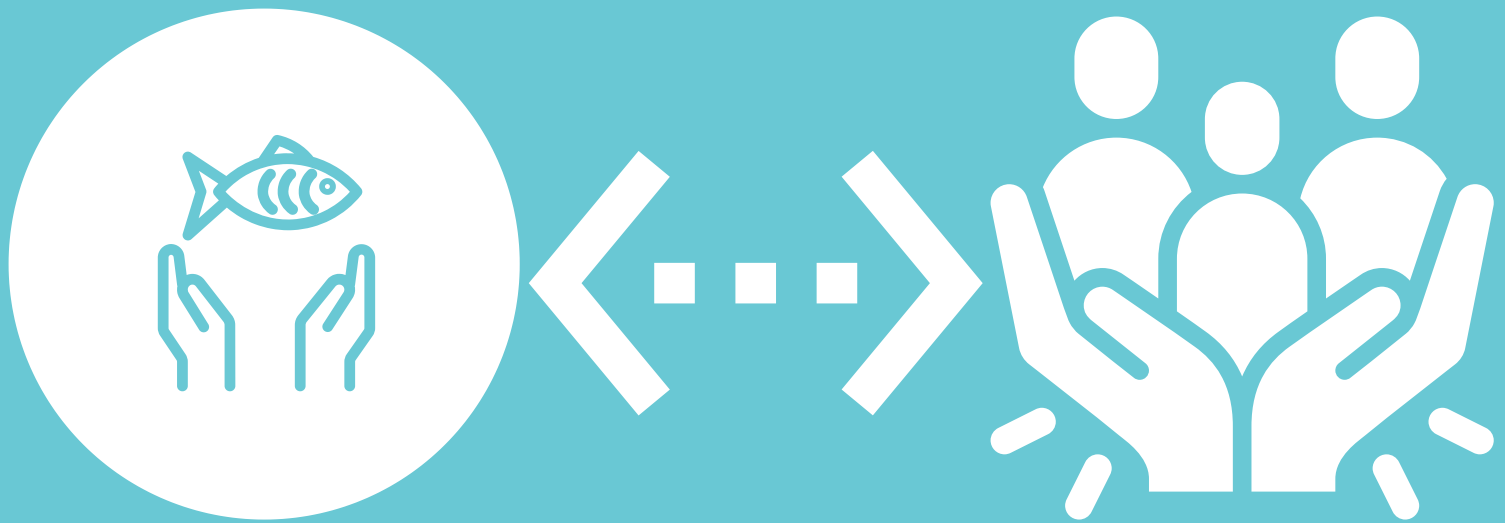


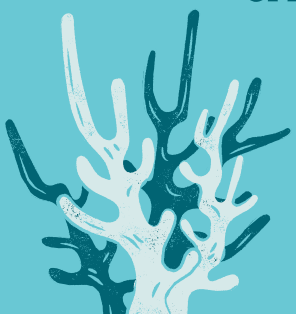


THE TOOL MANUAL FOR THE IMPLEMENTATION GUIDELINES OF INTEGRATED COMMUNITY BASED COASTAL RESOURCE MANAGEMENT(CBCRM)



November 2023

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



THE TOOL MANUAL for the implementation guidelines of Integrated community based coastal resource management(CBCRM)

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1. Preface

This manual is a guide of tools to fulfill the Integrated Community Based Coastal Resource Management (hereinafter referred to as “CBCRM”). The framework of the Integrated CBCRM mainly based on the outcomes of “The Project for Promotion of Grace of the Sea in the Coastal Village” (Phase 1: 2006 - 2009, Phase 2: 2011 - 2014, Phase 3: 2016 - 2021) implemented by Vanuatu Fisheries Department (VFD) and Japan International Cooperation Agency (JICA). The targets of this guideline are mainly for development officers, community authorized officers who are appointed by the government in each island where no fisheries officer is assigned, or persons who support planning and implementation of the CBCRM plan with local population of coastal communities such as Area Secretary of Provincial Government.

2. Basic structure of the Integrated CBCRM

As an important part of CBCRM Plan, there are three measures such as Resource Management Measure, Supporting Measure and Connecting Measure as shown in Figure 1. The tools for the Integrated CBCRM are the main components of these activities to achieve the CBCRM Plan. The details are shown as follows.

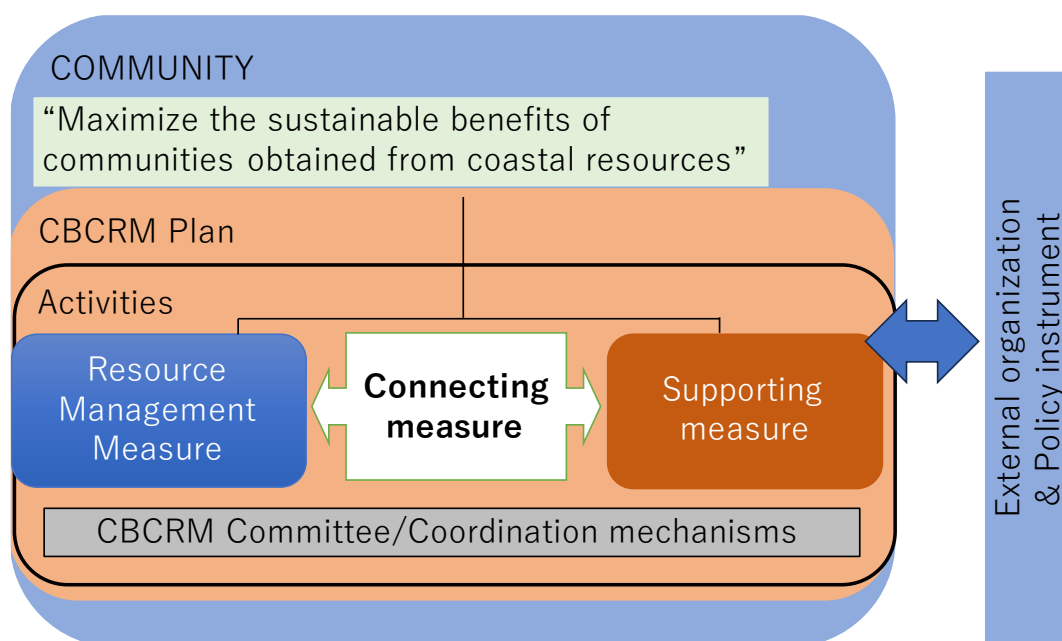


Figure 1: Basic structure of the Integrated CBCRM

3. Tools for the resource management measure

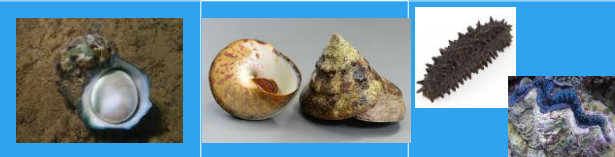
Tools for the resource management measure are divided into two categories, namely, “Regulatory management tools” and “Resource propagation tools”. These tools utilized in the Integrated CBCRM activities attempted in Vanuatu are seven and five respectively as shown in Table 1.

Table 1: Tools for the resource management measure

	Name of Tools	Serial No.
3-1. Regulatory management tools		
1	Catch restriction by species	MT-1
2	Fishing gear or method restrictions	MT-2
3	Control by fishing ground	MT-3
4	Control by fishing seasons	MT-4
5	Spatial Total Allowable Catch (TAC) setting	MT-5
6	Establishment of Fisheries Management Committee	MT-6
7	Fishing ground surveillance	MT-7
3-2. Resource propagation tools		
1	Translocation of broodstock of shellfishes	MT-8
2	Establishment of artificial nursery for larval and juvenile lobster	MT-9
3	Exterminating “Crown-of-thorns” (COT) for coral reef conservation	MT-10
4	Cleaning of beach	MT-11
5	Mangrove area preservation	MT-12

3-1 Regulatory management tools

MT-1 Catch restriction by species


Brief overview of this tool	Establishment of the rule or regulation such as limitation of the catch amount or size of target species is essential approach for resource management. It is important to have people of target community understand the meanings and importance of this tool for sustainable coastal fishing.																
Purpose	The aim is to realize appropriate management for fish resource in inappropriate condition.																
Implementation methods	<p>At first, the existing resource problems should be clarified. The target species is then selected. For each target species, definition of fishing ground, fishing season and fishing gears are determined.</p> <p style="text-align: center;">Items to be defined in the regulation of fish species</p> <table border="1" data-bbox="480 920 1353 1200"> <tr> <td colspan="2">Target species</td> <td>(e.g. rabbitfish)</td> </tr> <tr> <td colspan="2">Contents of regulation</td> <td>(e.g. complete ban of fishing, fish size control, limit of fish catch amount)</td> </tr> <tr> <td rowspan="3">Scope of regulation</td> <td>Scope of fishing ground</td> <td>(e.g. XX beach / YY reef / ZZ taboo area)</td> </tr> <tr> <td>Target period</td> <td>(e.g. January to May / through year)</td> </tr> <tr> <td>Target fishing gears</td> <td>(e.g. gill net / spear gun / all fishing gears)</td> </tr> </table> <div style="text-align: center; margin-top: 10px;">  <table border="1" data-bbox="608 1384 1225 1496" style="width: 100%; text-align: center;"> <tr> <td style="width: 33%;">Aneityum, Lelema</td> <td style="width: 33%;">Aneityum, Lelema</td> <td style="width: 33%;">Lelema</td> </tr> </table> <p>Controlled species in the CBCRM Plan in Aneityum (Tafea Province) and Lelema (North Efate, Shafa Province), Vanuatu</p> </div>	Target species		(e.g. rabbitfish)	Contents of regulation		(e.g. complete ban of fishing, fish size control, limit of fish catch amount)	Scope of regulation	Scope of fishing ground	(e.g. XX beach / YY reef / ZZ taboo area)	Target period	(e.g. January to May / through year)	Target fishing gears	(e.g. gill net / spear gun / all fishing gears)	Aneityum, Lelema	Aneityum, Lelema	Lelema
Target species		(e.g. rabbitfish)															
Contents of regulation		(e.g. complete ban of fishing, fish size control, limit of fish catch amount)															
Scope of regulation	Scope of fishing ground	(e.g. XX beach / YY reef / ZZ taboo area)															
	Target period	(e.g. January to May / through year)															
	Target fishing gears	(e.g. gill net / spear gun / all fishing gears)															
Aneityum, Lelema	Aneityum, Lelema	Lelema															
Items for evaluation of the achievement	<ul style="list-style-type: none"> - Reduction of Number of violators/vessels - Reduction of catch amount of target fish 																

MT-2 Fishing gear or method restrictions

Brief overview of this tool	Establishment of the rule or regulation for prohibition of the fishing gear and methods leading deterioration of resources is important. Together with the regulation of this tool, introducing new eco-friendly fishing practices to the target community will increase their effectiveness.											
Purpose	It is aimed to regulate the fishing gear and methods causing the deterioration of the fishery resources.											
Implementation methods	<p>At first, the existing resource problems should be clarified. The fishing gear and methods causing damage to coastal resources are identified. The management methods are selected for each target fishing gear and methods and the scope (fishing ground, fishing season, fishing gears) are defined.</p> <p>Items to be defined on the regulation of fishing gears and methods</p> <table border="1"> <tr> <td>Target fishing gear and method</td> <td>(e.g. gill net / spear gun)</td> </tr> <tr> <td>Contents of regulation</td> <td>(e.g. complete ban / mesh size / restriction of use at night)</td> </tr> <tr> <td rowspan="3">Scope of regulation</td> <td>Target species</td> <td>(e.g. rabbitfish / all fish species)</td> </tr> <tr> <td>Scope of fishing ground</td> <td>(e.g. XX beach / YY reef / ZZ taboo area)</td> </tr> <tr> <td>Target period</td> <td>(e.g. January to May / through year)</td> </tr> </table>	Target fishing gear and method	(e.g. gill net / spear gun)	Contents of regulation	(e.g. complete ban / mesh size / restriction of use at night)	Scope of regulation	Target species	(e.g. rabbitfish / all fish species)	Scope of fishing ground	(e.g. XX beach / YY reef / ZZ taboo area)	Target period	(e.g. January to May / through year)
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Contents of regulation	(e.g. complete ban / mesh size / restriction of use at night)											
Scope of regulation	Target species	(e.g. rabbitfish / all fish species)										
	Scope of fishing ground	(e.g. XX beach / YY reef / ZZ taboo area)										
	Target period	(e.g. January to May / through year)										
Items for evaluation of the achievement	<ul style="list-style-type: none"> - Number of violators/vessels - Status of public awareness of the regulation for fishing gears and methods 											

Example of fishing gear regulations in Vanuatu	
Name of fishing gears	Contents of regulations
Drag net or Beach seine	Mesh size should be less than 50 mm (National regulation)
Cast net	Mesh size should be less than 20 mm, diameter of net should be less than 2 m (National regulation)
Spear gun	It is prohibited to use in the taboo area. (Lelepa Island (Shefa Province, Waisisi (Tafea Province))

MT-3 Control by fishing ground

Brief overview of this tool	It is a regulation to restrict fishing in specific sea area. In most of Pacific Island nations, it is one of traditional resource management method in the coastal community. it is therefore relatively easy to introduce this tool to target community since it is familiar activity to community people.													
Purpose	It aims to regulate the use of fishing grounds and achieve appropriate management.													
Implementation methods	<p>At first, the existing resource problems should be clarified. The target area and rules for controlling fishing activities is then established. The rules must define the area, the management methods and scope (target species, fishing season, fishing gears).</p> <p style="text-align: center;">Item to be defined on the regulation of fishing ground</p> <table border="1" data-bbox="470 772 1340 1176"> <tr> <td colspan="2">Target sea area</td> <td>(e.g. around XX Island / YY reef / ZZ point – XY point)</td> </tr> <tr> <td colspan="2">Contents of regulation</td> <td>(e.g. complete ban / ban of catch for selling / ban on all kind of shellfish)</td> </tr> <tr> <td rowspan="3">Scope of regulation</td> <td>Target species</td> <td>(e.g. all fish species / all shellfish)</td> </tr> <tr> <td>Target period</td> <td>(e.g. July to October / through the year)</td> </tr> <tr> <td>Target fishing gear</td> <td>(e.g. all fishing gears / gill net / spear gun)</td> </tr> </table>  <p style="text-align: center;">Taboo area (Regulated area) in the CBCRM Plan of Aneityum, Vanuatu</p>	Target sea area		(e.g. around XX Island / YY reef / ZZ point – XY point)	Contents of regulation		(e.g. complete ban / ban of catch for selling / ban on all kind of shellfish)	Scope of regulation	Target species	(e.g. all fish species / all shellfish)	Target period	(e.g. July to October / through the year)	Target fishing gear	(e.g. all fishing gears / gill net / spear gun)
Target sea area		(e.g. around XX Island / YY reef / ZZ point – XY point)												
Contents of regulation		(e.g. complete ban / ban of catch for selling / ban on all kind of shellfish)												
Scope of regulation	Target species	(e.g. all fish species / all shellfish)												
	Target period	(e.g. July to October / through the year)												
	Target fishing gear	(e.g. all fishing gears / gill net / spear gun)												
Items for evaluation of the achievement	<ul style="list-style-type: none"> - Number of violators/vessels - Status of public awareness of the regulation for fishing ground 													

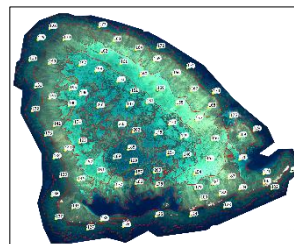
MT-4 Control by fishing seasons

Brief overview of this tool	It is a regulation to restrict the fish catch for specific time / periods.		
Purpose	It aims to regulate the fishing period according to biological characteristics of target species.		
Implementation methods	At first, the existing resource problems should be clarified. The regulations of the fishing season are then established. The scope (fish species, fishing ground, fishing gears) are defined.		
	Item to be defined on the regulation of fishing season		
	Target fishing season		(e.g. July to October / through the year)
	Contents of regulation		(e.g. complete ban / ban of catch for selling / ban on all kind of grouper)
	Scope of regulation	Target species	(e.g. all fish species / grouper)
Target fishing ground		(e.g. XX beach / YY reef / ZZ taboo area)	
Target fishing gear		(e.g. all fishing gears / gill net / spear gun)	
Items for evaluation of the achievement	<ul style="list-style-type: none"> - Number of violators/vessels - Status of public awareness of the regulation for fishing ground 		

Example of closed season in Vanuatu	
Type of regulations	Closed season
Green snail	October 2005-October 2020 (National regulation)
Coconut crab	30 th August to 1 November (Torba) 1 st May 2004 to 31 st March 2017 (Sanma) (National regulation)
Dive fishing	1 st October to 31 st March (every year) (Waisisi, Tanna)
Lagoon	July to February (every year) (Aniwa Island)

MT-5 Spatial Total Allowable Catch (TAC) setting

Brief overview of this tool	It can be considered as effective tool to prevent over exploitation of commercial invertebrate resources on community level in collaboration with Research Institutes and government agency.
Purpose	The Spatial TAC aims to maintain the fishing pressure at a sustainable level according to the resource status in respective fishing grounds.
Implementation methods	<p>1. TAC setting by community to target invertebrate's resources such as trochus, green snail, sea cucumbers and clams is applied. By the community interest, other marine resources can also be applied.</p> <p>2. The sampling design will be done by VFD using open source GIS software with high resolution satellite image to determine categories of habitat such as sea grass beds, inner reef flats, outer reef slopes, reef crest and lagoons. Number of the survey points is depend on availability of human resource, costs, and natural heterogeneity of the survey area.</p> <p>3. The field survey will be done by fisheries department staff in collaboration with community people. The survey method might depend on the situation, the line or belt transect method with 50m to 100m length (200m² area) would be suitable.</p> <p>4. Based on the survey result, TAC can be set for interested resources for sustainable use of the resources in the community. It is important to ensure that fishers (Male and Female) and customary right holders contribute to the decision making process of local scale such as a) participate in data collection, b) access to survey results, c) set the rule for TAC.</p>
Items for evaluation of the achievement	<ul style="list-style-type: none"> - Number of violators/vessels - Status of public awareness of the regulation for fishing ground regulation.



MT-6 Establishment of Fisheries Coordination Framework

Brief overview of this tool	It is effective for large area such as deep-sea bottom and offshore resources. In this framework, representatives of communities utilizing a same fishing ground discuss the policy for the resource management in the area. It is desirable to encourage the participation of stakeholders as many as possible. It is not necessary to set a high goal at the initial stage.
Purpose	It aims to provide a place to consider the management of fishery resources in the areas utilized by multi-community.
Implementation methods	<ol style="list-style-type: none"> 1. Identify the areas used by multiple communities as fishing grounds and list the communities that are using that area for fishing. 2. Understand how each community is using the target area and what kind of problems are there by conducting interview survey. 3. Invite representatives of each community and share information on the usage situation and problems in the target area. 4. Share the information to each community through the representative who attended the meeting above mentioned. 5. Invite representatives of each community again and discuss the policy for the resource management in the area. 6. Share and discuss the contents of the meeting to each community. 7. Form a framework by conducting such meetings with representatives and sharing the results in each community multiple times. <p>It is desirable to encourage the participation of stakeholders as many as possible. It is not necessary to set a high goal at the initial stage.</p>
Items for evaluation of the achievement	<ul style="list-style-type: none"> - Fisheries Coordination Framework is formed - Presence/absence of making agreement - Presence/absence of concrete management activities - Number and frequency of meetings or information sharing

BOX 1: Framework of the Deep-Bottom Fish Fishery Management

Deep-bottom fishes are fished in deep water offshore, unlike reef fisheries, identical fishing grounds are used by several fishing communities. Deep-bottom fishes are also slow-growing and therefore prone to overfishing. Therefore, fishing communities using the same fishing grounds need to work together to manage the resource. Furthermore, co-management between the government having responsibility to manage the water area and fishermen is required.

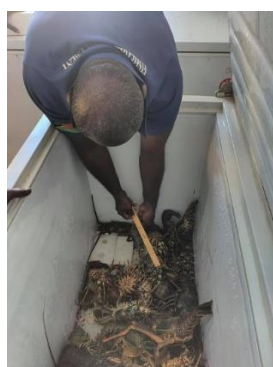
On the three islands of Emae, Makira, and Mataso in Shefa Province of Vanuatu where bottom fishing is thriving, a Deep-Bottom Fish Fishery Management (DBFFM) Liaison Conference was established in cooperation with the provincial government for making the deep-bottom fish fishery sustainable. The purpose of this conference is to exchange information necessary for deep-bottom fish fishery management, build consensus on management rules, and establish a framework for technical assistance from the Fisheries department. The problem of large fishing vessels from the capital frequently operating in the fishing grounds around the three islands has been a growing need for deep-bottom fish fishery management. The five fishing communities involved in the deep-bottom fish fishery, the Shefa Provincial Government, and the Fisheries department signed the minutes for mention of the establishment of the conference and its objectives. Although the conference is a non-legally enforceable entity, it is expected that it will be upgraded to an official Fisheries Coordination Committee in the future.



MT-7 Fishing ground Surveillance

Brief overview of this tool	In order to keep on the CBCRM plan formulated by the community, a surveillance team of the community with agreement of the community members is established. Penalty usually pertains to this tool for enhancing the effectiveness. It is therefore advisable to cooperate and coordinate with the police force and the coast guard.
Purpose	It aims to prevent the violation of law and CBCRM plan.
Implementation methods	<p>The typical methods of surveillance are as follows,</p> <ol style="list-style-type: none"> 1. patrol by boat; it is effective but costly, 2. observation from land; it is effective when the target area is limited, and 3. checking fish after landing; it is effective if almost all fish were landed in same place. 4. in case, a violation is confirmed, penalties are given based on laws and/or any rules. Minor violation can be handled within the community with traditional custom though the violation is generally entrusted to law enforcement officials such as police and coast guards, in particular, the violation is done by outsiders of the village or is in large scale.
Items for evaluation of the achievement	<ul style="list-style-type: none"> - Surveillance team is established. - Operation procedure of surveillance team is developed - Number and frequency of specific monitoring activities - Number of violators/cases

BOX2: Community Owned Fisheries Resource Management Activities



On Aneityum Island in Vanuatu, rock lobsters are an economically important fishery resource that provides cash income for tourists. To help lobsters reproduce successfully, Vanuatu fisheries regulations protect all females carrying eggs and all rock lobsters that are less than 22 cm in total length or 7.5 cm in carapace length and too young to reproduce.

However, the community has its own rule regarding this size limit, which prohibits the harvest of lobsters less than 25 cm in length, and has been adhered to for many years. The lobsters are collected at a single location on Mystery Island, where they are measured one by one by members of the community's MPA management committee, and those less than 25 cm in length are returned to the sea on the spot.



3-2 Resource propagation tools

MT-8 Transplantation of broodstock of immobile or less-mobile species

Brief overview of this tool	<p>Immobile or less-mobile species such as giant clams, green snail, trocus will be the target. Raising the density of the large-sized (parental) individuals of the target species by the transplantation improves the reproduction rate and some of larvae and juveniles stay in the target area. By such activities, it can be expected to promote the increase in the resource amounts of target species in the area. This tool is effective for immobile or less-mobile species. For example, transplantation of giant clam (<i>Tridacna gigas</i>), immobile in the adult stage, was undertaken from Tonga in 2007. The clams were concentrated in one place front of Mangaliliu community in North-West Efate with conservation of local community. After 10 years, they have still survived and have reproduced.</p>
Purpose	<p>It aims to promote the increment of standing stock of the target species in the area.</p>
Implementation methods	<ol style="list-style-type: none"> 1. The donor area where maintains abundant resource of target species at is identified. 2. Then, the recipient area where the target species is vanished now though previously was rich is identified. 3. It is naturally important to explain the reasons and effects of the transplantation to both donor and recipient areas' communities and gaining understanding and support from them. 4. Individuals of target species are gathered in. It is preferable to put a mark on each individuals for the identification. 5. The transplantation is then undertaken in cooperation with both communities. 6. It is preferable to plan on the monitoring of the distribution of individuals transplanted. <div data-bbox="699 1509 1123 1832" style="text-align: center;"> </div> <p style="text-align: center;">Giant clam spawning school in Mangaliliu, Vanuatu</p>

Item for evaluation of the achievement	<ul style="list-style-type: none">- Number of parent shell moved (number of individuals)- Number of parent shell groups formed- Presence or absence of reproduction after transplantation- Number of people who participated in transplanting, releasing and monitoring
----------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

MT-9 Establishment of artificial nursery for larval and juvenile lobster

<p>Brief overview of this tool</p>	<p>Lobster larva usually uses seagrass ground, algal bed and rubble substrate when it metamorphoses to juvenile lobster and settles itself down on the sea bottom. Normally, sandy bottom is not utilized for this settlement phase. This activity deploys artificial seaweed in combination with small blocks as hiding places for juvenile and young lobster on sandy bottom in MPA. Installation of such new habitat is effective for the resource enhancement of marine organisms such as lobster.</p>	 <p style="text-align: center;">Juvenile Lobsters collected in verification</p>
<p>Purpose</p>	<p>It aims to provide new nursery ground for lobster and other invertebrates in order to enhance the resources.</p>	
<p>Implementation methods</p>	<ol style="list-style-type: none"> 1. Preparing artificial seaweed made of leaves of burao tree (material of traditional grass skirt) and put sinker and buoy as shown to the right. On the surface of sinker, making holes with several diameters as hiding place for juvenile lobster. 2. Deploying the artificial seaweed on sandy bottom in 5 to 7m depth. 3. Deploying small blocks and gabions around the artificial seaweed. 4. Monitoring and surveillance to understand the condition of the artificial seaweed and to protect poaching of lobster and other fish. 	
<p>Items for evaluation of the achievement</p>	<ul style="list-style-type: none"> - Publicity of the purpose and contents of this activity to community members - Periodic monitoring and surveillance - Periodic maintenance of artificial seaweed 	

MT-10 Exterminating “Crown-of-thorns” (COT) for coral reef conservation

Brief overview of this tool	Extermination of COT which predate corals is effective for protecting corals in various former activities. Since the spines of COT are toxic and dangerous, it should be carried out by divers with the skills and the equipment for the extermination. For the community members participation, the special training is necessary
Purpose	The environment of coral reef is conserved through exterminating “Crown-of-thorns” (COT) and promote the resources enhancement.
Implementation methods	<p>The most efficient and easiest method to exterminate COTs is an injection of acetic acid into COTs in situ.</p> <ol style="list-style-type: none"> 1. prepare a reusable syringe with acetic acid. 2. Dive with the syringe with acetic acid and look for COTs. 3. inject acetic acid to COTs. 4. Record the how many COTs are injected. <p>Acetic acid is easy to dissolve in water and diffuses quickly, so it has little impact on the environment</p>
Items for evaluation of the achievement	<ul style="list-style-type: none"> - Number of implementing coral reef cleaning and number of participants - Amount of waste collected - Number of implementing extermination and number of participants - Number of COT exterminated - Number of people trained to exterminate COT

MT-11 Cleaning of beach

Brief overview of this tool	There are many cases that the drift of plastic wastes etc. to the beach in front of the coastal villages and the leeward of the lagoon. This waste is picked up and disposed of them on land. It is not necessary to dive, so that children and women can participate easily. The result is also visible and therefore, the effect of a wider range of environmental education can be expected.
Purpose	It is aimed to maintain and improve the fishing ground environment through cleaning up gathered wastes on the coast and preventing from returning the waste such as plastics and others to the sea again.
Implementation methods	<ol style="list-style-type: none"> 1. On the target community, it is explained that the importance of the cleaning activity on the beach. 2. It is also effective to elicit a cooperation from elementary school in target area. 3. Target area and event time are selected and these information are shared to possible participants for the activity. 4. Voluntary Participants implements cleaning activity on the beach in selected area. 5. It is preferable to prepare the prize or gift for the participants.
Items for evaluation of the achievement	<ul style="list-style-type: none"> - Number of implementation and number of participants of beach cleaning - Quantity of wastes dumped

MT-12 Mangrove area preservation

Brief overview of this tool	Mangrove forest is a nursery ground of many organisms. It is also an important fishing ground. Restricting logging, reforestation, clean-up activities should be considered in areas where over logging have been occurred,
Purpose	It aims to promotes of resources enhancement through cleaning and restricting of logging, maintaining and improving the environment through reforesting within the mangrove area.
Implementation methods	<ol style="list-style-type: none"> 1. Mangrove conservation awareness activities are planned and implemented. 2. Present status of target mangrove area is surveyed. 3. The management plan is discussed in the community. 4. The reforestation activities is undertaken in keeping with the management plan mentioned above. Children and women in the community are invited for participation as the environmental education. 5. It is desirable to use nursery stock for reforestation. It is effective only by planting viviparous seeds in tidal flats.
Items for evaluation of the achievement	<ul style="list-style-type: none"> - Number of implementation and number of participants of reforestation and cleaning activities - Number of nursery tree reforested

4. Tools for the supporting measure

There are several tools for the supporting measure. They are mainly assorted to following three categories such as “Diversification of fishing” “Value addition of fish products” and “Alternative income source development”. In Vanuatu, several tools are utilized in the CBCRM plans as shown in the Table 4. In this tool manual, total 16 tools are shown. Details of each tool are shown from next page.

Table 4: Tools for supporting measure

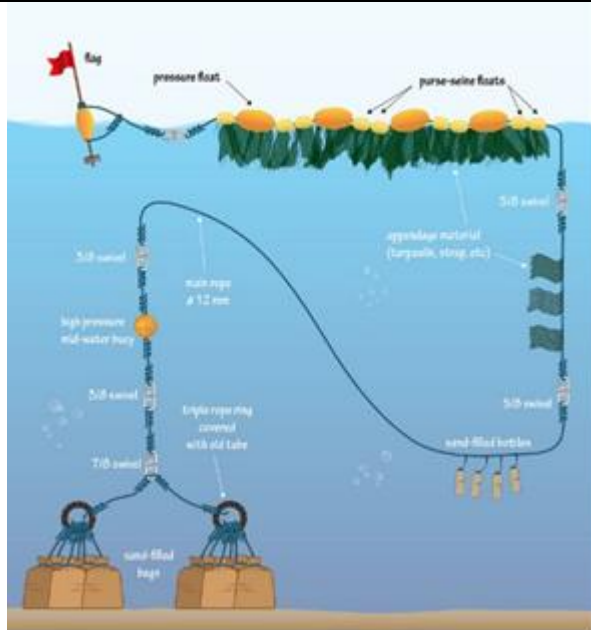
	Name of Tools	Serial No.
4-1 Diversification of fishing		
1	FAD development for large pelagic fishes	ST-1
2	FAD development for small pelagic fishes	ST-2
3	Deep sea bottom fishing development	ST-3
4	Diamondback squid fishing development	ST-4
5	Hybrid canoe development (Sailing/outboard engine)	ST-5
4-2 Value addition of fish products		
1	Improvement of fish distribution system	ST-6
2	Fish processing	ST-7
3	Local handicraft development for shell craft	ST-8
4	Fish café (Local fish restaurant/take away)	ST-9
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4-3 Alternative income source development		
1	Tilapia culture	ST-12
2	Giant freshwater prawn culture	ST-13
3	Giant clam culture	ST-14
4	Eco-tourism development	ST-15
5	Road market development	ST-16

4-1 Diversification of fishing

ST-1 FAD development for large pelagic fishes


<p>Brief overview of this tool</p>	<p>In many Pacific island countries, fishing pressure usually concentrates on shallow coastal areas, especially around coral reef. In the area, many resource distractions have been noted. Therefore reduction of fishing pressure against the reef resources is indispensable. To realize it, diversification of fishing activities is required. On the other hand, the resources of large migratory species such as tuna and skipjack are not sufficiently utilized. It is good for local fishers who do not have large fishing boats to deploy a shallow water FAD near the coast. Those local fishers can use it for catching large pelagic fish by using small outboard engine boats or canoes.</p> <p>This tool leads the development of large pelagic fishery, and fisher's benefits (income/self-consumption).</p>
<p>Purpose</p>	<p>It aims to the reduction of the fishing pressure in shallow coastal areas by ushering fishers into offshore fishing through deployment and utilization of FAD.</p>
<p>Implementation methods</p>	<ol style="list-style-type: none"> 1. Sea area more than 400m depth and sandy bottom should be selected for FAD deployment. It is preferable that the area where can be observed large pelagic species such as tuna and skipjack at the sea surface. 2. Fishers' group of community informs the selected area position to fisheries department and the Provincial Government for its approval. 3. Fishers' group of community establishes FAD user group and prepares FAD Management rules. 4. Construction of FAD (refer to detailed manual of FAD) is undertaken. 5. Deployment of FAD in area selected (refer to detailed manual of FAD). 6. Position of the deployment should be reported to fisheries department and the Provincial Government. 7. The catch data should be recorded and be reported to fisheries department by each boat using FAD 8. As maintenance, when the FAD user runs boat around FAD, he checks fouling organism and damages on the buoys, ropes and flag of the FAD. Depend on the necessity the FAD should be cleaned, repaired and replaced materials 9. Fishers' group of community collects usage fee from users. The usage fee should be utilized for maintenance and for the preparation of new FAD. The fees therefore might be deposited and managed by collected from users and FCA when the reserve which have been deposited by the fishers' group.

Relationship with resource management	<p><Direct relevance level with resource management: High></p> <p>Fishing efforts and pressures by fishers is dispersed from shallow coastal areas to offshore through development of large pelagic fisheries. In addition, it can be expected to raise awareness about resource management through participation of fishers on deployment of FAD and record of catch data etc.</p>
Items for evaluation of the achievement	<ul style="list-style-type: none"> - Utilization of fishers (number of people/fishing vessels, frequency of use) - Catch volume by using FAD - Change in behavior such as participation for FAD maintenance, newly deployment by fishers themselves
Conditions to implement	<p><Social and economic conditions></p> <ul style="list-style-type: none"> - Fishing boats should exist in the target community. - Comprehensive budget for production of FAD (approximately US\$ 1,300 for Vanuatu case). If the community cannot prepare it, financial assistance from administrative or donors is necessary. - Agreement on the FAD usage rules prepared by fishers' group in the community is necessary. Especially, when the fishers burden a part of budget, sufficient consultation is necessary so that there is no sense of unfairness among fishers. <p><Natural and environmental condition></p> <ul style="list-style-type: none"> - The sea bottom must be flat in topography at the target site of deployment. It is better to avoid the strong slope for the deployment of FAD. - The moderate current speed is preferable in the of the target site. <p><Technical conditions></p> <ul style="list-style-type: none"> - For the deployment of FAD, the structure should be simple for allowing small boats with outboard engine to implement it. It is desirable to use a sandbag as anchor because of the easy handling and safety. - Considering the dissemination of FAD, the inexpensive design is necessary. It is preferable to use local materials. - It is necessary to consider the safety countermeasure for deployment of FAD.

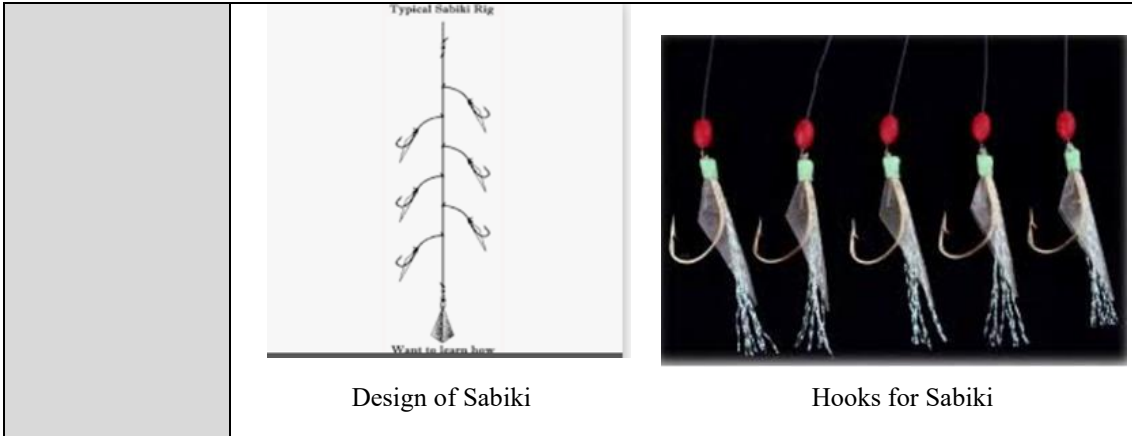


FAD developed by the Project for Promotion of Grace of the Sea in the Coastal Village/ JICA


ST-2 FAD development for small pelagic fishes

<p>Brief overview of this tool</p>	<p>In the coastal area in Vanuatu, although the existence of many small pelagic fish resources such as horse mackerel that is known to be suitable for bait of the line fishing, it is difficult to specify the migration period. Furthermore, even if such a bait fish moves to the vicinity of the community, it is difficult to catch and store in large quantities. Therefore, FAD made by bamboos is deployed at shallow area to catch small pelagic fish mainly horse mackerel that caught by Sabiki fishing and fish aggregating light at night time. Stable supply of small pelagic fish as a bait for large pelagic fish development as well as self-consumption of the community people.</p> <p>It is set at shallow area and made by bamboos to target mainly horse mackerel that caught by Sabiki and fish aggregating light at night time.</p> 
<p>Purpose</p>	<p>It aims to reduce fishing pressure in reef area, through deployment of FAD, a system to provide a stable supply of bait fish is established.</p>
<p>Implementation methods</p>	<ol style="list-style-type: none"> 1. Identify the location for deployment of FAD. The target location should be more than 400m depth and plain and no-rocky bottom condition. It is preferable that the pelagic fish such as tuna and skipjack can be observed visually from the boat. 2. Inform the location desired deployment of FAD to fisheries department and provincial government for getting authorized from public sector. 3. Fabricate FAD by referring the FAD manual. 4. Deploy the FAD by referring the FAD manual. 5. Inform the final location deployment of fisheries department and provincial government. 6. Prepare FAD Management rules by users group. 7. Recode catch data around FAD. It should be informed to fisheries department by each boat which used FAD 8. Observe the FAD condition, especially the amount of fouling organisms and damages of buoys, ropes and flag. Periodical maintenance and cleaning is necessary. 9. Collect usage fee from the users for maintenance and for the preparation of next FAD.
<p>Relationship with resource management</p>	<p>< Direct relevance level with the resource management: High ></p> <p>Through collecting and analyzing fish catch data, it is possible to understand the status of the bait supply and the contribution for the deep bottom fishing which might contribute the reduction of reef fishing activity.</p>

	<p>In addition, the data recording for small pelagic fish will also contribute to understand the present status of the fish stock.</p>
<p>Items for evaluation of the achievement</p>	<ul style="list-style-type: none"> - Community can develop and deploy FAD by their own effort. - Community can catch bait fish stably (recording is required)- Community people can maintain and manage the FAD (replacement of bamboo, checking the degree of rubbing of the rope, tightening and replacing) - Savings will be made for maintenance.
<p>Conditions to implement</p>	<p>< Social and economic conditions ></p> <ul style="list-style-type: none"> - The consensus in the community regarding the deployment and use of FAD. <p><Natural and environmental condition></p> <ul style="list-style-type: none"> - It should be a sea area where small pelagic fish such as horse mackerel come near the shore. - It should have a condition that is difficult to flow out FAD (It is desirable to select a bay topography where waves, winds, the tidal current are not intense, and the western part of the island, etc.) <p><Technical conditions></p> <ul style="list-style-type: none"> - It is available an instructor for production and deployment. - It is possible to procure fish aggregating lights (underwater light or kerosene lamp) <div style="display: flex; justify-content: space-around; align-items: center;"> <div data-bbox="491 1263 930 1585" data-label="Image"> </div> <div data-bbox="959 1227 1316 1585" data-label="Image"> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div data-bbox="603 1608 831 1639" data-label="Caption"> <p>Construction of FAD</p> </div> <div data-bbox="963 1608 1329 1639" data-label="Caption"> <p>Underwater fish aggregating light</p> </div> </div>



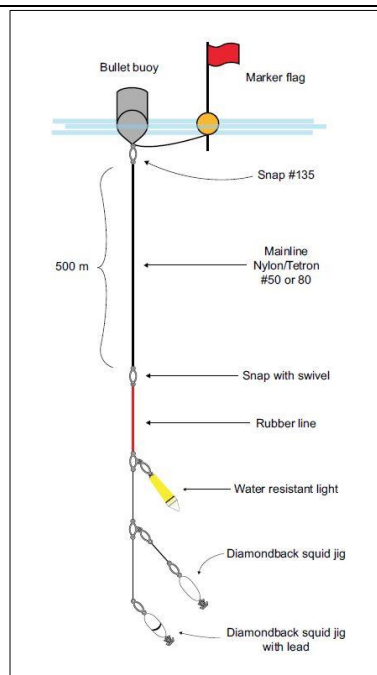
ST-3 Deep sea bottom fishing development

Brief overview of this tool	It is urgent to disperse current fishing pressure concentrating on reef resources. Since off-shore resource condition still healthy in Vanuatu, deep bottom fishing might be prospective activity for diversification of coastal fisheries as well as large pelagic fish. However, the deep bottom fish resources are vulnerable for intense fishing pressure. Therefore, it is necessary to monitor the fish catches and to carefully develop it for sustainable use of the resources.
Purpose	<ol style="list-style-type: none"> 1. Reducing fishing pressure to the reef fish resources by diversification of fishing method through development of deep bottom fishing. 2. Maintaining and improving the benefit and profit of local fishers.
Implementation Methods	<ol style="list-style-type: none"> 1. Select possible fishing ground which might be between 100~400m depth near sea mount or reef slope around the island. 2. Record the GPS position on the chart sea. 3. Prepare the fishing equipment with at least 4 hooks and fish attracting device (small container for the minced bait) 4. Soak the bait in salt water for long-lasting. 5. Wait all hooked (Rather than picking up one fish at a time, it is efficient to pick up after catching all four hooks). 6. Store the fish in cool box with ice or ice pack 
Relationship with resource management	<p>< Direct relevance level with the resource management: High ></p> <ol style="list-style-type: none"> 1. Diversification of fishing efforts through development of deep bottom fishing will contribute to the reduction of fishing pressure in the coastal waters. 2. Through collecting and analyzing fish catch data recorded by local fishers participating in this activity, it deepens understanding of the present status of the standing stocks and to raise the awareness of resource management.
Items for evaluation of the achievement	<ul style="list-style-type: none"> - Number of local fishers converting to deep bottom fishing - Number of fishing boats for deep bottom fishing - Frequency of the deep bottom fishing - Volume of fish catches
Conditions to implement	<p>< Social and economic condition ></p> <ul style="list-style-type: none"> - Existence of fishing boats with outboard engine in target community - Existence of ice making and supply facilities

	<ul style="list-style-type: none">- Existence of market- No conflict with neighboring communities regarding of fishing ground <p><Natural and environment condition></p> <ul style="list-style-type: none">- The target location should be more than 400m depth and plain and no-rocky bottom condition. It is preferable that the pelagic fish such as tuna and skipjack can be observed visually from the boat.- Existence of fishing ground with appropriate water depth (approximately 200 ~400 m depth, preferably with seamount) near the target community- Being able to secure bait such as sardines and horse mackerels <p><Technical condition></p> <ul style="list-style-type: none">- Having possibilities of acquisition of fishing gears and fishing methods for deep bottom fishing- It is preferable to receive training for specific fishing methods.
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ST-4 Diamondback squid fishing development

<p>Brief overview of this tool</p>	<p>Diamondback squid, large cephalopod, ranges in intermediate to deep offshore waters over tropical and subtropical zone in the world. The resource has hardly been exploited in Vanuatu so far though it has marketable demand in some countries such as Japan and China. The diamondback squid might be one of promising marine products in Vanuatu.</p>
<p>Purpose</p>	<p>It aims to reduce the fishing pressure to reef resources and also intends to maintain and to improve of livelihood of local fishers through the development of diamondback squid fishing which is untouched so far.</p>
<p>Implementation methods</p>	<ol style="list-style-type: none"> 1. Select possible fishing ground with more than 1,000m depth. 2. Prepare the fishing device 3. Use usually around 10 fishing gears, though it depends on weather condition. Reduce the number when strong wind and/or strong tidal current. 4. If the floats were observed in vertical position, possibly the fish is hooked (caught). 5. During the picking-up the fish to the boat, pay attention for other drifting fishing gears for that no lost.
<p>Relationship with resource management</p>	<p>< Direct relation level with the resource management: High ></p> <ol style="list-style-type: none"> 1. The fishing efforts can be diversified through development of diamondback squid fishing and the fishing pressure of coastal waters will be reduced. 2. It is possible to collect fishing data from local fishers through this activity and also raise the awareness of the resource management to them.
<p>Items for evaluation of the achievement</p>	<ul style="list-style-type: none"> - Data collecting by fishers and reporting to fisheries department. - Number of fishers and/or boats converting to diamondback squid fishing - Frequency of the fishing for diamondback squid fishing - Volume of fish catches and selling amount - Number of customers such as hotels and restaurants - Sharing information between neighbor communities



<p>Conditions to implement</p>	<p>< Social and economic condition ></p> <ul style="list-style-type: none"> - Existence of fishing boats preferably made of FRP and with outboard engine in target community - Existence of ice making and supply facilities - Existence of vacuum packaging machine and cold storage facilities - Forwarding development of local market, especially development of marketing channel as high-value added food product to hotels and restaurants <p><Natural and environment condition></p> <ul style="list-style-type: none"> - Existence of fishing ground with appropriate water depth (more than hundreds meter depth) near the target community <p><Technical condition></p> <ul style="list-style-type: none"> - Having possibilities to use the special fishing gear for drop-line and to receive the technical training - Premising its distribution as vacuum packaging frozen block cut - Laying out the framework to develop the diamondback squid products as high-value added food including introduction of the recipe due to unfamiliar cooking ingredient in the Vanuatu local.
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Trial of diamondback squid fishing development in Vanuatu

ST-5 Hybrid canoe development (Sailing/outboard engine)

Brief overview of this tool	One of major reasons to inhibit development of the offshore fishery is high fuel cost with non-guaranteed fishery yield. Whereas the traditional sailing technique does not require high fuel costs, it gradually becomes outdated in Vanuatu nowadays. It is the starting point on developing offshore fishery to conduct a low-cost fishing and evading a deficit risk.
Purpose	It aims to reduce fishing pressure in reef area through diversification of fishing activities by promoting offshore fishing with reduction for fuel cost in the fishing operation
Implementation methods	<ol style="list-style-type: none"> 1. Building up the sailing canoe which is for minimum 2 persons due to safety reason in the activity in the off-shore. 2. Sail is not only to reduce the fuel cost but also for the safe navigation in engine trouble case. 3. The canoe can be prepared as catamaran so that the working space will be wide and can be installed with 4 reels.
Relationship with resource management	<p>< Direct relation level with the resource management: High ></p> <p>Contributing to reduction of the fishing pressure around reef resources</p>
Items for evaluation of the achievement	<ul style="list-style-type: none"> - Technical level on sailing and outboard engine of community people - Technical level on fishing techniques such as deep bottom fishing and FAD fishing - Number of built hybrid canoe - Volume of the selling profits by using hybrid canoes.
Conditions to implement	<p>< Social and economic condition ></p> <ul style="list-style-type: none"> - Interest level for sailing technique- Attainability and condition of financing <p><Natural and environment condition></p> <ul style="list-style-type: none"> - Existence of good fishing ground in the sailing accessible range <p><Technical condition></p> <ul style="list-style-type: none"> - Existence of technical instructor of sailing - Possibility of obtaining four horsepower outboard engine

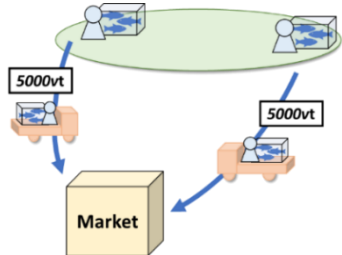
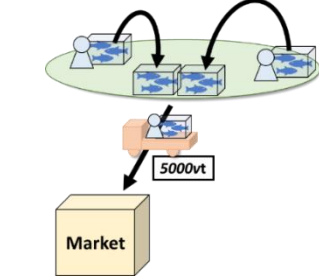


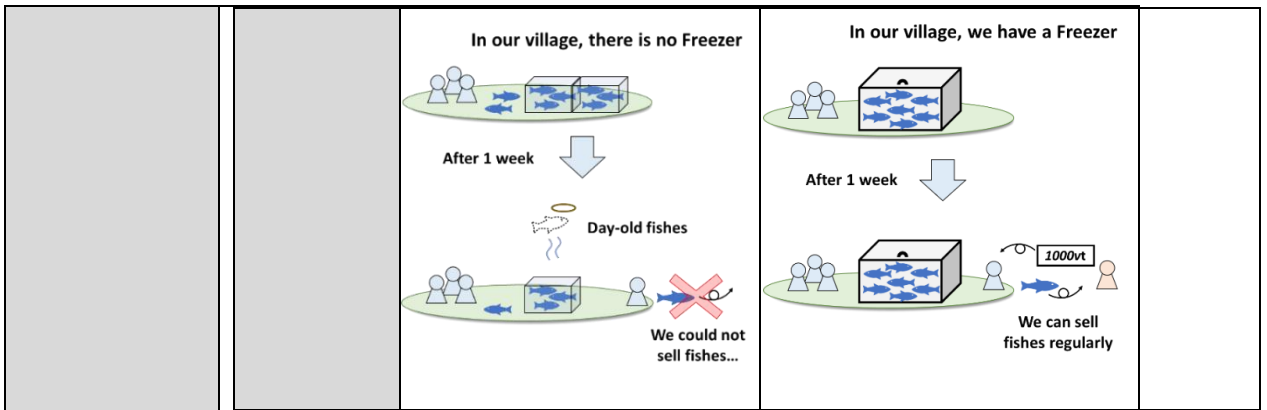
Hybrid canoe in Vanuatu

4-2 Value addition of fish products

ST-6 Improvement of fish distribution system



Brief overview of this tool	In Vanuatu, the distribution channels and the means of distribution have not fully developed yet. Some problems have arisen such as “high distribution cost” and “low frequency and irregular distribution” in the distribution system. That is to say, the fishery products are now sold under the inefficient distribution system. It causes the negative effect for the livelihood of fishes’ families who engage in the business from fish catch to distribution and sale. At the same time, the inefficiency of distribution restricts the difficulty to access to the fish products for the public, especially in remote areas. In terms of resource management, the vulnerability of distribution system causes the inefficient use of fishery resources, such as the post-harvest loss. Therefore, improvement of fish distribution system is important for resource management.
Purpose	It aims to improve the income for fishers and access to fishery products for publics through improving the vulnerability of distribution system and realizing efficient fish distribution. Moreover, it also contributes to improvement of fisher’s income without increasing fish catch amount through the efficient utilization of fishery resources through
Implementation methods	<ol style="list-style-type: none"> 1. To realize the joint shipment, several communities are grouped by location of villages, road condition among villages and the transportation such as boats and vehicles. 2. The members of fishers’ group (e.g. Fisherman’s Association) chip in money for purchase of fishes and transportation cost. 3. Fishers' group decides the price of fishes. 4. Fishers' group obtains the information of fish catch in each community through SMS/SNS. 5. Fishers' group decides the shipment destination depending on the catch amount and access to transportation such as boats, vehicle, public ferry. 6. Fishers' group records the selling prices by species and level of freshness at sales destination. In addition, Fishers’ group obtain the information about the needs (e.g. necessary amount) from sale destination. 8. Fishers’ group informs the results of selling to each community.
Relationship with resource management	<p>< Direct relevance level with resource management: low – medium ></p> <p>The relevance between the improvement of fish distribution and the resource management varies with the nature of measures.</p> <p>- The minimum data required for the survey of fish distribution is collected and managed at the time of activity for improvement of fish distribution system. (medium).</p>

	<ul style="list-style-type: none"> - The income of fishers is maintained without increasing a pressure of catch through reducing the distribution cost. (medium) - The reduction of post-harvest loss of fishery resources is realized through improving the distribution channel and it leads the effective utilization of resources. (low - medium) - Production adjustment is achieved by realizing the efficient fish distribution system. It mitigates the impact on the fishery resources. (low - medium) - Increased income of fishers and revenue of associations through improving the fish distribution system is used for the activities of resource management. (low) 		
<p>Items set for the purpose to be achieved</p>	<ul style="list-style-type: none"> - Number of fishers who selling fish through new distribution system - Total sales of new distribution system - Change of distribution cost, income of fishes, revenue of fishers' associations - Fish supply amount to remote areas - Number of involved fishers and associations on the fish catch survey 		
<p>Conditions to implement</p>	<p>The followings general problems show the options that can be practically applied to each target site. Considering all the circumstances on the site, the measures on improvement of fish distribution system should be established.</p>		
	<p>Current situation/ inhibiting factor</p>	<p>After improvement</p>	
<p>Individual shipment</p>	<p>Each fisher ships the fish to market individually. The waste of distribution cost is occurred.</p> 	<p>Joint shipment enables the reduction of the transportation</p> 	
<p>Occurrence of Post-harvest loss of fishery resources</p>	<p>Customer and/or demands of fish are insufficient and it causes the post-harvest loss of unsold fish.</p>	<p>Fish preservation is possible through installation of freezers realize planned shipment of fish.</p>	



ST-7 Fish processing

<p>Brief overview of this tool</p>	<p>Lack of proper facilities and techniques for fish handling and processing cause mal-hygiene. Because of these, post-harvest losses occur in tropical countries such as pacific islands. Especially, big catch of pelagic fish which migrate seasonally occur in short period. There are issues how to utilize these resources efficiently and effectively.</p> <p>Introduction of proper techniques which include fish handling, preservation and processing are important to solve above-mentioned matters. In addition, it is expected that value added fish products make more profits and expand market channels for fisheries communities.</p>
<p>Purpose</p>	<p>It aims to improve fisher's income except increase fish catch amount through introducing proper handling techniques to reduce post-harvest losses of fish products and processing techniques for value addition.</p>
<p>Implementation methods</p>	<ol style="list-style-type: none"> 1. Select pelagic fish species which is caught large amounts seasonally, and therefore with cheap price. 2. Necessary equipment and seasoning / preservation materials are prepared according to processing methods such as salted, smoked, bottled or fillet frozen. 3. Process with hygiene management (see other manuals for details) 4. Hold tasting events in several locations such as community markets, Kava bars, local restaurants, and supermarkets. 5. Based on the result of the tasting events, determine the sales location and conditions such as sales price, profit-sharing ratio between manufacturer and seller, delivery amount. 6. Record the production costs, sales amount, and profits for later management analysis to maximize profits.
<p>Relationship with resource management</p>	<p><Direct relevance level with resource management: Medium></p> <p>Proper fish handling improves the shelf life of fish and the value addition such as processing creates a new income source. Instead of catching more fish, these activities make profits with reducing post-harvest loses. Therefore, it is expected that fishers do not rely on overfishing and it reduces fishing effort.</p> <p>On the other hand, quality improvement of fish products increases in their market demands. So, when fishers promote their fish products, it is important to avoid using fish whose population is decreasing and necessary to consider fishing effort on a particular species and resource management.</p> <p>Fishers catch a large amount of fish during the migration season of pelagic fish. Therefore, these fish seem to be suitable for processing in Vanuatu.</p>

<p>Items for evaluation of the achievement</p>	<ul style="list-style-type: none"> - Proper handling and processing techniques are introduced - Processed fish makes higher profits than fresh fish
<p>Conditions to implement</p>	<p>< Social and economic condition ></p> <ul style="list-style-type: none"> - Proper facilities and equipment for handling and processing are available. - There are demands for processed fish products <p>< Natural and environmental condition ></p> <ul style="list-style-type: none"> - Proper fish for processing is caught around project sites. <p>< Technical condition ></p> <ul style="list-style-type: none"> - Training for hygiene control, handling, processing and marketing are provided. <div style="display: flex; justify-content: center; align-items: center; gap: 20px;">   </div> <p style="text-align: center;">Fish processing training at Santo Island, Vanuatu</p>

ST-8 Local handicraft development for shell craft

<p>Brief overview of this tool</p>	<p>Sea shells such as trochus, green snail and triton shell are highly valued as material for handicraft. Those species are targets of ban due to over fishing in many countries and areas. While at the same time, those shellfish species have been important food and income source for coastal communities for long time. Those shellfishes are easily collected on reef at the ebb by women, therefore the catching restriction tends to influence more on women. In other words, two parallel issues of decreasing both shellfish resources and income sources of women.</p> <p>Shell crafting is challenging those issues by adding value by processing shells as income generating activity and by controlling catching volume of them. Especially Trochus is appropriate for material for shell craft because of high reproductivity, more number compared with other species and easy processing way for shiny nacreous layer by polishing. In addition, as dead shell can be also useful for the material, it is not always necessary to catch alive ones in some areas.</p>
<p>Purpose</p>	<p>It aims to manage shellfish resources such as Trochus and to generate cash income of community women at the same time.</p>
<p>Implementation methods</p>	<ol style="list-style-type: none"> 1. Develop handicraft by exploiting characteristics of shells. (Including specialty publications for reference) 2. Prepare necessary tools for polishing and drilling. 3. Prepare generator to use electric tools. Instead of generator, inverter of solar freezer is also useful if community have it. 4. Prepare other parts than shells for accessories. 5. Conduct public relations activities such as banner and eco-tag for tourists.
<p>Relationship with resource management</p>	<p><Direct relevance level with resource management: Medium></p> <p>The relationship of shell crafting and resource management is very strong when resource is controlled by restricting amount of catching and marketing. The relationship gets stronger by using dead shells.</p> <p>Value can be added on the shell crafts with materials collected under such resource management by putting Eco-tag (Eco label) branding which is officially authorized. Introduction of Eco-tag (Eco label) also promotes producers' consciousness of participating in resource management.</p>
<p>Items for evaluation of the achievement</p>	<ul style="list-style-type: none"> - Quotative goals of resource management like catching volume - Sales volume and revenue - Production volume of Eco-tag products (Percentage of Eco-tag products on total production volume)
<p>Conditions to implement</p>	<p><Social and economic condition></p> <ul style="list-style-type: none"> - Agreement on coastal resource management



- Marketing channels for tourists
 - Access to necessary tools and machinery such as grinder
 - Access of electric power for grinder
- <Natural and environmental condition>
- There are relatively many shell resources or shell on coastal area.
- <Technical condition>
- Training by shell craft expert
 - Advice on marketing such as design and selling method.



Shell handicraft training on Vanuatu and its products

ST-9 Fish café (Local fish restaurant/take away)

<p>Brief overview of this tool</p>	<p>When expanding sales of fishery products, to develop market out of island or region is common approach in one hand, and to promote local consumption inside of island or region is another approach. Especially in areas of second approach where tourists come in and consume fishery products, its sales are important income generating activity with little cost for distribution. However, technical capacity of products development, sales strategy, hygienic management is limited in communities of remoted islands.</p> <p>For example, in case of Aneityum island of Vanuatu, lobster was provided to tourists of cruise ships from Australia and the resource had reduced due to high fishing pressure. To keep providing fisheries products to the tourist by reducing fishing pressure on lobster, Fish café with simple infrastructure provided migratory pelagic fish and deep bottom fish that were not taken attention before as alternative to lobster.</p>
<p>Purpose</p>	<p>It aims to reduce fishing pressure on specific species of coastal resource and to increase/stabilize income of fishers at same time through developing local market but not huge consuming market and reducing cost of transportation.</p>
<p>Implementation methods</p>	<ol style="list-style-type: none"> 1. Tentatively establish committee with residents who are interested in this activity and express their commitments. Divide roles of cooks, management, etc. 2. Decide details of activities (e.g. recipe for tourist or local people). Take cooking training if required. 3. Estimate expected volume of necessary fish (to secure minimum size for storing space). 4. Select land area for Fish café (e.g. communal property) and get agreement in the community. 5. Decide size of building and design layout with consideration of any activity plan or capital funds. 6. Construct the building with monitoring by committee member. 7. Record volume and cost of purchase by fish species and ingredients, costs for wage, electric, fuel and water and sales volume and prices.
<p>Relationship with resource management</p>	<p><Direct relevance level with resource management: Medium></p> <p>It is necessary to pay attention not to target threatened resources or not to get centered only on certain species. There is possibility to inform local consumers and tourists the resource management activities through Fish Café and to provide opportunities of promotion and education through selling Eco-tag (Eco label) products. In addition, some percentage of sales can be used for resource management activities that would be a way to support the activities directly.</p>

<p>Items for evaluation of the achievement</p>	<ul style="list-style-type: none"> - The number of opening days, the number of participants - Sales revenue, profit - Sales volume by species: To monitor not over fishing specific species
<p>Conditions to implement</p>	<p>< Social and economic condition ></p> <ul style="list-style-type: none"> - Prospect to increase the number of consumers such as tourists from outside - Finance for investment to start up <p>< Natural and environmental condition ></p> <ul style="list-style-type: none"> - Enough fishery resources in the area except threatened species <p>< Technical condition ></p> <ul style="list-style-type: none"> - Training on menu development, cooking and hygiene <div style="display: flex; justify-content: space-around; align-items: center;">   </div> <p style="text-align: center;">Fish café in Aneityum island in Vanuatu</p>

BOX 3: Community based Fish Café Operation



Mystery Island is a stunning coral reef Island located just south of the main island of Aneityum in Vanuatu. The island serves as an airport for light aircraft and is the first destination for cruise ships arriving from Australia. During peak season, up to 3,000 tourists visit the island, outnumbering the local population of 1,000. For a long time, the main seafood available to tourists was lobster, which was abundant in that area.,. More and more cruise ships came to the island. If lobster is all that is served, the resource will soon be overfished. The community had begun to offer fish that are abundant around the island, including pelagic fish such as wahoo and/or tuna caught by FADs.

The community attempted to promote sustainable fishing practices by empowering a local youth group to operate a fish restaurant called "Fish Café". The restaurant serves locally caught pelagic fish to tourists, reducing the pressure for lobster fishing in reef areas. This diversification of fishing practices aims to tap into previously untapped resources for a more sustainable approach to fishing.



ST-10 Community fish market

Brief overview of this tool	As described in SM-9: fish cafe, it is one of the strategies for fish marketing to expand fish consumption in target area like islands, villages and community. Stable supply of fish is essential factor to expand fish consumption not only for tourists which come from outside to target area but for residents in the communities. Market developments in local communities are profitable for fishers. Even if fishers understand the importance of resource management, they must lose their motivation to implement it, unless they feel benefits. To arrange cold storage and settle market place in local communities encourage fishers, middlemen and cooperative association to deal with fish products stably. These activities improve fish quality and expand fish consumption in local communities. In case of joint sales to markets which are located outside of local communities, fishers have to preserve their products until certain amount of fish are collected. Then fishers can use these community market facilities for their marketing activities.
Purpose	It aims to reduce fishing effort on a particular species, to increase fishers' income and to stabilize fishers' livelihood by developing local market which decrease distribution cost and value addition.
Implementation methods	<ol style="list-style-type: none"> 1. Tentatively establish committee with residents who are interested in this activity and express their commitments. 2. Decide details of activities (e.g. purchasing price, commission for middleman or fishers etc.). 3. Estimate expected volume of purchased fish to secure minimum size for storing space. 4. Select land area for market building (e.g. communal property) and get agreement in the community. 5. Decide size of building and design layout with consideration of any activity plan or capital funds. 6. Construct the building with monitoring by committee member. 7. Record purchase/selling volume and sum of money, costs for market running.
Relationship with resource management	<p><Direct relevance level with resource management: Medium></p> <p>Development of fish marketing expand fish consumption in local communities. Therefore, it is important to use fish whose resources are managed and not to deal with fish whose population is decreasing.</p> <p>Community market can be used as a base of information dissemination and support resource management activities. Staffs can deal with ecofriendly products with eco-tag and provide information about resource management to customers in the markets. Moreover, a part of sale from fish markets could be contributed to resource management activities and support their system.</p>

<p>Items for evaluation of the achievement</p>	<ul style="list-style-type: none"> - Volume and Value of transaction - Cost and benefit - The number of fishers use the market and value of transaction - Volume for each species: These quantitative data can be used to monitor fishing effort for each species and utilize resource management.
<p>Conditions to implement</p>	<p>< Social and economic condition ></p> <ul style="list-style-type: none"> - Expansion of fish consumption would be expected in local communities which include tourists' purchase. - Budget for the initial investment is allocated. - Making a profit after deduction of depreciation for equipment and running cost for the market. <p>< Natural and environmental condition ></p> <ul style="list-style-type: none"> - Enough fish resources are available for marketing in the communities except fish whose population seems to have decreased. <p>< Technical condition ></p> <ul style="list-style-type: none"> - Business management training which include running market and accounting system would be provided. <div style="display: flex; justify-content: space-around; align-items: center;">   </div> <p style="text-align: center;">Community fish market in case of Vanuatu</p>




ST-11 Quality control and hygiene management


<p>Brief overview of this tool</p>	<p>(Hygiene management) In some countries in Oceania, the use of uncleaned Esky's and freezers is common. Regular cleaning of Esky's and freezers is effective in preventing fish from spoiling due to dirt.</p> <p>(Quality control)</p> <p>Quality control of catches begins on board to ensure that fisheries products do not pose a health risk to consumers. Food poisoning can occur if the temperature is not properly controlled, mainly from the time the fisheries products are landed until it is cooked by the consumer. Therefore, when fishing, it is recommended to use an ice pack frozen in a freezer or ice in an Esky and place it on the boat to preserve the catch, and after landing, use a freezer that maintains sanitary conditions to manage the catch. On the other hand, in areas without ice, it is necessary to take appropriate measures such as shielding catch from direct sunlight and removing gills and internal organs first.</p> <p>In some countries in Oceania, there are cases where the market does not buy catches whose quality is not properly controlled. Additionally, fisheries products that have undergone quality control are often sold at higher prices than fish that have not. Quality control not only improves livelihoods but also indirectly contributes to resource management activities in that it maximizes the use of catches without wasting them or discarding them.</p>
<p>Purpose</p>	<p>This tool aims to keep the freshness and add value of fisheries product.</p>
<p>Implementation methods</p>	<p>Fisheries department will conduct training on seafood quality and food safety for market participants and training on post-harvest for fishermen. The training will raise awareness of the importance of quality control and hygiene management using educational materials that includes the following contents:</p> <ul style="list-style-type: none"> -Temperature management methods during transport of fisheries products -Maintaining the cleanliness of the freezer -Cases of poisoning caused by fisheries products (histamine poisoning, ciguatera poisoning), etc.
<p>Relationship with resource management</p>	<p><Direct relevance level with resource management: Medium></p> <p>Proper fish handling improves the shelf life of fish and the value addition. Instead of catching more fish, these activities make profits with reducing post-harvest loses. Therefore, it is expected that fishers do not rely on overfishing and it reduces fishing effort.</p>
<p>Items for evaluation of the achievement</p>	<ul style="list-style-type: none"> -Use of Fish Quality & Spoilage Training (training materials) -Use of Solar freezer cleaning (1 sheet of paper with lamination)
<p>Conditions to implement</p>	<p>< Social and economic condition ></p>

	<ul style="list-style-type: none">- Proper facilities and equipment for handling are available. <p>< Natural and environmental condition ></p> <p>Quality of raw fish is fresh and not degraded when it is landed.</p> <p>< Technical condition ></p> <ul style="list-style-type: none">- Training for hygiene management, handling is provided.
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4-3 Alternative income source development

ST-12 Development of inland tilapia culture

<p>Brief overview of this tool</p>	<p>In Vanuatu, development of inland aquatic resources is expected to play an important role in contributing to both income generation and food security in the local communities which are vulnerable to natural disaster such as cyclone. The tilapia culture can be a reliable source/tool for both income generation and food supply sufficiency. Inland aquaculture/tilapia culture is therefore one of the most important approaches for supporting coastal resource management. The island nations however generally lack in experience and history in freshwater/inland aquaculture since people in the community lives by the sea. Challenges for dissemination of tilapia culture business in the nations are 1) unstable production (and supply) of tilapia fingerling/fry 2) insufficient technical know-how of pond construction 3) weak sales chain.</p> 
<p>Purpose</p>	<p>It aims to reduce fishing pressure on reef area except decreasing fisher's income. The secondary aim is to provide aquaculture products as emergency food at the time of a natural disaster.</p>
<p>Implementation methods</p>	<ol style="list-style-type: none"> 1. Securing water source (existence of rivers, water body, well and spring water). 2. Pond excavation (at least 1m depth, 10 to 50 square meters for backyard-pod, 100 to 200 square meters for community pond). 3. Prepare of HDPE (High Density Polyethylene) sheet (If the soil is sandy) 4. Fill up the water to pond. 5. Fertilize by chicken manure (local animals' manure). 6. Plant island-cabbage around the pond as supplemental feed. 7. Rearing local animals for fertilizing pond water. 8. Stock of juveniles (5 fish/1 square meter with at least 3 to 5g body weight).  <p style="text-align: center;">HDPE sheet (liner)</p> 

	<p>9. Prepare compound feed if available (tilapia feed from Fiji, chicken feed, meat and bone meal, coconut meal, fish meal).</p> <p>Feed Composition of Tilapia Farming</p> <table border="1" data-bbox="539 434 1109 577"> <thead> <tr> <th>E</th> <th>Composition</th> <th>to make one kg</th> <th>%</th> <th>% Protein</th> <th>Price</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Meat & bone meal</td> <td>100g</td> <td>10</td> <td>5.5</td> <td>6</td> </tr> <tr> <td>2</td> <td>Copra meal</td> <td>100g</td> <td>10</td> <td>2.2</td> <td>7</td> </tr> <tr> <td>3</td> <td>Mill mix</td> <td>450g</td> <td>45</td> <td>6.3</td> <td>27</td> </tr> <tr> <td>4</td> <td>Fish meal</td> <td>300g</td> <td>30</td> <td>20.1</td> <td>42</td> </tr> <tr> <td>5</td> <td>Cassava. (Corn starch, Cassava powder or Wheat flour)</td> <td>50g</td> <td>5</td> <td>0.5</td> <td>5</td> </tr> <tr> <td colspan="2"></td> <td>1000g</td> <td>100%</td> <td>≈35%</td> <td>87VUV/kg</td> </tr> </tbody> </table>  <p>Dried pellets (meat and bone meal, coconut meal, mill-meal and wheat added, protein content 20-25%)</p>	E	Composition	to make one kg	%	% Protein	Price	1	Meat & bone meal	100g	10	5.5	6	2	Copra meal	100g	10	2.2	7	3	Mill mix	450g	45	6.3	27	4	Fish meal	300g	30	20.1	42	5	Cassava. (Corn starch, Cassava powder or Wheat flour)	50g	5	0.5	5			1000g	100%	≈35%	87VUV/kg
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<p>Relationship with resource management</p>	<p>< Direct relationship with resource management : Low ></p> <p>Development of inland aquaculture (for income generation and food self-sufficiency) will contribute to mitigation of an adverse effect by overfishing in the coastal area. However, the number of tilapia that can be produced in each house hold is small, so its effect is limited. In the case of aquaculture by community, it is also possible to actively participate in resource management activities by contributing a part of sales.</p>																																										
<p>Items for evaluation of the achievement</p>	<ul style="list-style-type: none"> - Stability and sustainability of production (number of harvests /durations) - Sales amount and profit of production - Contributions to resource management activities. 																																										
<p>Conditions to implement</p>	<p>< Social and economic conditions ></p> <ul style="list-style-type: none"> - Land to construct a fish pond is secured (at least 100 square meters or more). Consensus of community/landowner etc. can be obtained concerning the use of land. - Market survey is conducted, and it was confirmed the profitability. - In case it will be a source of cash income, the market is secured, and the transportation costs are not high. - Taste of tilapia is accepted by consumers (In some countries/area, people sometime hesitate to eat freshwater fish). <p>< Natural and environmental condition ></p> <ul style="list-style-type: none"> - Water can be secured (existence of rivers, well and spring water, etc.). - Investigation is made for the soil condition (If the soil is too sandy, it is necessary to lining ponds with polyethylene sheets (PE sheets) will resolve the problem.). <p>< Technical condition ></p> <ul style="list-style-type: none"> - Supply of fish/tilapia seed is available (It is necessary that seed production is carried by fisheries department or private hatchery). 																																										

	<ul style="list-style-type: none">- Polyethylene sheets are available (in case the quality of soil is sandy).- Condition of feed (It should be confirmed the presence or absence of commercial compound feed for fish, commercial compound feed for poultry, fish meal, meat and born meal and copra meal, etc.).- Supplemental feed (Confirm whether there is complementary available food such as vegetables and insect (ants)).- Material of livestock manure as fertilizer/nitrogen to fertilize pond water and propagate the plankton that fish/tilapia feed on to grow.- It is difficult to practice fish farming using the fertilization method if there is heavy seepage and leakage from ponds, because the fertilizer/nitrogen seeps out of the ponds before nitrogen can be utilized by the plankton. The deeper a pond, 1 to 1.5m, is the better its water-holding capacity. Therefore, excavation of deeper ponds could be one solution for the water seepage/leakage problem.
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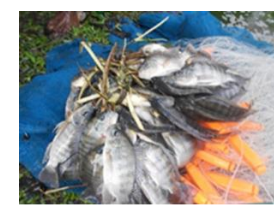
Box 4: Tilapia culture

The Wailapa community at South Santo was severely damaged by Tropical Cyclone Harold on the 6th of April 2020. Many homes, including the Chief's meeting house (Nakamal) and the community kindergarten buildings, were completely wiped out. Schools and roads were damaged and the main road access to Luganville was completely blocked by many fallen coconut trees.

Most of the household backyard farms and the community semi-commercial farm were also all damaged. Of course, 25 household backyard ponds and a community pond, including the duck's house which was supported by the Grace of the Sea III project were seriously damaged. The community was able to save 260 kilograms of tilapia from the community pond,



Community pond before and after the attacked TC Harold.



Harvested tilapia.

including several backyard ponds supporting them to share the fish amongst the community members, including other adjacent community settlements as an emergency food supply.



Household backyard pond before and after the attacked TC Harold

In addition, the village of Lamin in eastern Efate suffered food shortages due to Tropical Cyclone Pam in 2015. Villagers who farmed tilapia with the assistance of the Fisheries Department harvested tilapia and distributed them for free to about 200 residents in the surrounding area.

Circumstantial evidence in the two areas confirmed that tilapia farming can be used not




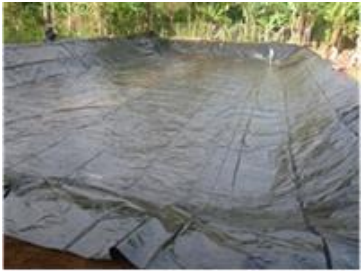
Distributed tilapia to 2,00 residents after tha attacked TC Pam.

only as a livelihood improvement measure, but also as a valuable food source when natural disasters occur.



Harvested tilapia.

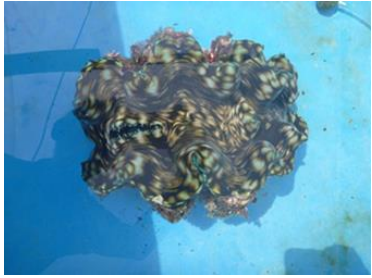

ST-13 Giant freshwater prawn culture



<p>Brief overview of this tool</p>	<p>Giant freshwater prawn (<i>Macrobrachium rosenbergii</i>) is a popular freshwater species cultured by commercial-scale farmers in the Southeast Asia. It ranges from large scale to small scale culture. The species fetches a good price in local markets due to a high demand of the prawn. The species has been cultured for decades in Fiji, one of island nations of the South Pacific Ocean. People in Vanuatu once tried a commercial-scale culture of the species in the 2000s, but the trial was halted due to insufficient technical know-how and experience of the prawn culture. The prawn culture in Vanuatu is a promising business, thanks to a good/high price in the market with high demand from local people and restaurants. The prawn culture can be a reliable income source for local communities. Same as tilapia culture, prawn culture is attracting attention as a source of animal protein and cash income sources in island nations. The prawn become emergency food in times of disaster or after attacked cyclones. This prawn culture is also expected from the aspect of food security. However, seed production of giant freshwater prawn is required to use seawater, which is technically difficult. Facilities suitable for seed production of the prawn, expert for seed production, food organism for larvae, etc. are also necessary. Because of this it is difficult to produce seeds in the community, so the provision of seeds from government or private hatchery is a precondition for dissemination of prawn culture.</p> 
<p>Purpose</p>	<p>Giant freshwater prawn culture can be a promising business for income generation, which will contribute to mitigation of an adverse effect by marine overfishing. Development of inland aquaculture, such as giant freshwater prawn farming, will contribute to the national food security when the nation suffers disaster from cyclone.</p>
<p>Implementation methods</p>	<p>Polyculture with tilapia must be require.</p> <ol style="list-style-type: none"> 1. Securing water source (existence of rivers, water body, well and spring water). 2. Pond excavation (at least 1m depth, 10 to 50 square meters for backyard-pod, 100 to 200 square meters for community pond). 3. Prepare of HDPE (High Density Polyethylene) sheet (If the soil is sandy) 4. Fill up the water to pond. 5. Fertilize by chicken manure (local animals' manure).  <p style="text-align: center;">HDPE sheet (liner)</p>

	<p>6. Plant island-cabbage around the pond as supplemental feed (this is for tilapia).</p> <p>7. Rearing local animals for fertilizing pond water.</p> <p>8. Stock of juveniles (1 to 2 juvenile/1 square meter with at least 3 to 4cm body length).</p> <p>9. Prepare pellet type feed (tilapia feed from Fiji, chicken feed, pellet make locally avrrable feed with meat and bone meal, coconut meal and fish meal).</p> <div data-bbox="475 680 1329 1234" style="text-align: center;"> <p style="border: 1px solid orange; padding: 5px; display: inline-block; margin: 10px auto;">Pellet making with locally available feed (meat and bon meal, coconut meal and etc.)</p> </div>
Relationship with resource management	<p>< Direct relationship with resource management : Low ></p> <p>Development of giant freshwater prawn farming for income generation and food self-sufficiency will mitigate an adverse effect by overfishing in the coastal area. However, the number of prawns that can be produced in each house hold is small, so its effect is limited. In the case of prawn culture by community, it is also possible to actively participate in resource management activities by contributing a part of sales.</p>
Items for evaluation of the achievement	<ul style="list-style-type: none"> - Stability and sustainability of production - Sales amount and profit of production - Contributions to resource management activities.
Conditions to implement	<p>< Social and economic conditions ></p> <ul style="list-style-type: none"> - It is possible to secure land for construct a culture pond (at least 100 square meters or more). It is necessary to obtain the consensus of community/landowner etc. concerning the use of land. - Market survey is conducted, and profitability is confirmed.

	<p>- It is necessary to secure the market and the transportation costs are not expensive.</p> <p>< Natural and environmental condition ></p> <ul style="list-style-type: none"> - Water can be secured (existence of rivers, well and spring water, etc.). - Investigation is made for the soil condition (If the soil is too sandy, it is necessary to lining ponds with polyethylene sheets (PE sheets) will resolve the problem.). <p>< Technical condition ></p> <ul style="list-style-type: none"> - Supply of prawn seed is available (It is necessary that seed production is carried by fisheries department or private hatchery). - Polyethylene sheets are available (in case the quality of soil is sandy). - Condition of feed (It should be confirmed the presence or absence of commercial compound feed for fish, commercial compound feed for poultry, fish meal, meat and born meal and copra meal, etc.). - It is difficult to practice fish farming using the fertilization method if there is heavy seepage and leakage from ponds, because the fertilizer/nitrogen seeps out of the ponds before nitrogen can be utilized by the plankton. The deeper a pond, 1 to 1.5m, is the better its water-holding capacity. Therefore, excavation of deeper ponds could be one solution for the water seepage/leakage problem.
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ST-14 Giant clam culture

<p>Brief overview of this tool</p>	<p>In Western countries, small-size giant clam is a popular ornamental species as the mantle is colorful and beautiful. The species has been in world trading markets for last decades. The government of Vanuatu, therefore, executes restrictions on exports and imports of giant clam because it is now endangered species by overfishing. Giant clam culture is now being practiced in many nations. The species has been cultured for decades in island nations of the South Pacific Ocean. The project for promotion of Grace of the Sea in the coastal community (implemented by JICA) in Vanuatu once tried an artificial breeding and settled-cage culture of small-sized giant clam (<i>Tridacna maxima</i>) in the 2010s. There are also demand for giant clam as edible. Here the culture of small-size giant clam is intended for production as ornamental species. The ornamental species has a high commercial value and there is a merit that production cost can be kept low because it does not require commercial feed for growth. If we can produce it steadily, profit is also big. However, it is not easy to make it successful because settled-cage culture requires routine care more than a year to raise a commercial size. Challenges for dissemination of small-size giant clam culture business in the nations are unstable production (and supply) of baby clam and weak sales chain.</p> 
<p>Purpose</p>	<p>Clam culture can be a reliable source/tool for new income generation. And development of small-size giant clam culture (for income generation) will contribute to mitigation of an adverse effect by overfishing in the area.</p>
<p>Implementation methods</p>	<ol style="list-style-type: none"> 1. Securing clean seawater (pump up system from coastal water or deep well) 2. Prepare the FRP of concrete seed production tanks (at least 2 tanks of 5 to 10 ton with 70 to 100cm depth) 3. Installation of the filter system 4. Installation of the air pump or blower system 5. Roof installation for prevention of algae blooming 6. Obtaining blood-stock (spawners) 7. Spawning (Blood-stock are transported to farm and placed in a seed production tank) 8. Remove the blood-stock from the spawning tank after spawning. 9. Before the metamorphosis to preveligers, blended mantle introduces to spawning tank. 

	<p>10. When Juveniles settled to bottom, those juveniles will be picked them up and settle on the concrete blocks.</p> <p>11. Continuously raise to 1 to 2 cm length in tanks</p> <p>12. Transplant the grown juveniles to the Taboo area for producing young clams</p> <div style="display: flex; justify-content: space-around; align-items: center;">   </div> <div style="text-align: right; margin-top: 5px;"> <p>Juvenile(≒10mm) of <i>Tridacna maxima</i></p> </div>
<p>Relationship with resource management</p>	<p>< Direct relationship with resource management : High ></p> <p>Development of small-size giant clam culture (for income generation) will contribute to mitigation of an adverse effect by overfishing in the coastal area. If it can be produced on a relatively large scale it is expected to be a large income. However, challenges for dissemination of small-size giant clam culture business are 1) unstable production (and supply) of baby clam 2) hard routine care of settled cage 3) weak sales chain. Contribution to the resource management activities by the small-size giant clam culture are 1) contribution of the part of sales 2) use farming facilities as a teaching material for environmental education 3) transplanting of produced young clams.</p>
<p>Items for evaluation of the achievement</p>	<ul style="list-style-type: none"> - Stability and sustainability of production - Sales amount and profit of production - Contributions to resource management activities
<p>Conditions to implement</p>	<p>< Social and economic conditions ></p> <ul style="list-style-type: none"> - Area of culture and land of hatchery is secured. Consensus of community/landowner etc. can be obtained concerning the use of land. - Market survey is conducted. - Domestic market is secured. <p>< Natural and environmental condition ></p> <ul style="list-style-type: none"> - There is a sea bottom where high water turbidity is low and enough sunlight can be reached. - Since it is necessary to clean the farming cage periodically, it is close to the sea shore. - It is a culture area where the current flow is not too fast.

< Technical condition >

- Artificially produced giant clam seed is available (It is necessary that seed production is carried out by fisheries department or private hatchery).
- It is possible to receive technical guidance on cage management, harvest time, transportation method etc.



Cage culture of giant clam in Vanuatu

ST-15 Eco-tourism development

<p>Brief overview of this tool</p>	<p>Pacific Island countries such as Vanuatu have a rich coastal nature, especially the beautiful scenery of the coral reef and fauna in surrounding areas. In Vanuatu, Grace of the Sea Project has contributed greatly to the resource enhancement of green snail and giant clam. Those marine organisms will be good attraction of the ecotourism. Tourists can observe them or attending resource management activity by skin diving under safety or guidance of local guides under the community's tourism organization. Also, in late year, sea-turtles are protected and in the full-scale prohibition of fishing in many island countries. The resource therefore been increased, and some spawning groups lay eggs at the shore. It will also be good candidate for tourism attraction if it can minimize the adverse effect for spawning behavior of sea turtles by gathering many tourists. The guide by local fishers can collect a charge from tourists by showing the coastal environments and the various animals. The initial costs are relatively low due to unnecessary of large-scale infrastructures. Furthermore, the community incomes might increase by selling light meal and small souvenirs such as shell-crafts and traditional basketry.</p> <p>However, it is necessary for the local fishers to learn the basic biologic information of the target marine organisms and to receive training for security of the tourists who are basically inexperienced in coastal waters. Also, it is desirable to prepare clean restroom and fresh water as a minimum institution.</p>
<p>Purpose</p>	<p>The purpose of eco-tourism development in coastal communities is to reduce fishing pressure on reef fisheries resources except decreasing fisher's income. It aims to attract tourists through developing accommodation facilities and tourism programs using coral reef organisms and the natural environment of the land area as tourism resources.</p>
<p>Implementation methods</p>	<ol style="list-style-type: none"> 1. Establish a temporary steering committee composed by community members having an interest in the activities. 2. Select the areas suitable for tourism such as coral reefs and abundant reef fish area including taboo areas and MPAs. 3. Prepare the funds.



Marking pencil on green snail by tourist



Giant clam garden in Mangaliliu, Vanuatu

	<p>4. Prepare minimum infrastructure such as toilet, shower and dressing room. Bungalow will be also attractive.</p> <p>5. Consider the fish cafes and road markets if it is possible</p> <p>6. Develop public information tools such as brochure, web-site.</p> <p>7. Having regular meetings by the members to improve management</p>
Relationship with resource management	<p>< Direct relationship with the resource management: High ></p> <p>This activity generates a positive impact on the coral reef and the organism inhabiting there directly because of necessity of appropriate management of the coastal nature to attract tourists. Local fishers can expect to obtain an income from a tourist even if they cannot catch many fish by fishery management measure. Local community also contributes a part of the income from this activity to environmental conservation and resource management activity and can expect to conduct management measure sustainably.</p>
Items for evaluation of the achievement	<ul style="list-style-type: none"> - Stability and sustainability of operation - Sales amount and profit of activities - Contributions to resource management activities
Conditions to implement	<p>< Social and economic condition ></p> <ul style="list-style-type: none"> - Securing rich fauna sea and land facing the sea - Making the public awareness tools - Access of the tourist being relatively easy <p>< Natural and environment condition ></p> <ul style="list-style-type: none"> - Resources and environment including the coral reef and mangrove area being abundant - Being able to access the target area safely - Location in which the tidal current is not too strong <p><Technical requirements></p> <ul style="list-style-type: none"> - Being to be able to learn the target faunae and their biology - Being able to learn the safety measures and a basic first aid.

ST-16 Road market development

Brief overview of this tool	The road market is a simple store which locates along the road with relatively heavy traffic and sells groceries and souvenirs to tourists and holidaymakers. In Vanuatu, there are some cases that the regional goodies and food products are sold in the road markets and the revenues are used for the activities in the communities. Usually, the fishery products and agricultural products produced in rural areas are brought to large towns or community markets. However, the strategy of road market managed by community is to reduce the distribution cost and widen sales. The road market has a potential to generate the income source of communities by utilizing its broad utility.
Purpose	Road markets create new source of cash income by selling local specialty products. This new income source works as an alternative income source and realizes the reduction of catch pressures.
Implementation methods	<ol style="list-style-type: none"> 1. Establish a temporary steering committee composed by community members having an interest in the activities. 2. Decide items of merchandise. 3. Prepare the funds 4. Prepare minimum infrastructure such as toilets. Bungalow will be also attractive. 5. Consider the fish cafes and road markets if it is possible 6. Having regular meetings by the members to improve management
Relationship with resource management	<p><Direct relevance level with resource management: Low></p> <p>This supporting measure contributes to the development of income resources for communities. However, it is difficult to associate directly with the resource management because the decision of selling items is depending on the demand by customers. But it is possible to support the resource management in an indirect way by following ways; to sell the goods with eco-tag, to utilize the road market as a place for awareness activities and to use the part of the sales for the activities of resource management.</p>
Items for evaluation of the achievement	<ul style="list-style-type: none"> - Number of business days - Stability and sustainability of operation - Sales amount and profit of activities - Contributions to resource management activities - Results of public relation/awareness raising activities related to the resource management (number of events, creation of teaching material, number of days of display, number of visitors)
Conditions to implement	<p><Social and economic condition></p> <ul style="list-style-type: none"> - The road side market locates near the high traffic area

- Land to construct the market is secured. Consensus to use of land among the communities and land-owners can be obtained.

- Market survey is conducted, and the commodity composition is verified.

- Consensus is obtained how to share profit gained.

<Natural and environment condition>

- The location of the market is not a place where is difficult to park cars such as a slope or a curve of road.

<Technical condition>

- It is necessary to discuss about the commodity composition among the relevant parties including an external organization.

- It is possible to receive technical guidance for operation and management (accounting, inventory management).

- Posts (manager, accountant, auditor etc.) are decided.



Road market in Mangaliliu community, Vanuatu

5. Tools for the connecting measure

There are several tools for the connecting measure. In case of Vanuatu, following seven tools shown in the Table 3 are utilized in the Integrated CBCRM activities. Details of each tool are shown from next page.

Table 5: Tools for connecting measure



	Name of Tools	Serial No.
1	Data collection on catch and fish distribution	CT-1
2	Activities on awareness raising and education	CT-2
3	Sports events	CT-3
4	Research and study	CT-4
5	Eco-tag (Eco label)	CT-5
6	Fund raising for resource management activities	CT-6
7	Providing labor force to resource management activities	CT-7
8	Nutritional improvement	CT-8

CT-1 Data collection on catch and fish distribution

<p>Brief overview of this tool</p>	<p>. It will correspond to supporting measure depending on fisheries resources such as FADs or deep-bottom fish development.</p>
<p>Purpose</p>	<p>The purpose of this tool is to improve existing management and supporting measures to provide basic information of appropriate resource management through understanding the situations of fish catch and distribution</p>
<p>Implementation methods</p>	<p>Data collections are carried by person in-charge of the community with recording sheets for catch and distribution on target species and selling location. The recording sheet is preferable to use official format, but it is not limited to cases where only specific fish species are targeted. In case of market survey for fish distributions, person in-charge should be appointed officially by cooperative leader or market representative and using official recording format.</p> <p>In case of catch data collecting by fishers of local community, following items are important, namely 1) explanation of the reason for the data collection to local fishers, 2) results sharing to local fishers with appropriate timing to keep their motivation. On the survey result sharing with local fishers, it is better to use the graphs and photographs to promote an understanding of the results.</p> <div data-bbox="603 1041 1212 1422" data-label="Form"> </div> <p>Example of a sheet for record of fish catch</p>
<p>Items for evaluation of the achievement</p>	<ul style="list-style-type: none"> - Number of surveyed participants (fishers who provide the data) - Frequency of reporting to fisheries department - Presence or absence of feedback to management/supporting measure - Change in people’s awareness on way of thinking to resource management

CT-2 Activities on awareness raising and environmental education programs

<p>Brief overview of this tool</p>	<p>Activities on awareness raising and environmental education programs related to the Integrated CBCFM for children by being provided the opportunity of the community hatchery is important to understand the concept of the Integrated CBCRM activities and encourage people for the sustainable of use for coastal resources by providing the opportunity to learn about the experiences. By collaborating with community members and schools, we can expect to promote resource management activities in the future.</p>
<p>Purpose</p>	<p>This activity aims to raise awareness for children to be participated the Integrated CBCRM activity through environmental educational opportunity.</p>
<p>Implementation methods</p>	<p>This environmental educational program invites schools and introduce one of the school field trips. Teachers are the key to strengthen the student's participation. To Set up the Integrated CBCRM Environmental Education Programs:</p> <ul style="list-style-type: none"> • Discussion and agreement are made within fisheries and the community to have environment education activities. It is necessary to have the community group to be lead and be advised by the fishery office . • Collect the previous activity information what fishery office or any other projects have implemented in the country on the co-management marine resources. Based on collected information, you can draft the educational material such as the history of the Integrated CBCRM activities and the contents to be provided. • To have an interview with local teachers and principals if they have the possibility of being introduced school field trip and what is the issues on science for teachers and students. Also, share the ideas of the targeted the grade level to clarify. And have a preparation meeting beforehand on the role and the overall programs for teachers. • Implement the environment educational programs as a school field trip involving the community members and other field fishery officers. <p>Hands on activities:</p> <ul style="list-style-type: none"> • Conducting lecture of the history and lifecycle of the species • Observe the spawning of green snail, giant cram, and trochus at hatchery and swim those species in the sea • Create the own coral by writing your name on the name tag • Exhibiting posters or performance of the related activities etc, <p>How to continue the Integrated CBCRM environmental educational programs:</p>

	<ul style="list-style-type: none"> • Share the pilot activities with Ministry of Education if these programs can be considered in a budget as one of the school field trip. • Discuss the possibility of collaboration with curriculum development unit to check the contents itself and support to publish as a resource book. • Disseminate to deliver this programs through country and also for students from other countries to modify the contents of the environment educational package <div style="display: flex; justify-content: space-around; align-items: center;">   </div> <p style="text-align: center;">Students observing the spawning of giant clams in the hatchery</p>
<p>Items for evaluation of the achievement</p>	<ul style="list-style-type: none"> - Number of the awareness raising/education programs implemented - Number of participants for the activities - Change in people’s awareness on way of thinking to resource management

CT-3 Sports events

<p>Brief overview of this tool</p>	<p>Sports event is an effective tool for promotion of community people's involvement. It is usual for youth to participate the sports events. It therefore provides the good opportunities for public awareness and information sharing of resource management activities to younger generation. The sports events may also promote the involvement of people, establish the community groups and find out new leaders for next generation. Since many youths join sports events, it is good opportunity to establish youth groups and invite as Integrated CBCRM activity participants.</p>
<p>Purpose</p>	<p>It aims to encourages youths to actively participate in resource management activities.</p>
<p>Implementation methods</p>	<p>The sports such as football and/or volleyball are popular in the area.</p> <p>The league matches by community team are programmed.</p> <p>At same time, exhibitions of posters, presentation for awareness raising, lecture for resource management activities to the community people.</p> <p>Giving awards are effective means of awareness rising.</p>
<p>Items for evaluation of the achievement</p>	<ul style="list-style-type: none"> - Number of sports events implemented - Number of participants for the events - Change in people's awareness on way of thinking to resource management <div data-bbox="687 1227 1131 1563" data-label="Image"> </div> <p>Football tournament corroborated with the Integrated CBCRM project in Emae island, Vanuatu</p>

Box 5: Effect of the sports event for the Integrated CBCRM activities

When participatory workshops are held in communities for the Integrated CBCRM, the participants are often older people with a high level of awareness, and the youth who are actually involved in the fishing industry are reluctant to participate in such community activities. One way to encourage youth participation in community coastal resource management is to hold popular football (mainly popular with men) and volleyball (mainly popular with women) tournaments, with the aim of using the events to raise awareness of the importance of resource management activities among the general population and school children.

Resource management awareness-raising activities through sporting events were conducted three times during Grace of the Sea Project Phase 3. The second CBCRM Cup, held on Emae Island, involved four teams from the island, and the Shefa Province Football Association organised a football school for the children. During and between each match, community leaders and staff from local NGOs gave speeches on the importance of resource management activities and displayed relevant posters. Discussions were also held between fisheries department staff and community members to develop a common understanding of the current situation and challenges facing the coastal population.

In this CBCRM Cup, the residents' participatory workshops conducted in each community were able to gather youth who is normally low levels of participation at the island-wide level, as shown in the table, enabling the resource management plans set up in each community to be made known as island-wide resource management plans. In doing so, it was not only a means of "gathering people", but by applying the "field", "rules", "division of roles" and "discipline" of group sports to the target areas of fisheries resource management, management rules, roles of resource management committee members and compliance with the rules, it was not a one-sided explanation of the fisheries resource management plan, but a positive response to the plan among residents. The plan also allows for active discussion of the plan among the local population.

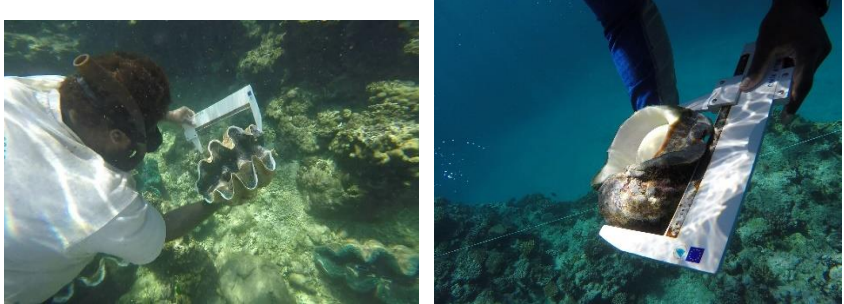
Table Average age of the players and the percentage of people who is involved in the fisheries activities

Name of teams	Poloa	Sakamao	Iwoka	Matakina
Average age	24.75	27.41	23.24	29.37
Number of players	20	17	21	19
Percentage of fishers (%)	10 (50%)	7 (41%)	11 (52%)	14 (74%)

Source: Questionnaire survey conducted by the project



CT-4 Research and study

Brief overview of this tool	Surveys such as underwater visual census and interviews to residents regarding the past trend of resources for management are effective. The underwater visual census corresponds to the management measure.
Purpose	It aims to obtain basic information of the resource
Implementation methods	<p>As the underwater visual census, a line transect method is easy to introduce. In addition, it is easier for community to decide the target species and concentrating to benthic species (not free-swimming). Especially, large shellfish such as tridacna and green nail is relatively easy to count the number of individuals. In addition, through the participation of the underwater visual census, it is possible to expect improvement of community's awareness on resource management.</p> <p>Interview surveys can be used for a wide range of applications, such as changes in resource conditions from the past and changes in the awareness of residents. It is effective survey method to understand the effects of resource management measures and supporting measures.</p>
Items for evaluation of the achievement	<ul style="list-style-type: none"> - Number of surveys, period of the survey - Number of participants to the survey (diving survey) - Change in people's awareness on way of thinking to resource management <div style="text-align: center;">  <p data-bbox="523 1473 1310 1507">Underwater stock assessment for shellfishes in Emae island, Vanuatu</p> </div>

CT-5 Eco-tag (Eco label)

Brief overview of this tool	Tags (labels) are developed as a certification in appropriate resource management manner on fish catch. Making standards for certification as well as official support is desirable. It is corresponding to supporting measure such as shell crafting.
Purpose	It aims to raise the awareness of the target community people and to make alternative income sources by making eco-friendly products.
Implementation methods	<p>Discussion and agreement are made within the community for following items such as 1) target fishery resources for the eco-tags, 2) conditions for the selection, design, application and approval procedures, 3) manufacturing and printing methods of the tags themselves, and 4) estimation of necessary budgets, source of expenditure on budget. It is therefore necessary to consult with specialists of external support organizations. It is also desirable to obtain official approval by government authorities. Eco-tags are issued for fishery products or processed products based on decision of the eco-tag authority. The producers can sell the product with an eco-tag attached to the product after receiving approval. The shell-crafting or processed fish (frozen fillets, smoked products) are typical target for Eco-tag. It is necessary to periodically monitor the eco-tag awardees to check the rule compliance. It is also necessary to previously decide on the penalty to violators.</p> <div data-bbox="667 1055 1131 1402" data-label="Image"> </div> <p style="text-align: center;">Shell crafts with eco-tag in Aneityum island, Vanuatu</p>
Items for evaluation of the achievement	<ul style="list-style-type: none"> - Number/percentage of eco-tag certified products. - Change in people’s awareness on way of thinking to resource management

CT-6 Fund raising for resource management activities

Brief overview of this tool	A part of the profit obtained from the supporting measure for the activities of resource management and indirectly support resource management. Although it can relate to supporting measure, it has a high affinity for supporting measure that do not rely on natural fishery resources
Purpose	This tool aims to get part of the funding for resource management activities
Implementation methods	There is a method of preliminarily determining the amount and rate of fund raising from profits to a group that adopts specific supporting measure, and a method to leave it to their autonomy of each person. In case, deciding the amount/rate of fund raising in advance, it is unlikely that an unfairness will occur. However, there is a risk that antipathy to resource management activities may arise since the activity has a strong characteristic as a duty. In the case of depending on their autonomy, there is a risk that there will be no one who makes fund raising due to unfairness, but those who continue donating can gain motivation for stronger resource management. Both methods have advantages and disadvantages, it is necessary to decide through discussing in that community. It is important to foster the sense of ownership that “We participates the resource management”.
Items for evaluation of the achievement	<ul style="list-style-type: none"> - Percentage/number of people on the fundraising - Amount of donation - Change in people’s awareness on way of thinking to resource management

CT-7 Providing labor force to resource management activities

Brief overview of this tool	Even though he/she is not involved in the resource management activities independently, he/she participates in resource management activities led by others (e.g, beach cleaning, control and monitoring activities) and provides labor force.
Purpose	This tool aims to secure a workforce in carrying out resource management activities
Implementation methods	The basic idea is the same as “fund raising”. There is a way to obligate provision of labor force and a way to leave it to individual autonomy. There is a possibility that antipathy or unfairness coming from each sense of obligation may occur. However, there is an aspect that it is easier to participate than fund raising because money is not concern, and it is enough to ask participants for each event of resource management activities without setting special rules. In any case, it is important that it leads to create a sense of ownership that “We are participating the resource management”.
Items for evaluation of the achievement	<ul style="list-style-type: none"> - Percentage/number of persons who provide labor force - Change in people’s awareness on way of thinking to resource management

CT-8 Nutritional improvement

<p>Brief overview of this tool</p>	<p>Fish bones, previously discarded, are now used for food, supporting resource management through the effective use of resources.</p> <p>Calcium intake is inadequate in some Oceania countries. Lack of calcium causes: (1) growth is affected, (2) weak bones and teeth, (3) numbness, (4) rough skin, (5) osteoporosis, (6) hypertension, (7) arteriosclerosis, and so on. In some Oceania countries, however, the intake of calcium-rich foods (dairy products, vegetables, seaweed, small fish, and beans) is below the recommended amount, but these foods are relatively expensive. On the other hand, fish bones, which are usually discarded, contain many nutrients such as calcium, phosphorus, magnesium, vitamin D, iron, folic acid, and amino acids, which can be effectively utilized.</p>
<p>Purpose</p>	<p>This tool aims to use effectively the fisheries product and improve the nutritional status of target.</p>
<p>Implementation methods</p>	<p>(Commercial level, school lunch, etc.) Aim to increase calcium intake by creating powder from the bones of tuna that can secure a certain amount. Especially, by utilizing it for school meals, will help children understand the importance of calcium and contribute to regular calcium intake.</p> <p>(Household level) To increase calcium intake by making crackers from the bones of reef fish that are thrown away when eating reef fish.</p> <p>(Tilapia farmers level) In Tilapia culture, small individuals are sometimes thinned out in order to promote the growth of large individuals, so fried fish is made from these small individuals with the aim of increasing calcium intake.</p> <div data-bbox="496 1294 1310 1686" style="text-align: center;"> </div> <p style="text-align: center;">Effective use of fish bone</p>
<p>Items set for the purpose to be achieved</p>	<ul style="list-style-type: none"> • Use of Leaflet: A summary of the nutritional status of the target country, the role of calcium, the effects of calcium deficiency, the nutrients in fish bone powder, etc.



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