the green snail as valuable resources.

B) Because I will be able to make a profit when green snail fishing is opened after its resource increased in the future.

C) Because we decided in a community meeting not to catch green snails.

D) Because we have to obey the law and custom ordered ban on green snail fishing.

Table 12. Order of the motive of villagers in Uripiv Island for transplantation and conservation of green snail.

Uripiv Island			Number of samples	Order of the strength of the motive (higher number shows stronger motive)			
				1 st	2 nd	3 rd	4 th
In total:			62	A: 2.601	B: -0.262	D: -1.085	C: -1.254
Breakdown	Gender	Female	25	A: 2.560	B: -0.290	D: -1.070	C: -1.200
		Male	27	A: 2.628	B: -0.243	D: -1.095	C: -1.291
	Age group	x <= 20	5	A: 2.900	B: -0.400	D: -1.200	C: -1.300
		20< x <= 40	40	A: 2.594	B: -0.250	D: -1.094	C: -1.250
		40< x <= 60	15	A: 2.483	B: -0.283	D: -1.000	C: -1.200
		60< x	2	A: 2.875	B: 0.000	D: -1.250	C: -1.625

A) Because I know (or learned) that it is important and necessary to protect the green snail as valuable resources.

B) Because I will be able to make a profit when green snail fishing is opened after its resource increases in the future.

C) Because we decided in a community meeting not to catch green snails.

D) Because we have to obey the law and follow the custom ordered ban on green snail fishing.

All responses to the questionnaire were examined using the Games-Howell multiple comparison test in order to see if the order of the strength of the motive in each community was statistically significant.

No significant differences among motives A, B and D occurred in Lelepa Island. However, they showed significant differences with motive C. This might suggest that motive C was not regarded as important for green snail transplantation and conservation. It probably suggests that in some communities there were not enough green snails to justify making a rule for them. However, a rule might be necessary in these communities to enable them to either understand the idea of the activity, to help them envision the future economic benefit of regulation, or to enforce the law and regulations concerning their ownership.

In Mangaliliu, no significant difference was found in any combination of the four motives. Although motive D came first in the counting of the questionnaire, the four motives could not to be ranked statistically.

In Uripiv Island, motive A (1st) showed a significant difference to motive B (2nd), motive D (3rd), and motive C (4th). In addition, motive B (2nd) showed a significant difference with motive D (3rd) and motive C (4th). Therefore, motive A ('Because I know [or learned] that it is important and necessary to protect the green snail as a valuable resource') was the strongest in the Uripiv community, compared with the other two communities.

Based on those results, it is important to understand the tendency of a motive and its strength in the community, in order to promote transplantation and conservation activities for green snails.

Awareness survey for resource management in a community that has no experience of the transplantation of green snails

Survey site

In the fishing villages in eastern and southern Efate Island, where transplantation and conservation activities had not yet been undertaken, an awareness survey was implemented for the chiefs and leaders of the eight communities in order to understand how people recognise the present status of green snails and the effect of transplantation and conservation activities for green snails.

Method

1. The chief, leader and other collaborators were interviewed in each target community regarding resource management activities.
2. Inquiries were made in the same manner and in accordance with the contents of the questionnaire described in Table 6.
3. Results obtained were analysed regarding respondents' recognition of the present status of green snail resources and, the most important motive for the resource enhancement and conservation activities.

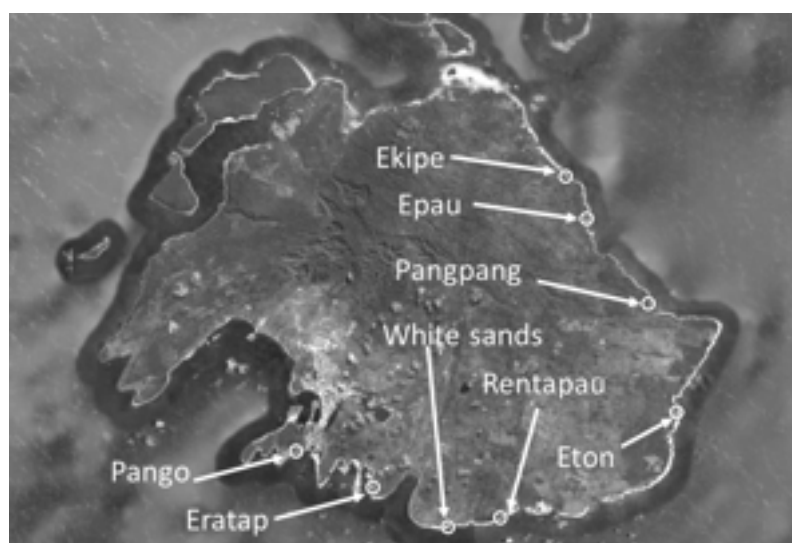


Figure 26. Sites for the awareness survey in the eastern and southern Efate.

Results and discussion

The number of respondents to the awareness survey in each community is shown in Table 13.

General knowledge of green snails

Eighty per cent or more of respondents understood that the green snail was already endangered by overfishing in Vanuatu in the 1990s and 2000s, therefore green snail fishing had been banned nationwide in 2005, that the meat was edible and that the shell was expensive. However, almost 40% of them were unaware that the green snail had been an important export product for Vanuatu. In addition, around 70% of respondents were aware of the recovery of green snail, and all respondents had been taught about green snails by their parents, relatives and teachers. This suggests that the information about green snails had been introduced successfully to community leaders and others interested in the green snail fishery. The main content of the information they were taught is that the green snail was formerly abundant, although it had become scarce in recent years, and therefore its fishing had been banned. Also, some respondents who mistakenly collected green snails had either their father explain that it was prohibited to catch it, or VFD staff had warned them and confiscated their catch, perhaps indicating that young people,

in particular, were unaware that the green snail population had decreased. It is important to familiarise the younger generation about the biological and economic characteristics of green snails, so as to continue its management.

Population and resource management of green snails

Regarding the population of green snails before the fishing ban was implemented, more than 70% of respondents answered that they found less than five to 10 individual green snails in one day of diving – the area that one fisher could cover in one day would be more than one hectare, at least. Therefore, the population of green snails was probably very small in the area before enforcement of the fishing ban. In addition, most respondents replied that the green snail resource had increased. This may suggest that recognition of the increase of green snail resources is common knowledge in the survey area in eastern and southern Efate Island.

All respondents replied that the transplantation activities of green snails were effective for resource enhancement and conservation. Furthermore, more than 90% regarded surveillance as necessary for resource management. Almost all respondents recognised the need for both transplantation and the surveillance activities for the management of the green snail resource.

Table 13. Number of respondents to the awareness survey in each community by age and gender.

		≤ 20	≥21 and ≤40	≥41 and ≤60	≥61	Total
Ekiye	Female	0	1	1	0	2
	Male	0	2	0	0	2
	Sub-total	0	3	1	0	4
Epau	Female	0	0	0	0	0
	Male	0	4	1	0	5
	Sub-total	0	4	1	0	5
Pangpang	Female	0	0	1	0	1
	Male	0	2	2	0	4
	Sub-total	0	2	3	0	5
Eton	Female	0	0	0	0	0
	Male	0	2	3	0	5
	Sub-total	0	2	3	0	5
Rentapau	Female	0	1	0	0	1
	Male	0	0	2	0	2
	Sub-total	0	1	2	0	3
White sands	Female	0	0	0	0	0
	Male	0	0	1	0	1
	Sub-total	0	0	1	0	1
Eratap	Female	0	0	0	0	0
	Male	0	2	2	1	5
	Sub-total	0	2	2	1	5
Pango	Female	0	0	0	0	0
	Male	2	2	2	3	9
	Sub-total	2	2	2	3	9
Total:						37

On the other hand, only two respondents out of 37 mentioned issues with green snail transplantation and surveillance activities. One was a villager who declared that he did not care about resource management. In the case that green snail management transplantation and surveillance activities take place, such an attitude could jeopardise the operations' success. The other said that transplantation might not be always effective because resource enhancement of green snails depends on its habitat preference and the availability of food. In the future, guidelines regarding green snail transplantation and surveillance must address these issues.

Conclusion drawn from the survey

- As a result of survey, the density of the green snails was found to be much higher in the sites where transplantation had been conducted through 'the Grace of the Sea' project phases 1 and 2. The fishers in both sites related that no green snail had been found prior to the transplantation activities. At both areas of Efate and Uripiv islands, in geographically remote locations, similar results and densities had been obtained. This strongly supports the positive effect of green snail transplantation.
- The main probable reason accounting for the high density of green snails in the transplantation sites is self-seeding by eggs and suspended larvae that had remained on the spawning ground. Meanwhile, the fact that the green snail was found at locations several kilometres from the transplant location could be due to: (1) self-seeding from the few broodstock that are naturally remaining at the site; (2) settlement of drifting larvae produced in neighbouring areas; or (3) settlement of drifting larvae produced in transplantation sites. All these reasons would contribute to the increase of the population to varying degrees. Even so, the artificially transplanted broodstock might contribute significantly to the promotion of the resource increase, since the natural population size had been small. The dense population of broodstock, resulting from transplantation, also might have boosted the reproduction rate of green snail.
- Transplantation of green snails had been conducted in Moso Island, in northern Efate Island, in 2007. However, the green snail was not found there during this survey. It was reported that the depth of the transplantation site was more than 10 m, but the precise location of the transplantation site on Moso Island has not been recorded by VFD. The location of the survey site that we set up may have been several hundred metres away from the transplantation site. Furthermore, the water depths of other survey sites were no more than 6 m and we used the same depth for standardising the environmental condition among the survey sites. Also, when transplanting green snails, participants usually place individual snails carefully on the sea bottom. But in Moso Island, green snails were just sprinkled from a boat, so individuals probably remained widely scattered. The relatively deep water could have also affected green snail survival. All these reasons may explain why we have not been able to find green snails at Moso Island.
- Most transplantation sites were placed in either a taboo area or a marine protected area (MPA). It is very effective to set up transplantation sites in such areas to facilitate surveillance. Green snail density increased mainly around transplantation sites, but its distribution range remained limited. Furthermore, while the green snail population tended to increase, it is still very small, and the green snail remains endangered in Vanuatu. It is therefore necessary to continue the transplantation and conservation activities with a focus on taboo areas and MPAs. In addition, periodic monitoring of the density of green snails is indispensable for evaluating population trends.
- Where green snail transplantation took place, it was well received by the inhabitants. However, some people felt uncomfortable with the long limitation of fishery activities imposed by large-scale resource management. They were asking for a better balance between opening the fishery for economic activities and closing it for resource management. In recent years, chiefs and leaders of communities that were not involved in transplantation activities perceived, nevertheless, transplantation and conservation activities positively. They understood the significance of green snail resource management activities. Their positive reaction might indicate an interest in participating in such activities. However, before starting any resource management activity it is necessary to carefully consider the balance between fishery-related economic activities and resource management.
- In one area where transplantation of green snails was undertaken, motives for the implementation of green snail resource management activities, as reported by members of the community, were mainly: A) *Because I know (or learned) that it is important and necessary to protect green snails as a valuable resources.*, B) *Because I will be able to make a profit when green snail fishing is opened after its resource has increased in the future*, D) *Because we have to follow the law and custom-ordered ban on green snail fishing*. However, it was suggested that motive C) *Because we decided in a community meeting not to catch green snail* was generally

not a strong motive among inhabitants. When considering implementing pilot activities in target communities, management and support activities must be selected in accordance with how communities rate the different motives for resource management and support activities, using statistical analysis.

- In the future, it will be important to increase resource enhancement activities such as green snail transplantation. It will be necessary to explain to target community members that the transplantation technique is actually applicable to low-mobility animals such as green snails, big-eyes, button shells, sea cucumbers and giant clams. It is also necessary to demonstrate the effectiveness of resource enhancement by techniques such as transplantation, and not merely to recommend conservation of species. It is vital to utilise these examples to ensure the transition from simple resource management, which passively waits for spontaneous growth under restriction of fishing activities, to an enhancement type of resource management, which provides better conditions for accelerating resource propagation.
- In 'The Grace of the Sea' project – Phase 3, as one of the resource management tools in the pilot project we will consider resource enhancement by transplantation for other low-mobility animals other than the green snail. For example, on the east coast of Tanna Island, women of the Waisisi community harvest the big-eye snail (*Turbo setosus*), a low-mobility animal from coastal waters. This could be one of candidate species for resource enhancement by the community. In addition, the transplantation of low-mobility animals might be considered on the west coast of Tanna Island, where fish populations have decreased remarkably in coastal waters. It may also be possible to conduct these activities elsewhere in Oceania as an example of community-based coastal resource management.

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Note about contents

It was decided not to include the set of annexes in this version of the article that accompanied the original submission. Those readers who wish to examine the annexes are requested to contact Dr A. Terashima, the corresponding author, for a copy of them, using the email address provided on the front page. The annexes that are omitted are as follows:

Annex 1. GPS position and location map of each transect line (Longitude and Latitude);

Annex 2. Green snails seen at each transect line;

Annex 3. Ratio (%) of substrate cover of each survey site;

Annex 4. Results of statistical analysis for comparison of the number of green snails seen in northeast Efate;

Annex 5. Results of statistical analysis for comparison of the number green snail seen in Uripiv and Uri islands;

Annex 7. Aggregate results of respondents to closed-ended questions for understanding the motive of villagers participating in transplantation and conservation activities for green snails;

Annex 8. Figures and tables from the results of closed-ended questions for understanding the motive of villagers participating in transplantation and conservation activities for green snails;

Annex 9. Results of a pairwise comparisons test for the most important motive to manage and conserve the green snail resources in the local community; and

Annex 10. Aggregate results of awareness survey for resource management in communities having no experience of the transplantation activity of green snail.