

Report for the transplantation of green snail to Emae Island

25 December. 2022

Grace of Sea Project Phase III Team

Background

According to the report titled "A field survey of the green snail (*Turbo marmoratus*) in Vanuatu: Density, effects of transplantation, and villagers' motives for participation in transplantation and conservation activities" published on the issue 39, TRADITIONAL Marine Resource Management and Knowledge Information Bulletin, the habitat density of the green snail was extremely higher in the sites conducted the transplantation of the adult snail in Efate Island. It suggests that the eggs and suspending larvae had been retained on the spawning ground and would contribute to the increase of the population in the area. Based on this report, project team has been planning the green snail transplantation into Emae Island, one of target sites of the Grace of the Sea Project Phase III.

Outline and aim of the transplantation activity

In 24th November, 2018, 35 individuals of green snail were transferred from Aneityum to Mangaliliu, Efate Island to be cured in certain time period. Each green snail was marked and released in the sea front of Mangaliliu community for curing approximately three months. The green snails then have been kept in the re-stocking station of Mnagaliliu.



Meanwhile, the project team and MPA committee (Fenoati) member (hereafter "survey team") conducted a survey for candidate site selection at 7th Feb. 2019 as follows.

Site Decision Survey

Method for Site Decision Survey

As survey sites, the survey team selected 9 candidates along the north to west coast of Emae Island. Each location's name and GPS position are shown in following table and figure.

Name of site GPS position

a) Front of Makatea	17° 03.466' S., 168° 26.462' E.
b) North side of Makatea	17° 02.951' S., 168° 26.293' E.
c) Front of Reisu	17° 02.129' S., 168° 24.561' E.
d) Moroa	17° 02.095' S., 168° 23.106' E.
e) Nambagoro	17° 02.140' S., 168° 22.830' E.
f) Front of Marae	17° 02.290' S., 168° 22.646' E.
g) Nagisunitoe	17° 02.691' S., 168° 22.446' E.
h) Front of Vaitini	17° 03.412' S., 168° 21.431' E.
i) Sokona Vaitini	17° 03.562' S., 168° 21.142' E.



In the survey for site selection of green snail transplantation, we considered following six items, viz. 1) Habitat Condition, 2) Wave / Current condition, 3) Visibility, 4) Depth, 5) Tabu / Access area, 6) Accessibility for Monitoring. The basis of valuation of each item is as follows.

- 1) Habitat condition: Green snail usually inhabits a substrate of bedrock or reefy areas with rugous (irregularities and dimples) condition. Further, it is expected that locations with abundant micro algae as feed would be a preferred habitat for green snails.
- 2) Wave / Current condition: Rough wave and strong current generally protect green snail due to prevention for human intervention. Meanwhile, it causes for difficulty of implementation of monitoring activities.
- 3) Visibility: Good visibility would be preferable.
- 4) Depth: Since the monitoring activities would be implemented by snorkelling, the preferable depth must be around -2 m to -5 m depth.
- 5) Tabu / Access area: Transplantation site must be in the marine protected are (tabu area).
- 6) Accessibility for Monitoring: For monitoring activities, it is preferable to access easily even in worse weather.

Survey Results of Site decision survey

The survey was conducted at 7th February 2019.

The underwater sceneries of each site except "c) Front of Reisu" were as follows.

"a) Front of Makatea"



"b) North side of Makatea"



"c) Front of Reisu"

Regarding "c) Front of Reisu" was steep slope in the landscape and decided as not suitable for transplantation of green snail.

"d) Moroa"



"e) Nambagoro "



"f) Marae "



"g) Nagisunitoe "



"h) Vaitini "



"i) Sokona Vaitini "



The result of survey was as following table.

Location	a)	b)	c)	d)	e)
Name of location	Front of Makatea	North side of Makatea	Reisu	Moroa	Nambagoro
Habitat Condition	Flat beach rock	Flat beach rock with trenches	Many sands	Many coral and some rocky bottom	some Colal and contoured rocky bottom,
Wave / Current	Storong	Strong	Calm	Calm	Calm
Visibility	Very good	Very good	a little poor	Good	Very good
Depth	approx. -5 m	-2 ~ 3 m	-2 ~ 4 m	-3 ~ 5 m	-2 ~ 4 m
Tabu/ Access	Tabu	Access	?	Access	Tabu
Accessibility for Monitoring	Sea is usually rough	Sea is usually rough	Good	Good	Good

Location	f)	g)	h)	i)
Name of location	Marae	Nagisunitoe	Vaitini	Sokona Vaitini
Habitat Condition	Colal and rocky bottom Visibility is not good	Colal and rocky bottom Visibility is not good	Coral & dead coral, rocky, Sand	Coral & dead coral, rocky, Sand
Wave / Current	Calm	Calm	Calm	Calm
Visibility	A little poor	Good	Good	Good
Depth	-3 ~ 6 m	-2 ~ 5 m	-2 ~ 5 m	-2 ~ 5 m
Tabu/ Access	??	Tabu	Tabu	Tabu
Accessibility for Monitoring	Good	Good	Good	Good

Among the candidate sites, it seems that the "Nambagoro" is suitable for the transplantation of green snail and the MPA committee (Fenoatai) made a final decision for location site as Nambagoro after discussion within the members.

The survey team also confirmed the presence of green snail around each survey site, but no green snails were observed at the time of the survey, confirming that the mussel resources were almost depleted.

Transplantation of the green snail

As mentioned above, the green Snails transferred from Aneityum to Mangaliliu, was transferred to Emae Island about three months later . Each individual was marked before release. A total of 50 individuals were released, including 35 individuals transferred from Aneityum and 15 individuals donated kindly by the Mangaliliu community. They were transported by boat from Mangaliliu to Emae Island in time for Chief's Day (March 5th) in 2019, and then transplanted to the site planned.

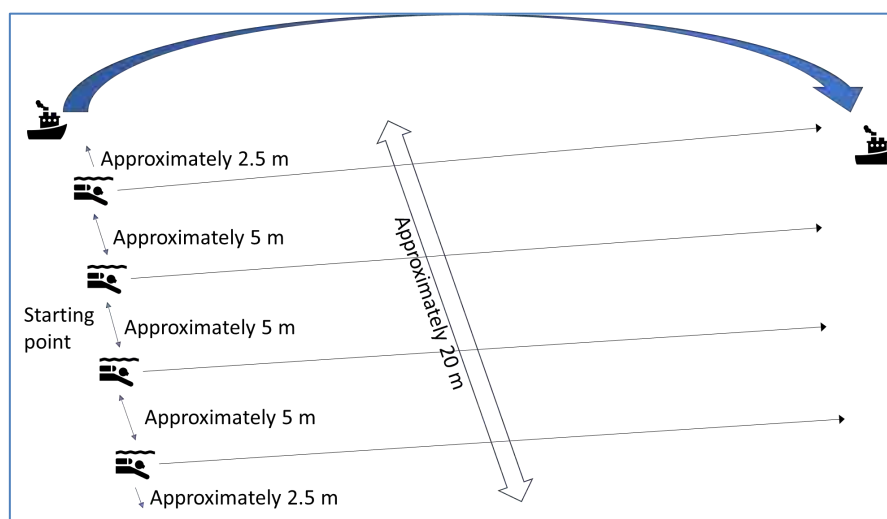
Status survey of green snail transplanted to Emae Island

In November 2022, approximately three years after the transplantation of the green snails, a survey to understand the distribution of the green snails transplanted .

Method for the Survey

An underwater visual survey was conducted by the belt transect method in the northeastern part of Emae Island, focusing on the area where the green snails were released in 2019. The specific research method is as follows.

1. Record the GPS coordinates of the starting point on the outer edge of the reef.
2. Move the boat to the end point 100-400 m away from the start point, record the GPS coordinates, and anchor and park the boat if necessary.
3. Four snorkelers swim in a straight line at intervals of approximately 5 meters from the starting point to the end point where the boat is waiting, and if they find a green snail, they retrieve it. Snorkelers at both ends also observe 2.5 m outside of themselves.
4. When the snorkeler arrives at the end point, measure the shell height of the mussels collected on the boat and check whether they have been released in the past by checking for markings.



5. Once the final specimen has been measured and confirmed, the mussels are released into the surrounding area again.

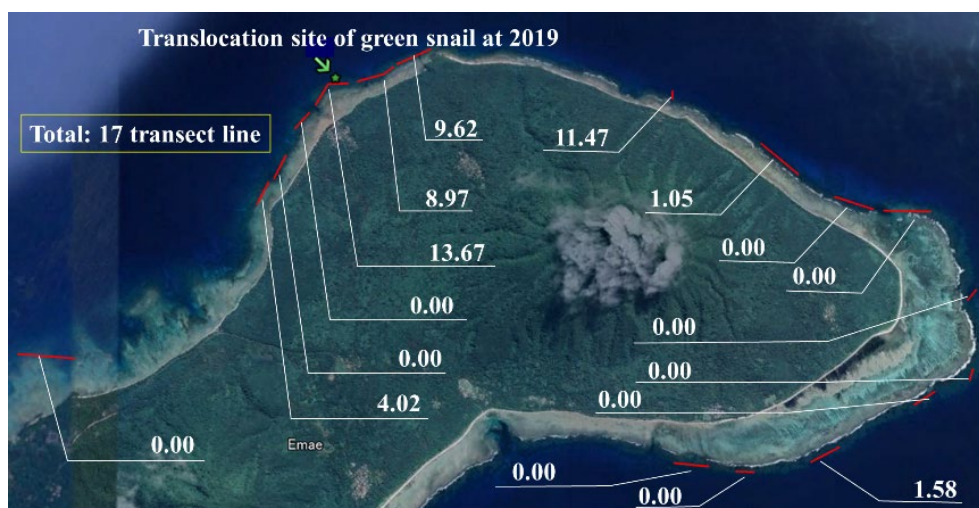
6. The range observed by the snorkeler is calculated and estimated from the recorded GPS coordinates as follows, and the amount of mussels inhabited per unit area is recorded. The calculation method: distance between start and end points x width observed by snorkeler (20 m = 5 m x 3 + 2.5 m + 2.5 m).

Survey Results

The survey was conducted on November 11, 12, 23, and 24, 2022. The details of the results were as follows.

Nine of the 50 individuals released in 2019 were observed around the transplant site. It means that approximately 20% of the transplanted green snails were confirmed to be staying around the transplant site even three years after the transplant. In addition, green snails were observed on the northeast side of the transplant site, but most of them were small, with a shell height of 150 mm or less, and large individuals were rarely seen. On the other hand, few green snails were observed on the southwest side of the transplant site. Furthermore, on the southeast and south sides of the island, far from the transplant site, almost no green snails were observed, as was the same at the time of the 2019 survey.

The following figure o shows the estimated number of mussels per unit area (100 m x 100 m) at each survey point.



Number of green snails estimated per unit area (100 m x 100 m)



Green snails observed around the transplantation site.

The above results can be summarized as follows.

- 1) Many green snails were observed near the transplant site.
- 2) As before, few mussels were observed in other locations.
- 3) Most of the individuals observed on the northeast side of the transplant site were small.

From these things, it can be inferred that the number of green snails is increasing around the transplant site due to the reproduction of the individuals transplanted in 2019.

Additionally, in the area, it is common for the current to flow northeast in ebb tide and to the southwest in rising tide. The spawning of green snails occurs at high tide, It is assumed therefore that their distribution has spread to the northeast of the transplant site.

Report submitted on: 03 November 2023

North Efate Giant Clam Assessment

JUNE - JULY 2023



VANUATU FISHERIES DEPARTMENT

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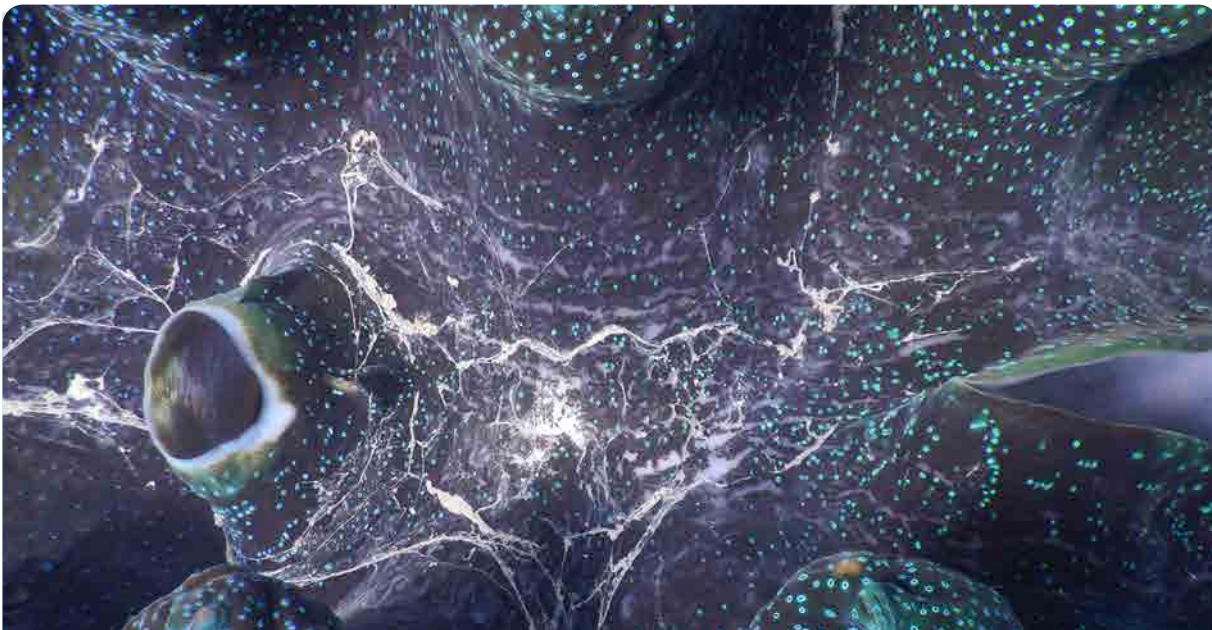
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Acknowledgment



The Fisheries Department (VFD) would like to acknowledge the tireless effort and support that the Japan International Cooperation Agency (JICA) has provided through the Grace-of-the-sea (GOS) project. The technical and financial assistance provided has helped progress the department's mariculture program across the nation. Important farming, restocking and reseedling activities has no doubt helped in tipping the scales for the better on the decline of many local populations of macro-invertebrates. Knowledge transfer and sharing between GOS members and VFD staff has further strengthened the relationship between the Vanuatu government and the JICA program and has been an exemplary experience.

Additionally, VFD would like to thank the communities and their members who have been quite supportive of the GOS project and the work that they carry out on behalf of the department. In particular, the Department would like to thank the communities of Mangaliliu, Lelepa, Gideon's Landing, Sunae and Tassiriki for playing a major role in safeguarding the assets which have been placed in their communities. The *Tridacna gigas* individuals were placed with these communities in the hopes that they may repopulate the surrounding and adjacent areas through natural spawning processes.

Last but not least, a special thanks to the researchers, divers and community members who helped to collect the data that is reported in this document.

Introduction

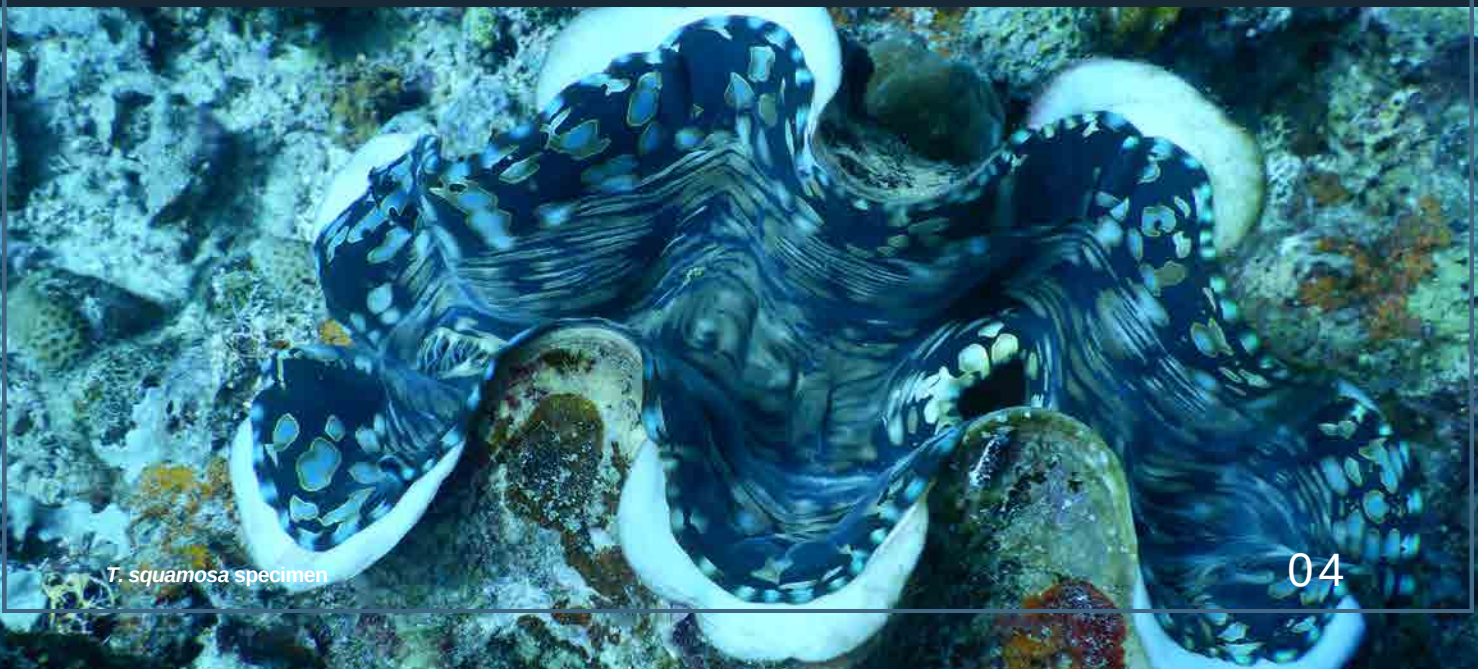
Giant clams are bivalve mollusks that inhabit shallow tropical and sub-tropical waters, mainly in the Indo-Pacific region (Hean and Cacho, 2003). They are unique to other bivalves as they share a symbiotic relationship with an algae (symbiodinium) that resides within the upper layer of their mantle. The algae help convert sunlight into nutrients for the clam (Beckvar, 1981; Hean and Cacho, 2003; Klumpp et al. 1992). Excess carbon from the biochemical reaction is then transferred to the host's tissues to assist with shell building. Additionally, giant clams possess digestive tracts that digest nutrients filtered from the surrounding water which help supplement the food that they get through photosynthesis. Klumpp et al. (1992) suggested that the combined input from these two modes of feeding is particularly advantageous to exist in the nutrient-poor environment of coral reefs.

Beckvar (1981), as well as numerous other authors and scientists, have remarked on the decline of clam populations throughout the Pacific since the 1960s. For instance; 156,000 giant clams were estimated to have been harvested from the Swain reefs on the Australian Great Barrier Reef since 1969. Traditional harvesting by expanding coastal villages for subsistence purposes and illegal, unreported and unregulated fishing have contributed to the declining stocks (Hean and Cacho, 2003). Lucas (2008) describes eight species of giant clams that have been overfished for meat and shells throughout their Indo-Pacific distributions. Populations of the larger species of giant clams, particularly *Tridacna gigas*, have declined impetuously in many areas because of over-exploitation (Crawford et al. 1986, Elfwing et al. 2003).

T. gigas is the largest giant clam species reaching a maximum shell length of 140cm and weighing up to 500 Kilograms (Beckvar, 1981; IUCN, 2004; Mecha and Dolorosa, 2020). Since it grows so large, its flesh and shell have served as a great source of food and income for many Pacific Island inhabitants. Surtida and Buendia (2000) explain that *T. gigas* reaches sexual maturity at four to five years old and can live anywhere from 40 - 100 years in the wild and 34 years under mariculture conditions. Most *T. gigas* can be found on sandy bottoms anywhere from shallow waters to about a maximum depth of 15m (Mecha and Dolorosa, 2020). In 2004, the International Union for Conservation of Nature (IUCN) listed *T. gigas* as vulnerable (VU) which prohibits the trade of wild-stock products but allows for trade in certified cultured products.

Declining stocks and local extinctions of *T. gigas*, such as was seen in Vanuatu, has been a catalyst for research into mariculture and artificial restocking of depleted reefs (Lucas, 2008). According to Hean and Cacho (2003), village-farming of giant clams is now emerging as a potential industry. In 2005, the Vanuatu government through the Fisheries Department in partnership with the JICA Grace-of-the-sea project, imported 500 *T. gigas* juveniles from Tonga. Upon arrival, a couple hundred died and the rest were distributed and restocked onto reefs around North Efate. There are, currently, 5 locations in North Efate that house *T. gigas*: Sunae and Tassiriki on Moso Island, Lelepa Island, Gideon's landing and Mangaliliu community. It is uncertain whether these restocked groups have been able to successfully breed in the wild and reseed once abundant clam waters after several years of protection.

This study aimed at inventorying the live *T. gigas* that was restocked with the JICA project and to identify whether juvenile clams of these species are present within the stocking vicinity. Other giant clams species were also sampled. These included *T. squamosa*, *T. maxima*, *T. crocea* and *Hippopus hippopus*.



T. squamosa specimen

Methodology



Six VFD officers and 1 JICA counterpart conducted a 3-week long study from Tuktuk point to Moso Landing and around Lelepa Island. The underwater survey was conducted from 16 June to 5 July 2023 and targeted sampling for the following clam species: *Tridacna gigas*, *T. maxima*, *T. squamosa*, *T. crocea* and *Hippopus hippopus*. The aim of the assessment was to gauge the success of farmed *T. gigas* to spawn naturally in the wild and reseed reefs around Mangaliliu, Lelepa, Moso and the general Havannah Harbour area.

There were two types of stations that were designed for this assessment: a) Snorkel stations and b) scuba stations (Fig. 1).

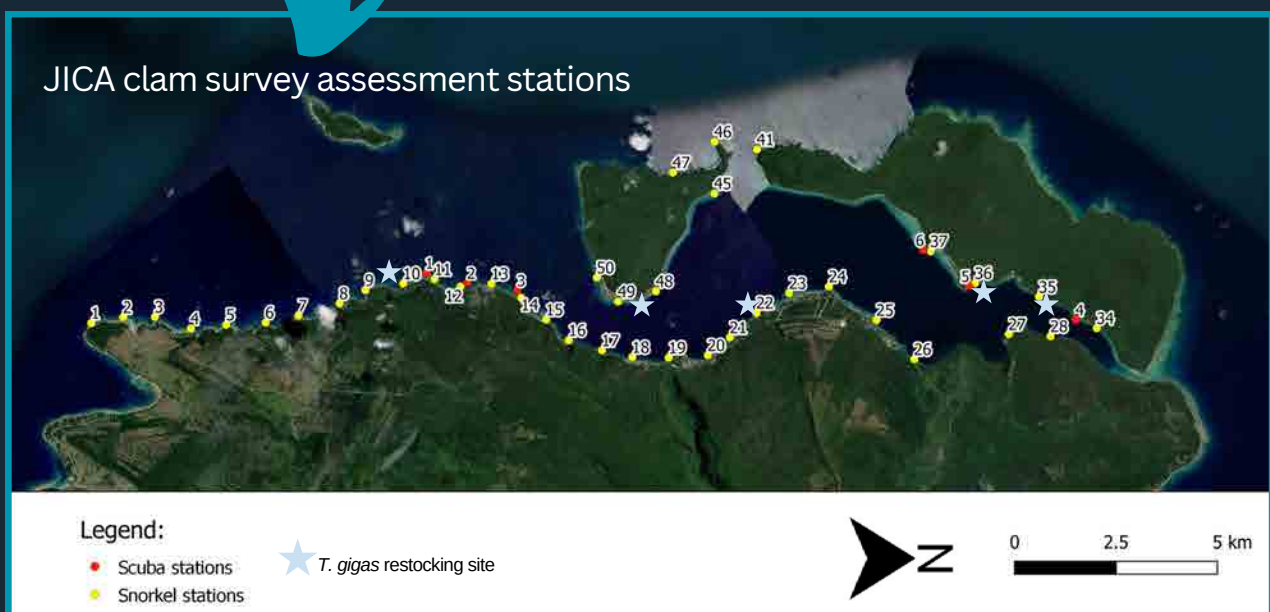


Figure 1. Map of survey stations from Tuktuk point to Moso Landing

Snorkel stations

These stations ranged from Tuktuk point to Moso landing (shown as yellow and red dots on the map in figure 1). Stations were approximately 700m - 1000m apart. There was a total of 44 snorkel stations that were surveyed. These stations were randomly placed along the coastline to keep survey depth at 1m to 6m . Average area swam was approximately, 600m per station.

Using a GPS (Garmin GPSMAP 64sx), the points were uploaded as a GPX file and the GPS was used to navigate to the stations. Once the station was located, divers jumped into the water with slates and measuring tape. Each dive team which was made up of 1 recorder and 1 measurer were spaced out 2m from each other. In a uniform motion, the diver teams start swimming parallel to shore in a northerly direction with the current.

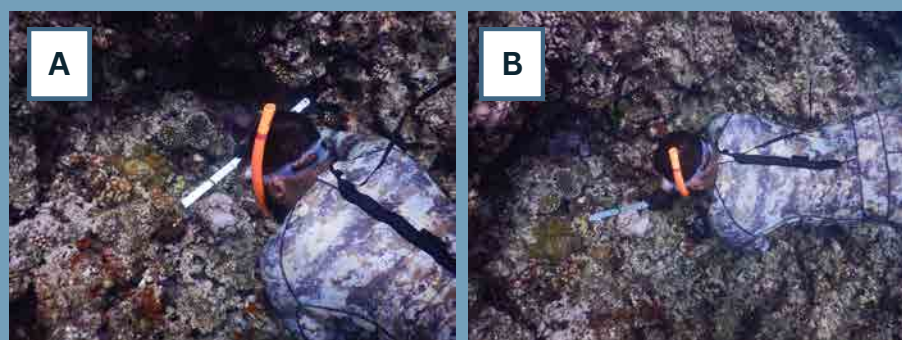


Figure 2. a) Snorkeler measuring the length and b) width of a boring giant clam (*T. crocea*).

Methodology

Samples of clams were counted and measured for those that fell within the survey area. Photos of samples were taken using a Nikon W300 SLR camera (Nikon Corporation). Additionally, each dive team had a 1m tailor's measuring tape that they used to measure the shell length and shell width of the clams (fig. 2).

Scuba stations

Scuba units were used by divers to collect data at 8m - 15m depth. A similar approach to the snorkel surveys was used (fig. 3). Dive teams included 2 people: a diver and buddy. Dive time was around 53 - 60mins each dive and 2 dives were conducted each day. Stations were placed near areas where *T. gigas* had been reseeded to. Overall, 6 stations were surveyed using scuba.

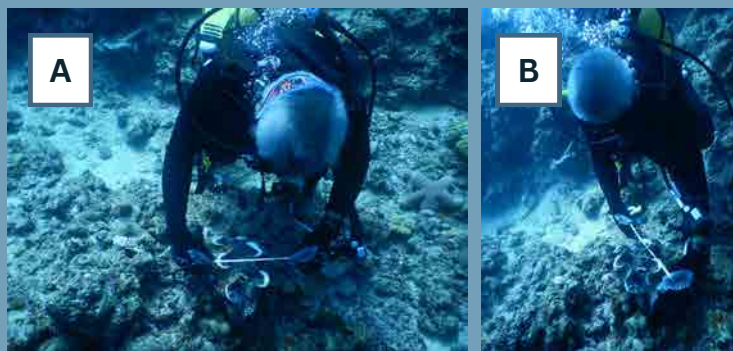


Figure 3. a) Scuba diver measuring the length and b) width of a Fluted giant clam (*T. squamosa*).

Other Macro-invertebrates

Additionally, other food macro-invertebrates such as green snail (*Turbo marmoratus*) and the Top shell (*Rochia niloticus*) were, also, surveyed and recorded. The longest width was recorded for *T. marmoratus* (fig. 4a) and the longest shell base length (fig. 4b) was recorded for *R. niloticus*.

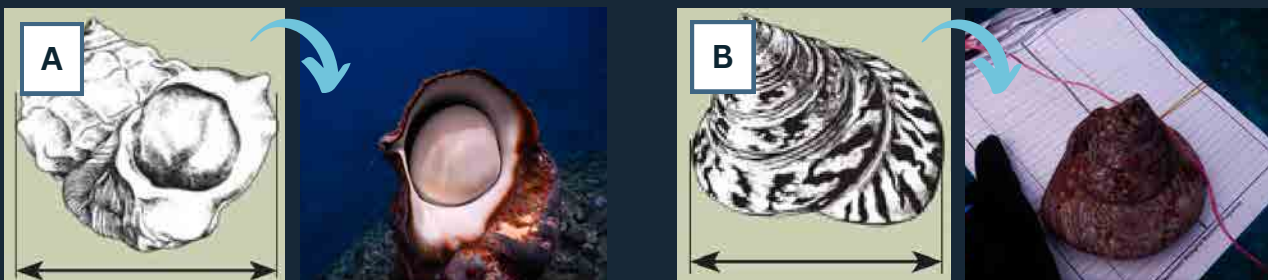


Figure 4. a) Measuring the long width in *T. marmoratus* and b) measuring the longest shell base length in *R. niloticus* (Pakoa, 2013).

Calculations

Excel was used to run several calculations on the data that was collected. Primarily, counts of individuals, average length of shell by species and length-frequency calculations were conducted. Pivot tables were used to calculate the number of individuals per species and the average length of shell. On the other hand, the length-frequency calculations and graphs were made using the histogram data analysis function under the data tab in excel after bin sizes were decided. No calculations were made using the shell widths of the clams.

Additionally, density by species for the area surveyed were calculated. The following formula was used:

$$\text{Density} = \left[\frac{\text{UVC total abundance count}}{\text{total surface area surveyed}} \right]$$

Results



Approximately 35.5km of coastline was surveyed from Tuktuk point to Moso Landing and around Lelepa Island. A total of 8,053 individuals were recorded over the 3 weeks sampling period (fig. 5).

Abundance and Spatial Distribution

Observations show that the highest abundances belong to *T. crocea* and *T. maxima*, two of the hardest giant clams to harvest because of the way that they burrow and attach themselves into hard substrate. Primarily, the Boring clam, *T. crocea*, had the highest abundances of all 5 giant clams that were observed and had an average shell length of 102mm (Table 1). Hamner and Jones (1976) state that the growth rate for *T. crocea* is 1.5cm/year and after 5 years the growth rate declines. Hean and Cacho (2003) recite the length at maturity for *T. crocea* to be 15cm (150mm). This shows that many of the *T. crocea* individuals that were observed and measured are still to reach maturity.

Table 1. Counts of individuals by target species observed and their average shell length

Species	Common name	Average shell length $\pm$ Standard deviation (mm)	Total individuals counted
<i>Tridacna crocea</i>	Boring clam	102.279 $\pm$ 32.516	6810
<i>Tridacna maxima</i>	Elongated Giant clam	118.562 $\pm$ 33.777	931
<i>Tridacna squamosa</i>	Fluted Giant clam	242.907 $\pm$ 148.593	129
<i>Hippopus hippopus</i>	Horse Hoof clam	364.762 $\pm$ 76.298	105
<i>Tridacna gigas</i>	Giant clam	802.333 $\pm$ 201.609	29 (1)*
Clam sub-total			8005
Other macro-invertebrates of Interest			
<i>Rochia niloticus</i>	Troka	119.722 $\pm$ 15.521	36
<i>Turbo marmoratus</i>	Green snail	222.500 $\pm$ 42.453	12
Macro-invertebrate sub-total			48
Grand Total			8053

*29 represents the number sampled from *T. gigas* that was reseeded to the area whilst 1 represents the number of *T. gigas* that was identified as an offspring of the reseeded *T. gigas*.

The abundance of the other giant clams show a clear “easy harvest” trend with the larger and easily harvestable species having the lowest abundances. *T. gigas*, unfortunately, falls under this category and is the least abundant species that was identified. Only 1 wild *T. gigas* was counted during the scuba survey. It was observed in approximately 8m depth of water and was 150mm in length.

The abundance of other macro-invertebrates were low. Spatial distribution observations showed that the majority of *T. marmoratus* and *R. niloticus* were found between Tuktuk point and Lelepa landing. Stations outside this area recorded no individuals.

Spatial distribution of clams observed during the snorkel survey indicate that *T. crocea* is widely distributed from Tuktuk point to Moso Island and is the most abundant at almost all stations surveyed (fig. 6). The only exceptions are around Tuktuk point itself, where *T. squamosa* was most abundant and the backside of Lelepa island where *T. maxima* was most abundant.

H. hippopus was found in select few locations with low abundance, primarily around Samoa point and areas leading to Moso landing. This may be an indication of heavy fishing pressure and spatial distribution based on favorable substrate (sand).

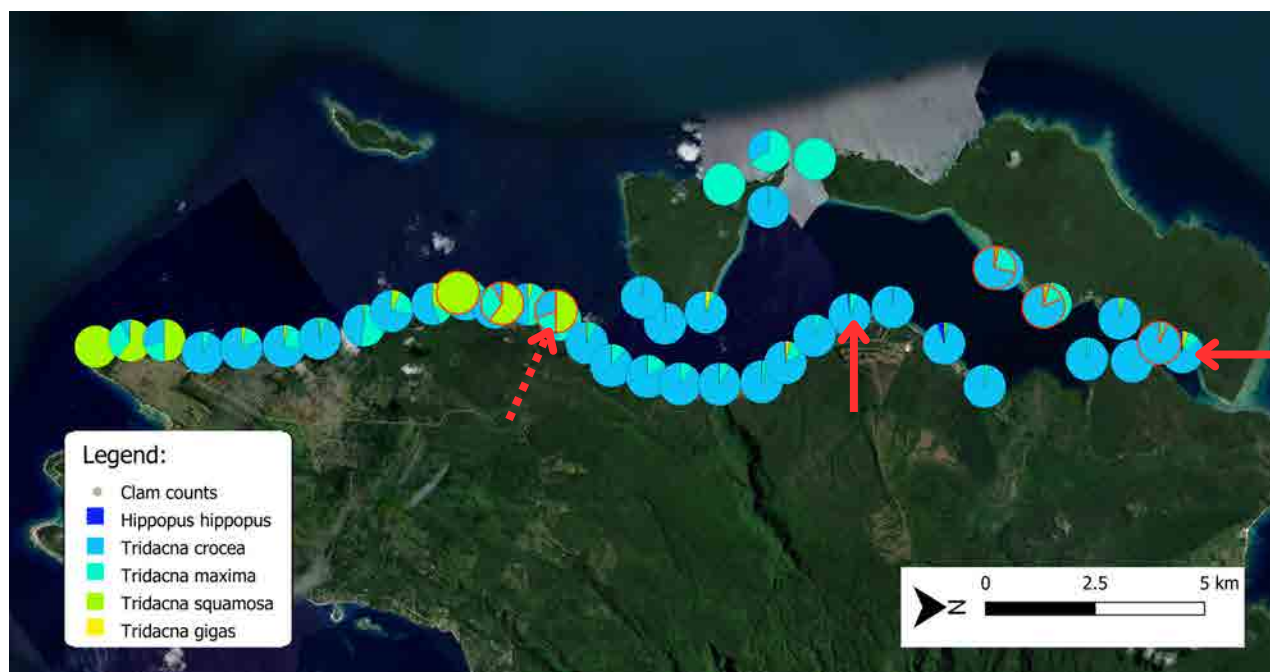


Figure 6. Proportion of abundance per species per station. Red outlined pie charts are scuba stations whilst black outlined pie charts are snorkel stations. Solid arrows show clam gardens that were put together by local communities that happen to be in vicinity of the station while dotted arrow shows location of single wild juvenile *T. gigas* that was found.

Moreover, there were two locations (depicted by solid arrows in fig. 6) where communities had made clam gardens. These are areas where certain individuals of a species, in this case, *T. squamosa* and *H. hippopus*, are brought together and placed within close proximity of each other. This is to increase the chances of successful reproduction and also, as a eco-tourism product. *T. gigas* was even more sparsely distributed compared to the other clam species and was observed mainly in areas that were restocked. *T. gigas* was observed in only 1 other location (denoted by dotted arrow in fig. 6) outside of the restocking area.

Additionally, there were disturbing observations made in Moso, particularly around the Sunae community, concerning the *T. gigas* that were restocked there. In 2020, Mariculture officers under the Fisheries Department conducted a survey of *T. gigas* at the restocking locations. The following data was recorded:

Table 2. Clam inventory conducted on 22 October 2020 (data retrieved from Field work note #2)

Site	# of clams alive	# of dead shell	Average shell length
Sunae Village, Moso	67	0	89cm
Tasiriki village, Moso	76	0	84cm
Gideon landing	5	0	80 cm
Lelepa Island	62	2	66cm
Mangaliliu Village	20	0	88cm
Total	230	0	

Further inventories, showed that Sunae was the only location where the number of individuals did not remain the same. Another inventory in August 2022, recorded only 46 individuals at the time. There were some dead and empty shells present on site. This number further decreased to approximately, 30 individuals at the time of this clam survey. Even with scuba, no individuals were found in deeper locations. It is possible that TC Judy and TC Kevin may have had an impact on the individuals there but it is hard to say for certain without proper investigations. Also, there were no indication of any disease present in the specimens that were observed. As most of the individuals are yet to reach the maximum length of 120cm, old age can be ruled out as a factor. Needless to say, more investigations are needed to identify possible reason(s) why this number continues to drop.



Figure 7. Sample of one of the dead *T. gigas* at Sunae. It was the only dead shell that was found in July 2023.

Density

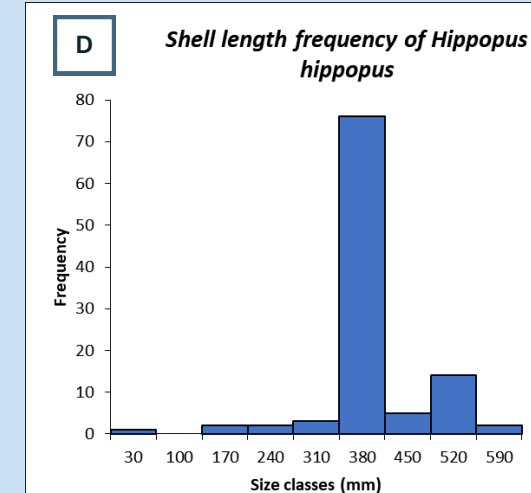
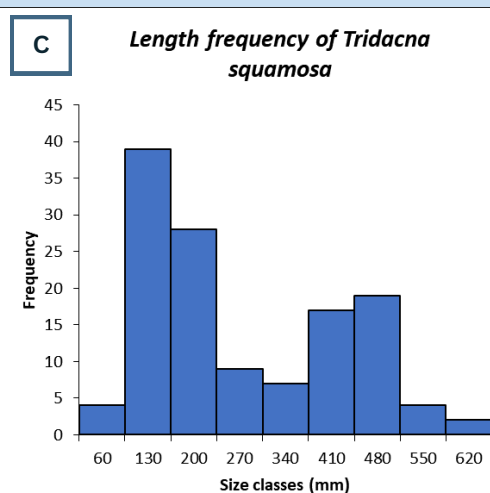
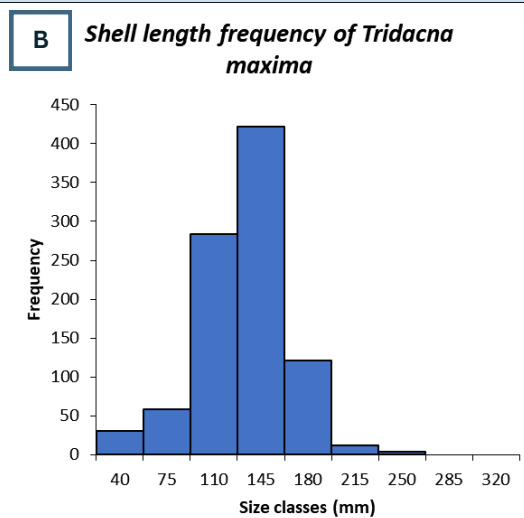
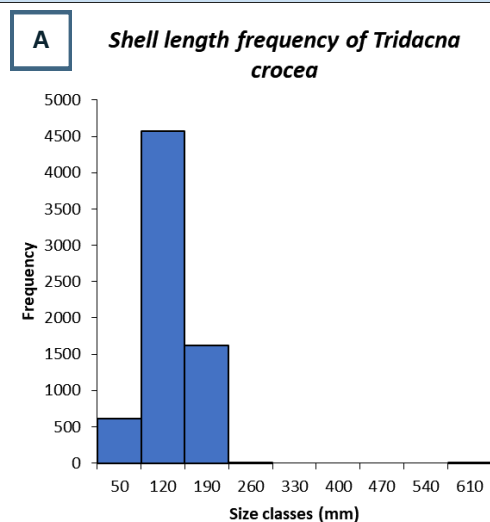
T. crocea had the highest calculated density of all clam species that were observed with 322 individuals per hectare followed by *T. maxima* with 44 individuals per hectare. Much like the trends in abundance, the trends in density, also, follow a similar pattern.

Table 3. Density of individuals surveyed by the entire sample location

Species	Density (Ind/Ha)
<i>Tridacna crocea</i>	322
<i>Tridacna maxima</i>	44
<i>Tridacna squamosa</i>	6
<i>Hippopus hippopus</i>	5
<i>Tridacna gigas</i>	1

Length frequency calculations

T. squamosa had the widest range of size classes present from 40mm (min. length) - 570mm (max. length) compared to the other species (fig. 8c). From the graph, it is determined that the population is continuing to grow with individuals in the 60 - 130mm size class having the highest frequency. There are some larger sized individuals as well that are present in the 340mm - 480mm size class which were mostly from the clam gardens created by coastal communities.



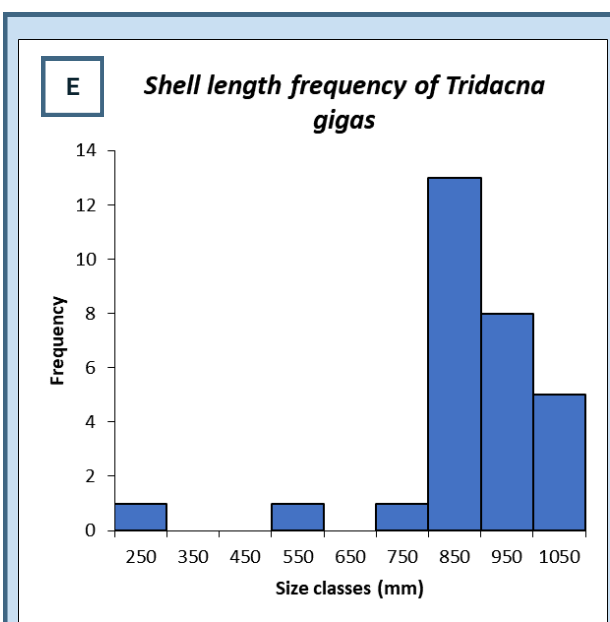


Figure 8. Length frequency histogram for a) *T. crocea*, b) *T. maxima*, c) *T. squamosa*, d) *H. hippopus* and e) *T. gigas*

There was not much variation in size classes for the other 4 species whose data were recorded. *T. maxima* had the closest population structure to a normal bell curve. The smallest *T. maxima* that was found was 15mm and the largest was 250mm.

T. crocea had a narrow population structure which is to be expected as it is the smallest species of giant clam. Hean and Cacho (2003) mentioned that *T. crocea* reaches maturity at 15cm, which from the length-frequency histogram (fig. 8a), shows that the majority of the samples fell in the size class (50 - 120mm) which is just before maturity.

H. hippopus has an unusual spike in individuals around 310 - 380mm. These individuals were found in the clam gardens and because of that added protection were able to grow to the lengths that were recorded. The frequency of other size classes is, however, quite small. Added surveillance on stocks and sizes is needed to ensure that the local North Efate stock is not exhausted. Additional, restocking may be needed to counteract the observation that we are currently seeing.

On the other hand, *T. gigas*, shows that stock are nearing total length which is 1.2m. The majority of individuals observed were mature individuals with the potential to spawn. There was only 1 juvenile that was identified which was the smallest individual at 150mm whilst the largest individual measured had a shell length of 1040mm.

Discussion

In March 2007, 500 live *T. gigas* clams were imported from Tonga to Vanuatu to re-stock reefs around Efate where local extirpation had happened. Only 408 of these clams survived the quarantine period. It was the hope of the first phase of the GOS project that the establishment of 5 of these giant clam garden's would:

- 1) create a spawners group for natural breeding,
- 2) establish a broodstock group for artificial breeding through VFD's mariculture program, and
- 3) build an eco-tourism project around the garden.

Over the next 6 years, the gardens were monitored jointly by GOS and VFD. The results showed that each site had an average survival rate of 86.8%. As the restocking survival rate was quite high, it was believed that there was a high chance for natural reproduction to happen for the restocked individuals. However, recent data that was collected showed that this is not the case and that there is possibility of poor recruitment or settlement and/or heavy fishing pressure on juvenile clams around the North Efate region.

Mecha and Dolorosa (2020) conducted a study in the Philippines to obtain data about the distribution, numbers, sizes, age and usage of both dead and live *T. gigas* shells. These shells are either offspring of shells that had been restocked to the area or shells from previous populations that continue to reside in the area. Data was collected using various field activities, key informants and previous studies that looked at juvenile recruitment in the area. They found that many of the dead shells were used as decorative pieces either in churches or in houses.

Of the live shells, Mecha and Dolorosa (2020) found that just half of the number found were being looked after in resorts and concluded that these conservation areas provide a safe place for the shells to naturally breed and recover from the severe fishing which they had experience. However, while this provides hope for the possible restoration of dwindling local stocks, Mecha and Dolorosa (2020) state that the natural re-establishment of local populations may take up to a hundred years. Considering that it has only been 16 years since the re-introduction of live *T. gigas* in the North Efate region in set conservation areas, there is still a long way to go in terms of re-building a healthy stock in the area.

Additionally, Mecha and Dolorosa (2020) looked at the success stories of restocking hatchery-produced juveniles to reefs throughout the Philippines. Many of these juveniles did not survive and it was concluded that this was because of the absence of management interventions. Ideally, juvenile clams need to be protected in order to fully establish themselves. As *T. gigas* is known to inhabit areas of sandy or rocky substrate without adhering to it, it is very easy to harvest juveniles. A conservation or no-take regime over the restocking area, can increase their chances of survival. It is quite evident in the results that there is high fishing pressures on clam populations throughout North Efate. Clams which are harder to extract from the reef, such as *T. crocea* and *T. maxima*, had the highest individual counts whilst clams that are easy to remove from the reef, such as *T. gigas*, *T. squamosa* and *H. hippopus*, were not found in high numbers.

Furthermore, Nash et al. (1989) indicate that temperature and exposure has an effect on the growth and survival of juvenile *T. gigas* clams. The study concluded that some levels of daytime intertidal exposure can benefit growth. Selecting restocking areas within 20 - 30°C will further encourage optimal growth in juveniles. Food availability for clams was found to not be a huge factor because of the dual way that clams obtain their food. As temperature and exposure of clams restocked around North Efate, were gauged to be within a reasonable level for the most part, it is highly unlikely that it was a factor in the survival of juvenile and adult clams.

Moreover, Elfving et al. (2003) state that there could be further implications for *T. gigas* survival in channels where there is continuing impacts from increased human activities. The resultant eutrophication of channel waters will reduce light availability. Additionally, increased eutrophication is known to weaken shell structure, allowing parasites to be able to drill into the flesh of the clam. Therefore, the location of restocking sites has a great impact on the growth and survival of clams as well as to their ability to be able to handle additional stressors.

Based on the findings in Elfving et al. (2003), a possible reason as to why individuals in Sunae are dying could be because of the poor water quality and poor natural flushing of the area. The additional wreckage of the Motor yacht, Blue Gold, could be a factor in the high clam mortality. The beached vessel may be leaking some unseen chemicals into the water.

However, there needs to be a detailed investigation to rule this out as well as rule out the illegal poaching of the established stock. With the observations made during the assessment, it is uncertain what exactly is causing the high mortality rate. When the GOS project phase 2, was conducting inventory counts during the mid-2000s, they concluded that the cause of high mortality in Mangaliliu, particularly around the Mangas area, was because of poaching by the local community. Over time with further education and management regimes, that survival rate increased whilst mortality decreased. Today, they have attained one of the highest survival rates of all the restocked clam gardens that were established in 2007.

In conclusion, the recruitment and settlement of juvenile *T. gigas* within the North Efate region had little to no success. While there is some indication that there are juveniles present, they have not had the chance to grow into adulthood to be able to create a permanent population within the area. Severe fishing on juveniles seems to be the greatest factor in clam survival with the only juvenile *T. gigas* found within the Mangaliliu community area. The only location where water quality is questionable is around Moso Island which could be why Sunae's clam garden has not been able to sustain live individuals. There is definitely need for further investigation to rule out poaching. All in all, the study shows that there is need for additional interventions to be made to increase the survival of *T. gigas* juveniles in the wild.

Recommendations

The following recommendations have been proposed by the Research and Aquaculture section within the VFD to improve the success of *T. gigas* recruitment, settlement, survival and growth in North Efate:

- Investigate drop in survival rate of adult *T. gigas* in Sunae, Moso Island that were restocked there in 2007. Involve community members in the investigation and include data collection of both abiotic and biotic factors as well as anecdotal evidence from community members.
- Approach communities in North Efate with the data in this report to show sparsely distributed populations of *T. gigas*, *T. squamosa* and *H. hippopus*. Hopefully, this report can generate some adaptive management to manage fishing pressures.
- Educate community members on the importance of clams and how to distinguish between the different species.
- Propose management regimes on giant clam harvest; either to a) ban harvest of clams for 3 years to allow for unhindered recruitment or b) to work with communities to establish a network of conservation areas that will protect the juveniles.
- Breed adult *T. gigas* and reseed areas with farm-reared individuals. Mariculture officers need a refresher training to be able to carry out this activity.



Phyllida varicosa seen during the survey



Pterois volitans seen during one of the dives



Two *Lyncina lynx* cowries that were breeding and laying eggs



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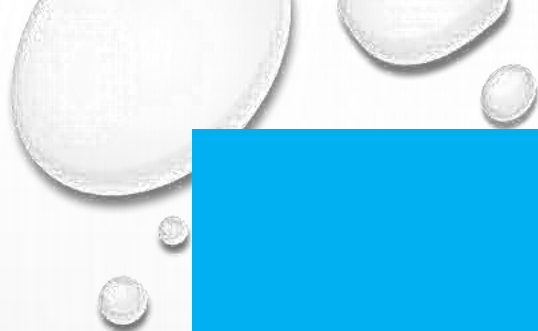
TRAINING FOR INTEGRATED COMMUNITY BASED- COASTAL RESOURCE MANAGEMENT (CB-CRM) FOR FISHERIES DEVELOPMENT OFFICERS

VANUATU FISHERIES DEPARTMENT (VFD)

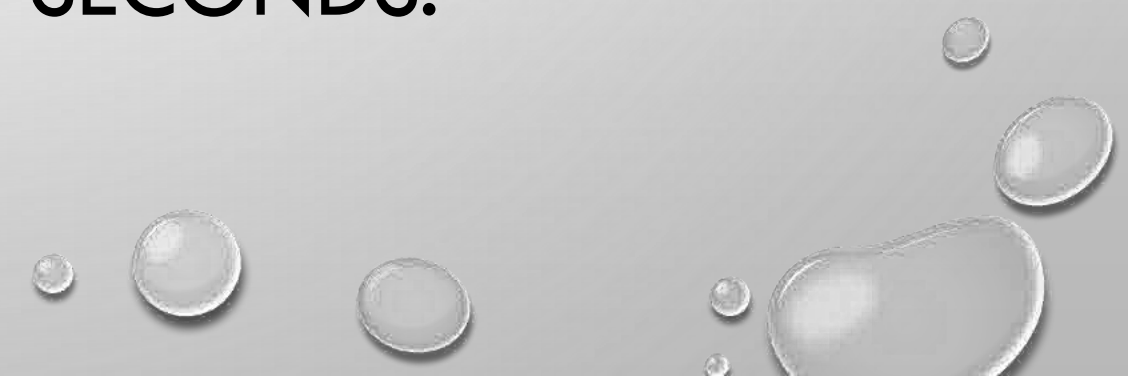
THE PROJECT FOR PROMOTION OF GRACE OF THE SEA

IN THE COASTAL VILLAGES (PHASE III)





INTRODUCING OTHERS (ONE METHOD OF ICE BREAKING)

- TWO PERSONS FORM A PAIR
 - INTERVIEW EACH OTHER FOR TWO MINUTES.
 - PARTNER IS INTRODUCED BY THE OTHER PARTNER IN FRONT OF EVERYONE FOR 30 SECONDS.
- 

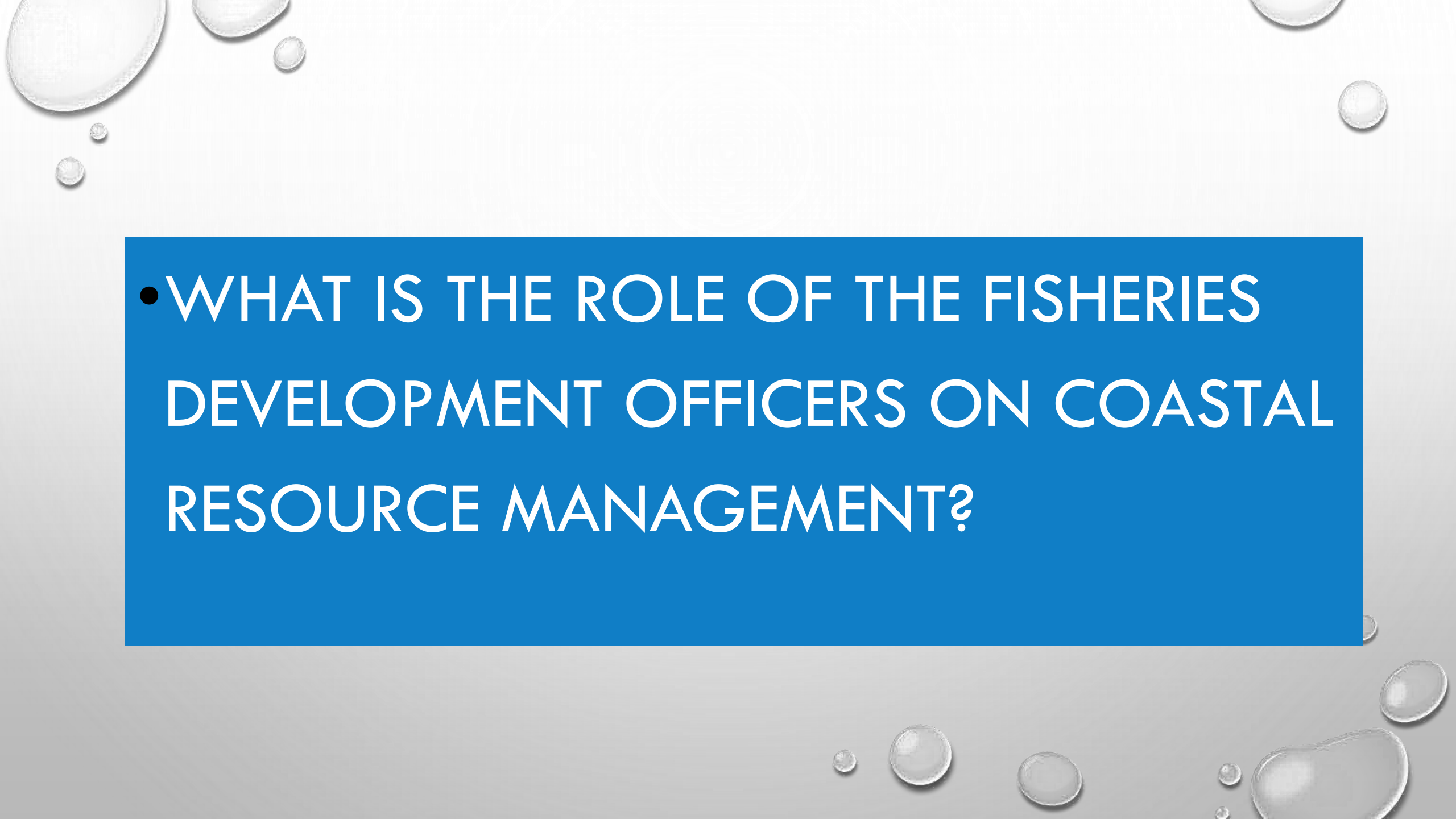


WHAT IS INTEGRATED CB-CRM?

COMMUNITY **B**ASED-

COASTAL **R**ESOURCE **M**ANAGEMENT



- 
- WHAT IS THE ROLE OF THE FISHERIES DEVELOPMENT OFFICERS ON COASTAL RESOURCE MANAGEMENT?

ROLE OF A FISHERIES EXTENSION OFFICER IN TERM OF COASTAL RESOURCE MANAGEMENT

1. ROLE AS A MASTER TRAINER/TRAINER OF TRAININGS
2. ROLE AS A TEAM LEADER OF SURVEY TEAM
3. ROLE AS A FACILITATOR IN COMMUNITY
4. ROLE AS AN MONITOR OF MONITORS

CONTENTS OF THIS TRAINING

Day 1	✓ Learning the contents of CB-CRM guideline ✓ Orientation for Day 2 practice ✓ Presentation of CBFM in Solomon Islands ✓ Presentation of MSG
Day 2	✓ Practice of preliminary survey ✓ Practice of facilitation techniques
Day 3	✓ Explanation and practice of monitoring sheet ✓ Preparation of trainings for community leaders

WHAT IS TRAINING OF TRAINERS (TOT)?①

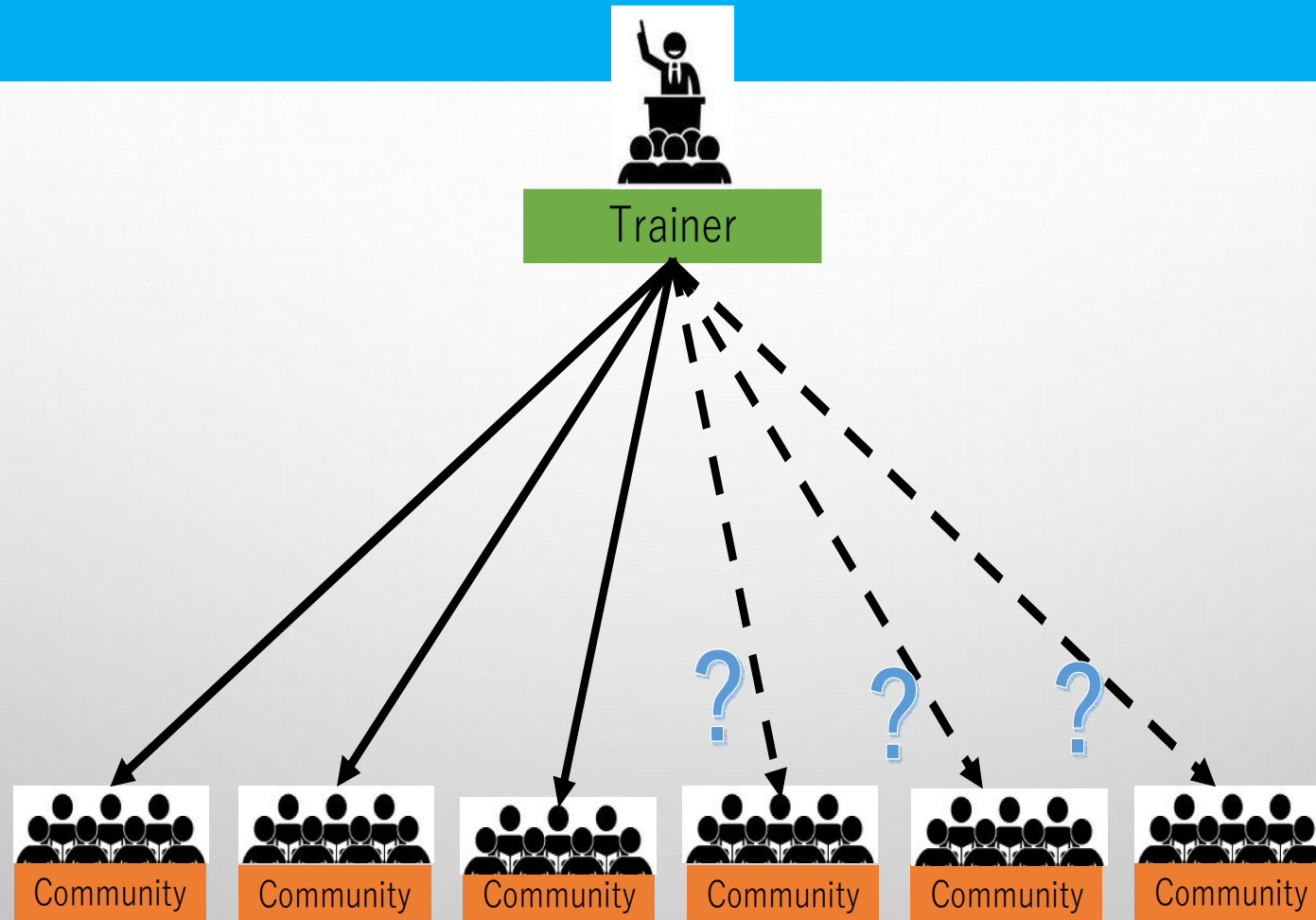


Figure: Structure of ordinary trainings

WHAT IS TRAINING OF TRAINERS (TOT)?②

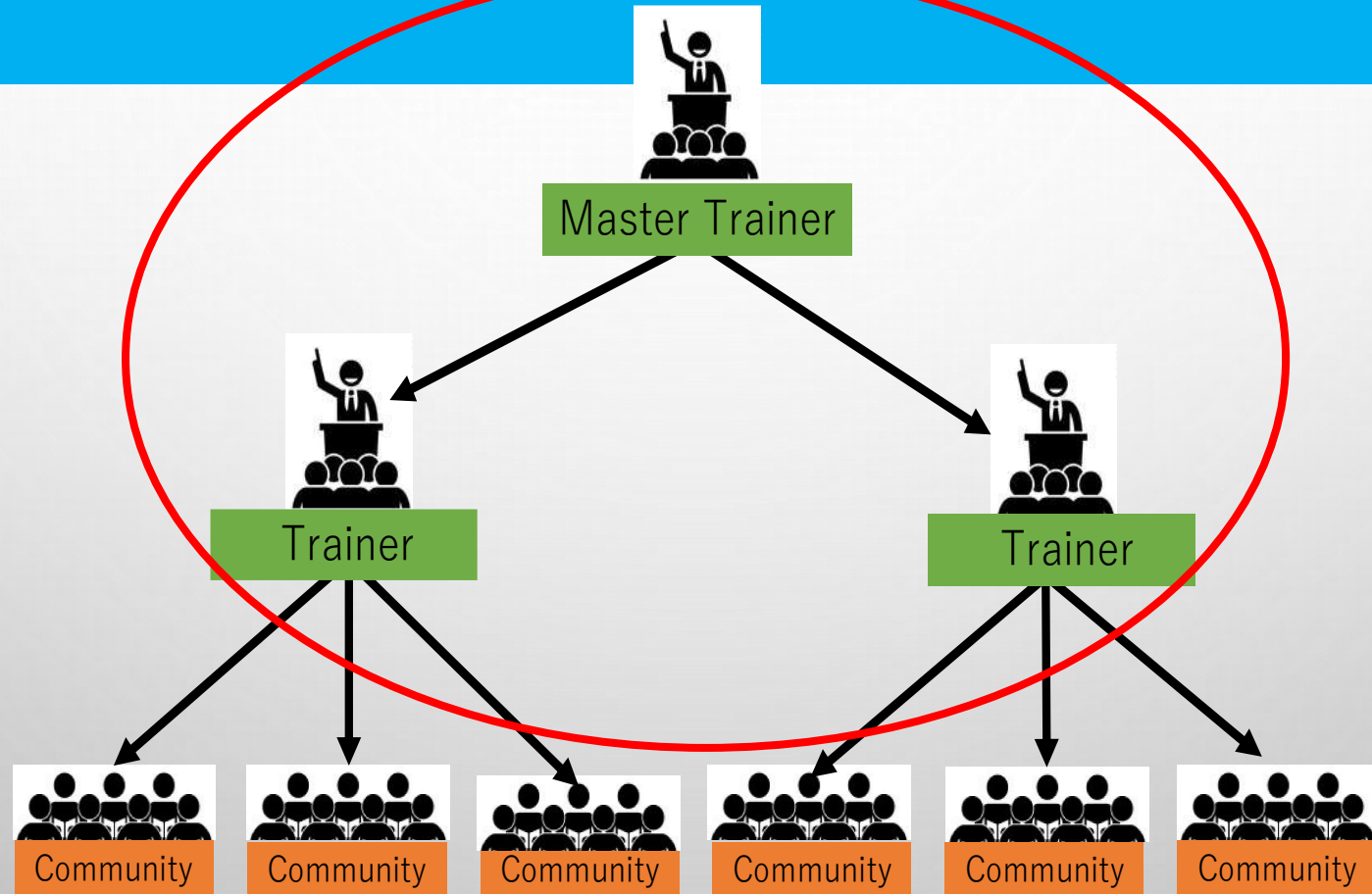


Figure: Structure of TOT

EXPECTED RESULT AFTER THE TRAINING

1. ABLE TO EXPLAIN IMPORTANCE OF RESOURCE MANAGEMENT AND THE CONCEPT OF CB-CRM TO COMMUNITY LEADERS IN A SIMPLE MANNER.
2. ABLE TO CONDUCT A PRELIMINARY SURVEY IN THE FIELDS.
3. ABLE TO FACILITATE CB-CRM PLANNING WORKSHOPS IN COMMUNITY.
4. ABLE TO EXPLAIN HOW TO USE MONITORING SHEET

Simpol Guide blong Community Based-Coastal Resource Management (CB-CRM)



(1) Konsept mo CB-CRM planing



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

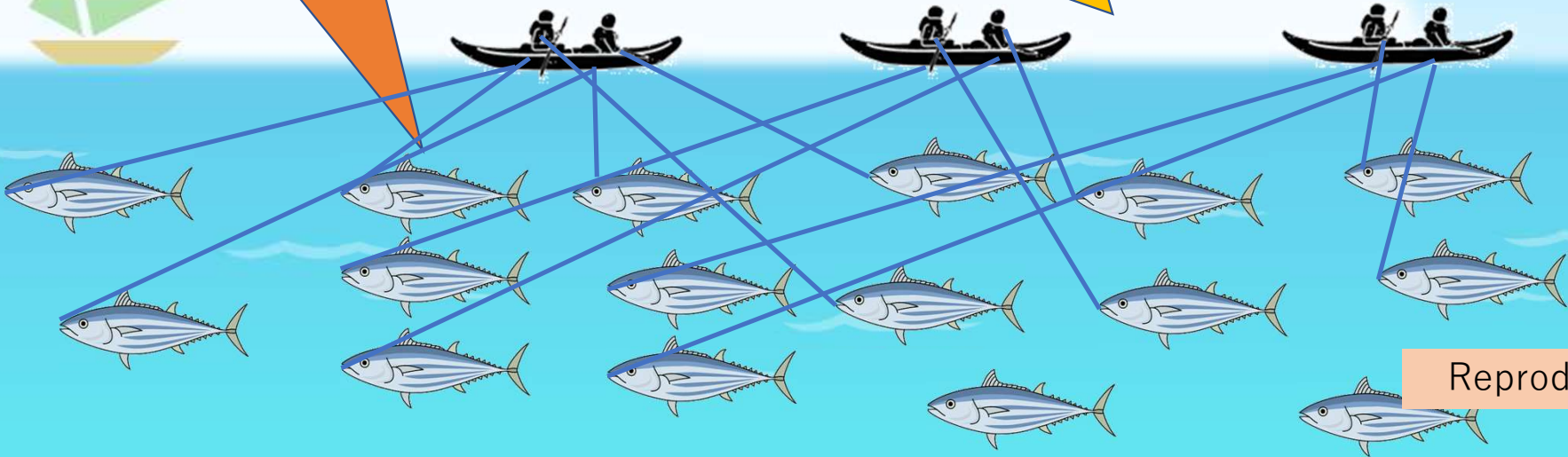


1. Necessiti blong kostel risos manejmen

Riprodaksen
blong fis hemi
kat wan limit

Sapos namba blong
fisaman i go antap mo
ol fising gia hemi gud,
bambae catch volume
hemi go antap.

Hemi imposibol blong
namba blong fis hemi go
antap mo nokat limit



Diskasen

Ol patisipens oli luk risal blong solwota (long tebol) mo diskasem olgeta mesa blong kontrolem namba blong ol fis;

- Hu nao hemi shud manejem olgeta kotel risos? Kommuniti? Kavman?

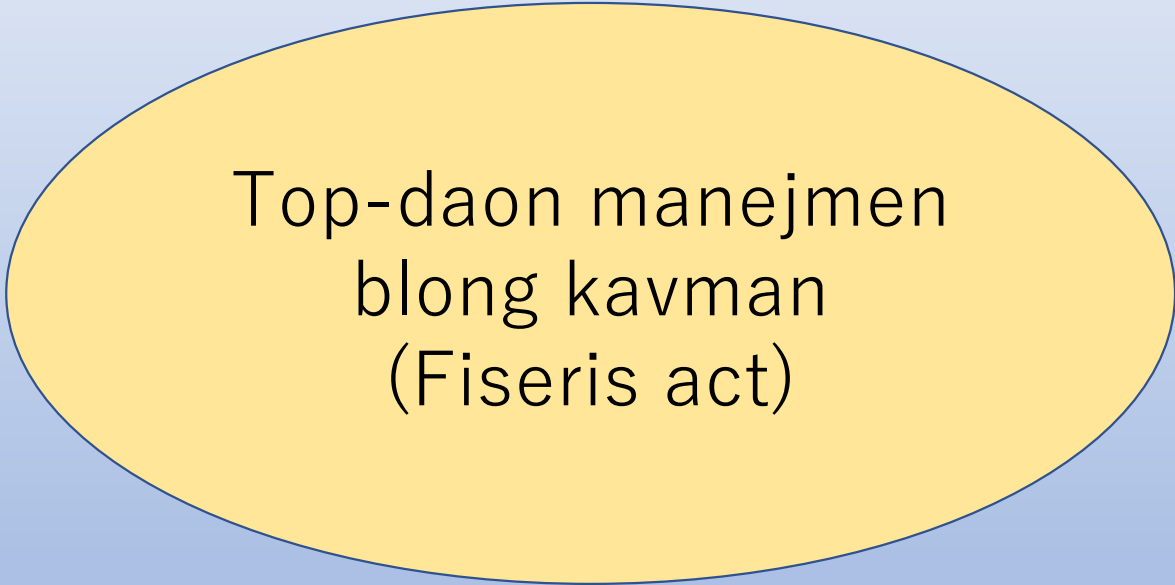
- Ol wanem kaen mesa nao bambae yumi konsidarem blong kontrolem blong i stopem risos we i sta go daon?

- Sapos i kat sam control mesa blong tekem, bambae wanem hemi happen long laef blong ol fisaman?

2. Olgeta wei blong fiseris risos manejmen①

Ol gudfala saed

- Effect hemi hae mo waed.



Top-daon manejmen
blong kavman
(Fiseris act)

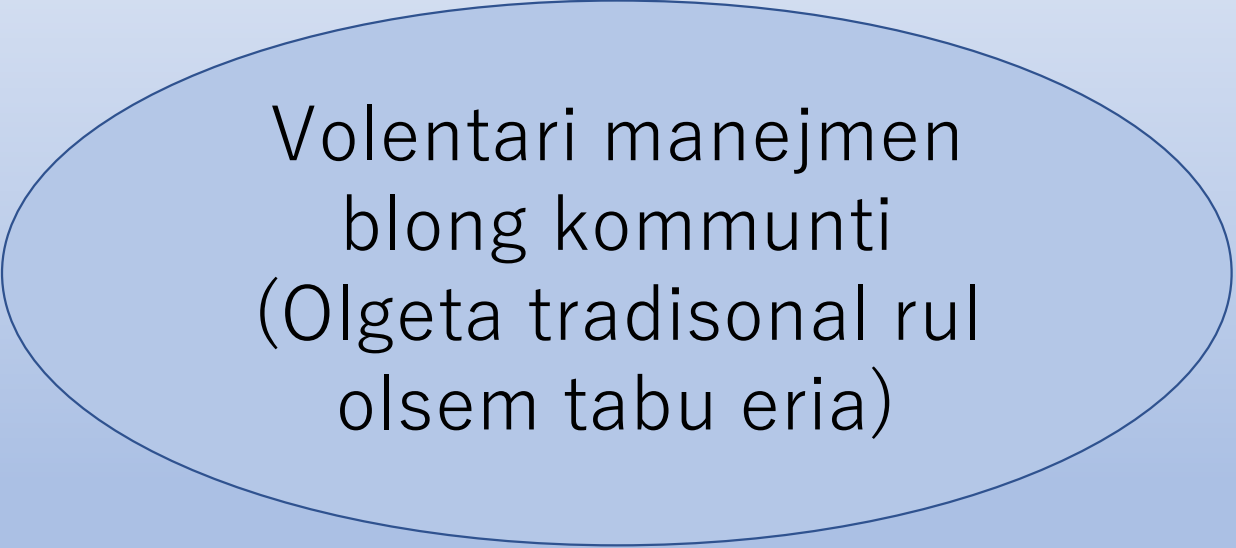
Ol rabis saed

- Hemi hard blong adjustem lokol situesen.
- Kost blong enfosmen hemi hae.

2. Olgeta wei blong fiseris risos manejmen ②

Ol gudfala saed

- Hemi isi blong adjastem situesen we hemi stap.
- Effect hemi hae from kommuniti nomo hemi desaedem olgeta rul.



Volentari manejmen
blong kommuniti
(Olgeta tradisonal rul
olsem tabu eria)

Ol rabis saed

- Manejmen rul hemi blong kommuniti nomo.
- Hemi no effectif long ol man aotsaed.

2. Olgeta wei blong fiseris risos manejmen ③

Top-daon
manejen
blong
kavman(Fiseris
act)



Community
Based- Coastal
Resource
Management
(CB-CRM)

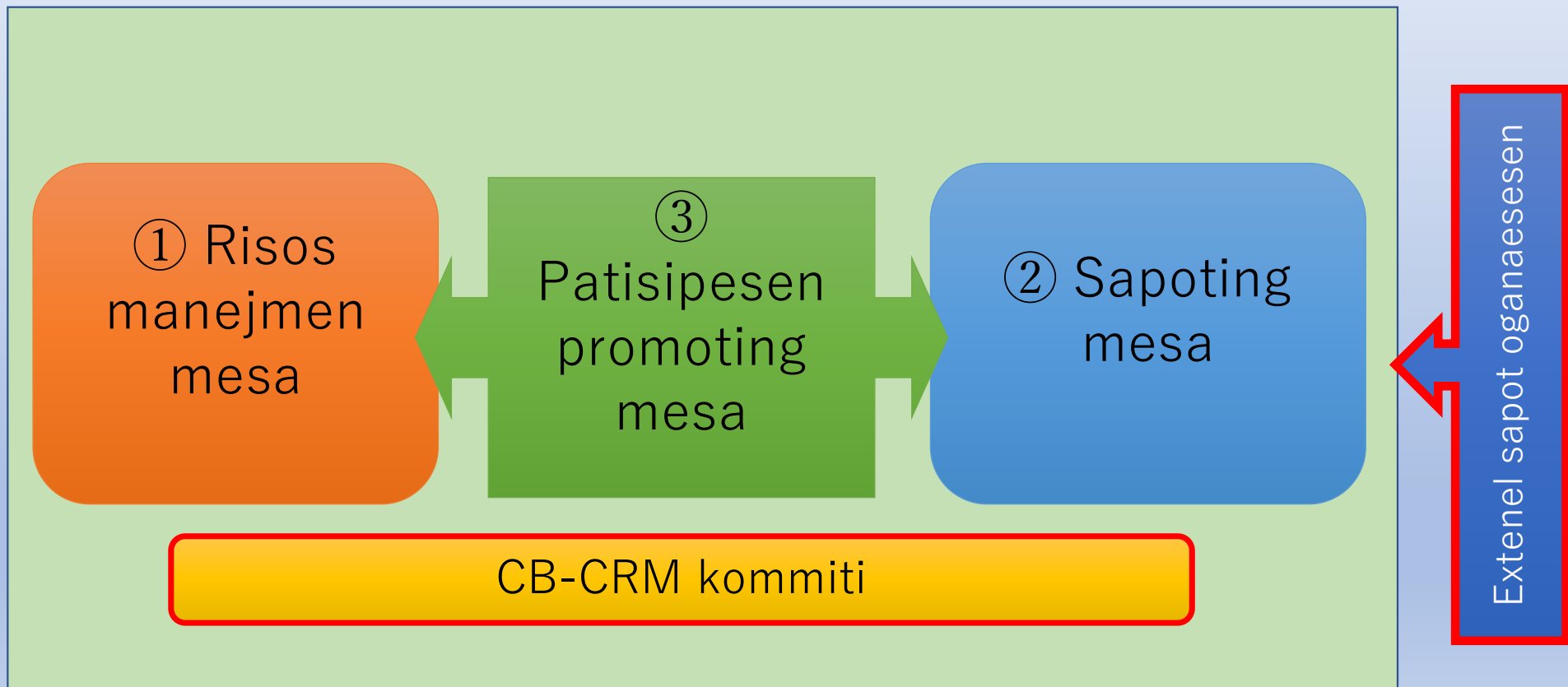


Volentari
manejen blong
kommunti
(Olgeta
tradisional rul
olsem tabu eria)

Government authorizes their
rules and supports to
implement it

Community discusses and
decides own rules on their
coastal resources

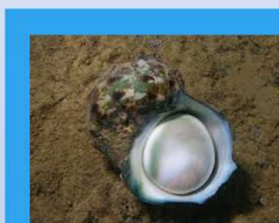
3. Components of the CB-CRM plan



4. Risos manejmen mesa ①

Ikat foa mein wei blong kontrolem.

Kontrolem
spisis blong
fis



Aneityum,
Lelema



Aneityum,
Lelema



Lelema

Kontrolem
fising method
mo gia

Nem blong fising gia	Kontents blong reguleisen
Dragem net o Beach seine (Nasonal reguleisen)	Mesh size hemi shud be less than 50 mm
Kast net (Nasonal reguleisen)	Mesh size hemi shud be less than 20 mm, diameter blong net hemi shud be less than 2 m
Spia gun (Lelepa Island (Shefa Province, Waisisi (Tafea Province))	Hemi tabu blong usum long tabu area.

Kontrolēm
fising graon



Kontrolēm
fising period

Ol type blong reguleisen	Close sisen
Grin snel (Nasonal reguleisen)	October 2005-October 2020
Koconut crab (Nasonal reguleisen)	30 th August to 1 November (Torba) 1 st May 2004 to 31 st March 2017 (Sanma)
Diva fising long Waisisi, Tanna	1 st October to 31 st March (everi yia)

4. Risos manejmen mesa ②

Yumi no save reguleitem ol fising aktiviti nomo be i kat narafala wei blong manejem ol risoses. Hemia hemi blong “inkrisim kostel risos”. Hemia olgeta exampol:

**Rilisim ol baby fis/
restocking**



**Fomem ol spawning
skul blong ol shellfis**



**Mekem ol atifisel
neseri graon blong
larva mo baby naura**



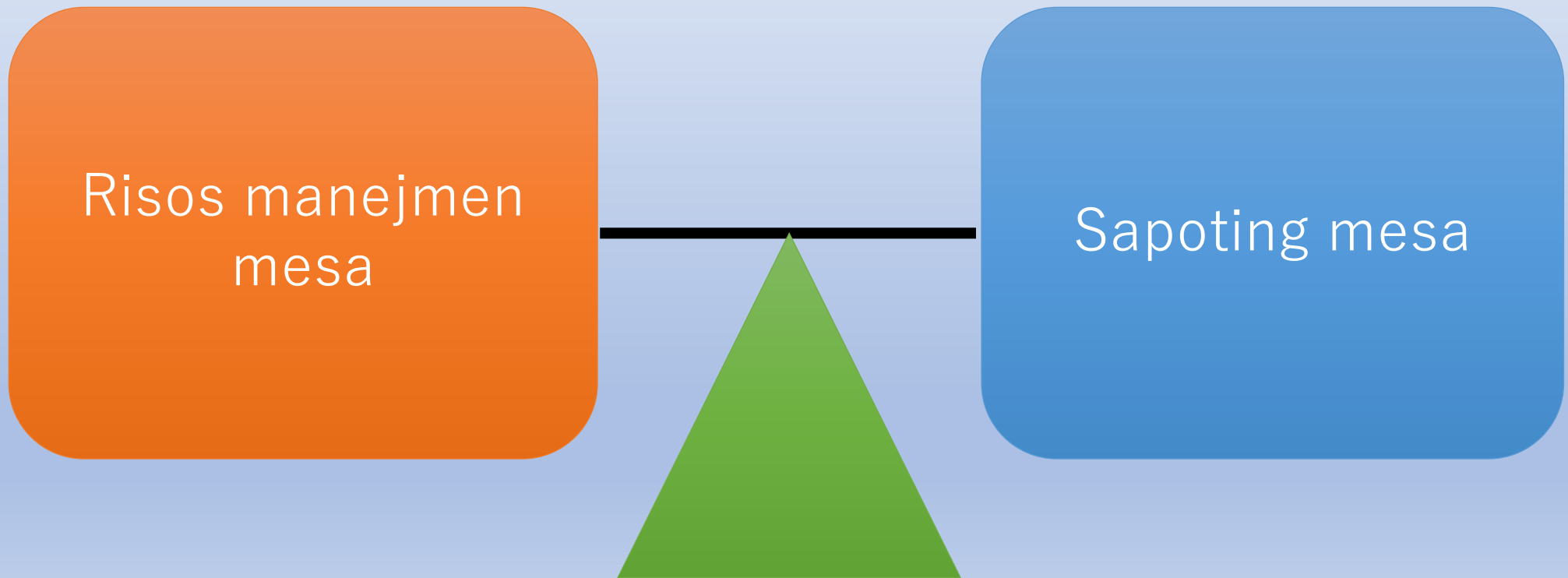
5. Sapoting mesa

Diskasen:

- Hemi enaf blong implimentem ol risos manejmen mesa nomo blong manejem gud ol kostel risos?
- Sapos risos manejmen hemi stap, bambae hemi no affecktem livelihood blong olgeta kommuniti memba?

5. Sapoting mesa

Blong sapotem implimenteisen blong risos manejmen mesa, hemi gud blong kondaktem “ol sapoting mesa” long sem taem blong daonem ol negatif impact taem risos manejmen hemi stap.



6. Approach blong sapoting mesa

Ikat tri taep blong sapoting mesa. Olgeta ia hemi;

- (1) Daevesifikesen blong olgeta fising aktiviti
- (2) Valiu addisen long olgeta fis prodak mo
- (3) Olgeta narafala wei blong inkam sos developmen.

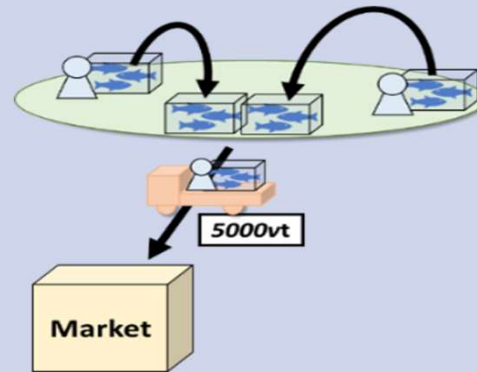
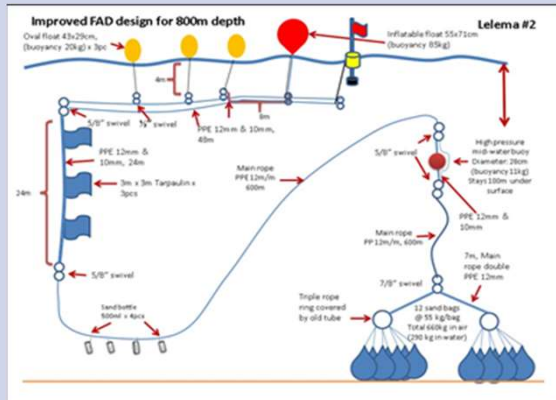
Hemia olgeta exampol:

6. Approach blong sapoting mesa

Daevesifikesen blong olgeta fising aktiviti

Valiu addisen

Olgeta narafala wei blong inkam sos developmen



7. Patisipesen promoting mesa

Diskasen:

- Sam long olgeta aktiviti blong sapoting mesa (espeseli olgeta narafala wei blong inkam sos developmen) oli no rileit direct i go long kostel risos manejmen olsem aquakalja. Bambae ol tool ya oli save kontribut blong inkrisim motivesen blong manejem olgeta kostel risos?

7. Patisipesen promoting mesa

Blong sapotem implimentesen blong risos manejmen mesa mo olgeta sapoting mesa, hemi gud blong kondaktem “patisipesen promoting mesa” long sem taem blong inkrisim motivesen blong karemaot olgeta risos manejmen aktiviti.

Risos manejmen
mesa



Patisipesen
promoting mesa



Sapoting mesa

8. Olgeta aktiviti blong patisipesen promoting mesa

Exampol blong olgeta aktivitis blong patisipesen promoting mesa hemi olsem:

**Sherem infomesen
(Fidbak olgeta risal
blong risej i go long
kommuniti)**



**Reisem aweness blong
risos manejmen
(Oganaesem sport
event)**

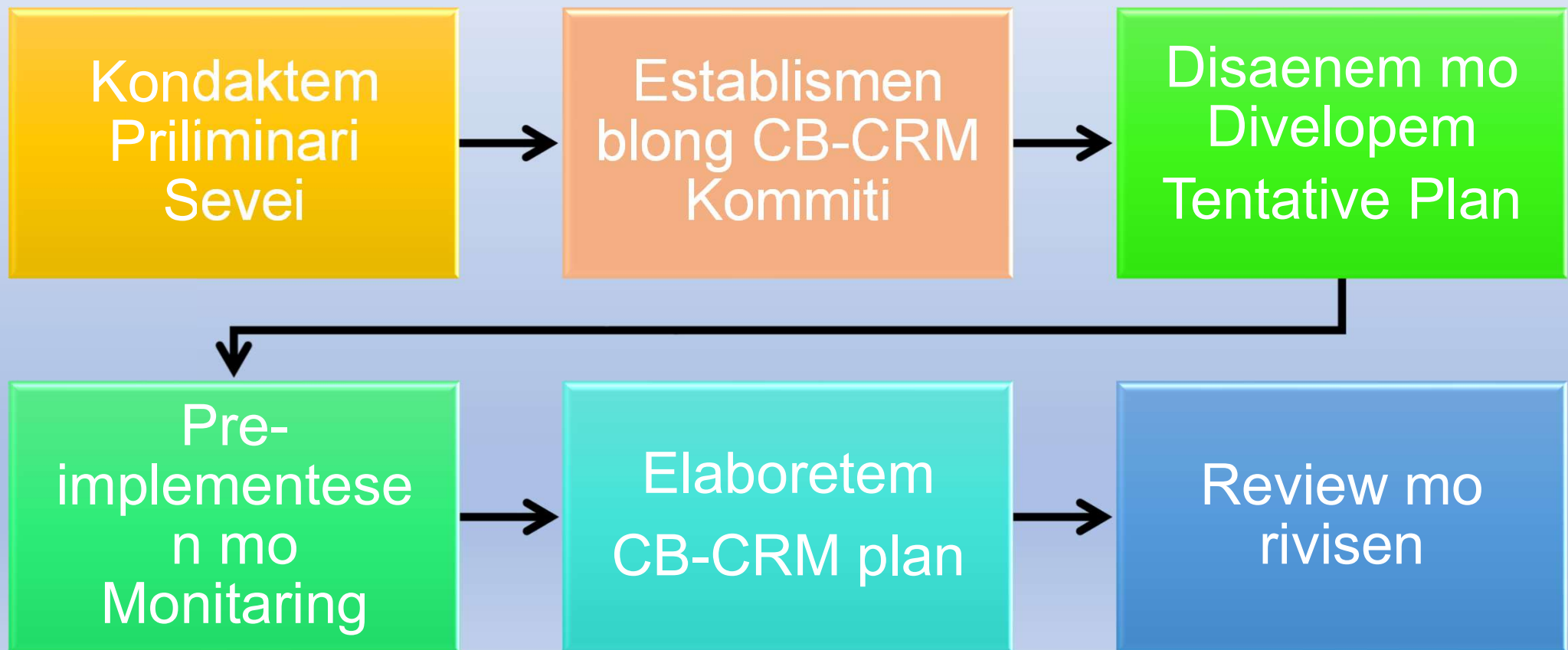


Eco-tag

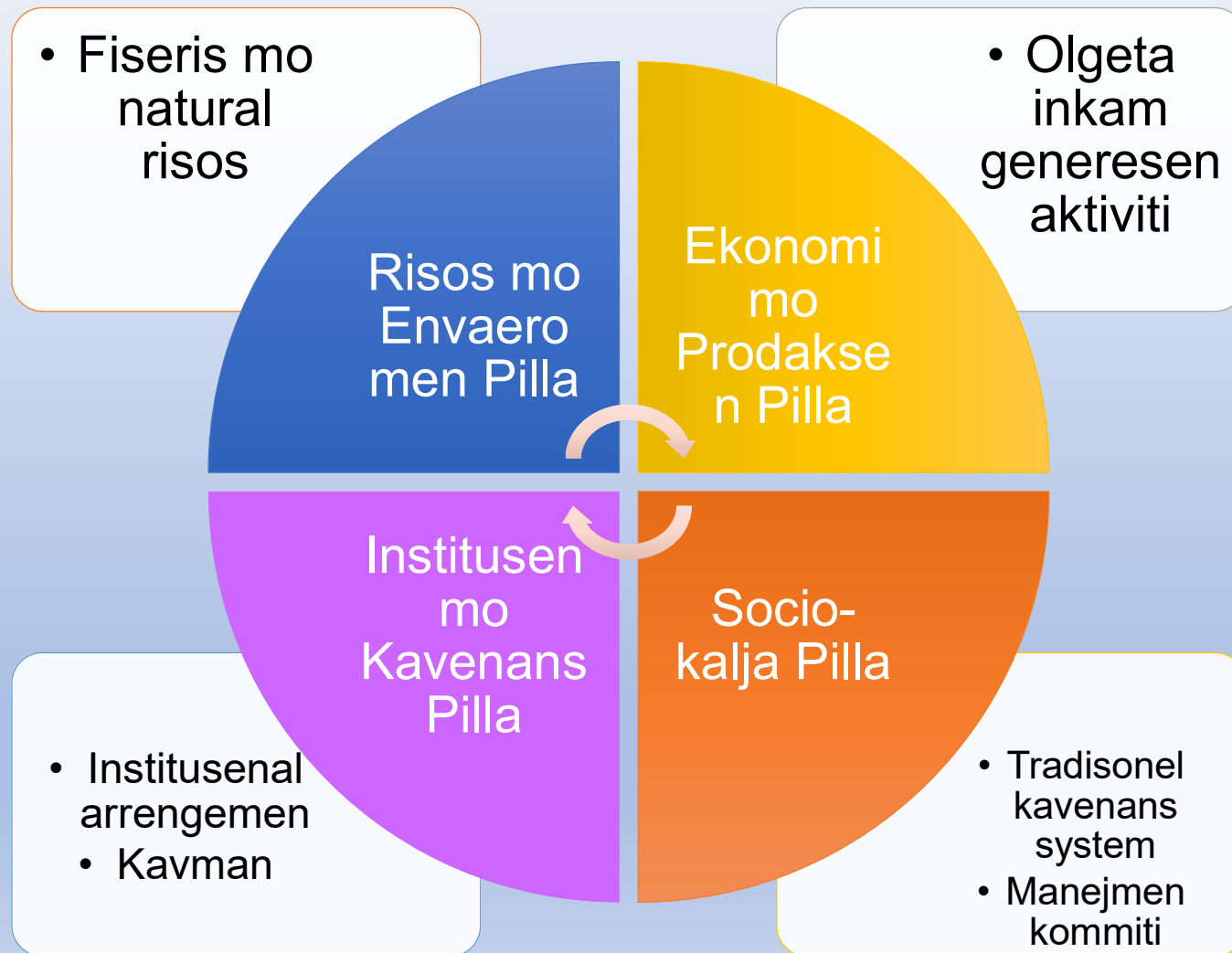


9. Hao blong prioerem CB-CRM plan

Hemia hemi wan flow chart blong priperem CB-CRM plan



10. Olgeta foa pilla blong CB-CRM plan



Olgeta foa pilla ya oli yusful viewpoint blong jekem kontents blong CB-CRM Plan blong avoidem olgeta samting we hemi no included long taem blong;

- (1) Priliminari sevei stage
- (2) Elaborating stage
- (3) Monitaring stage mo
- (4) Rivisen stage.

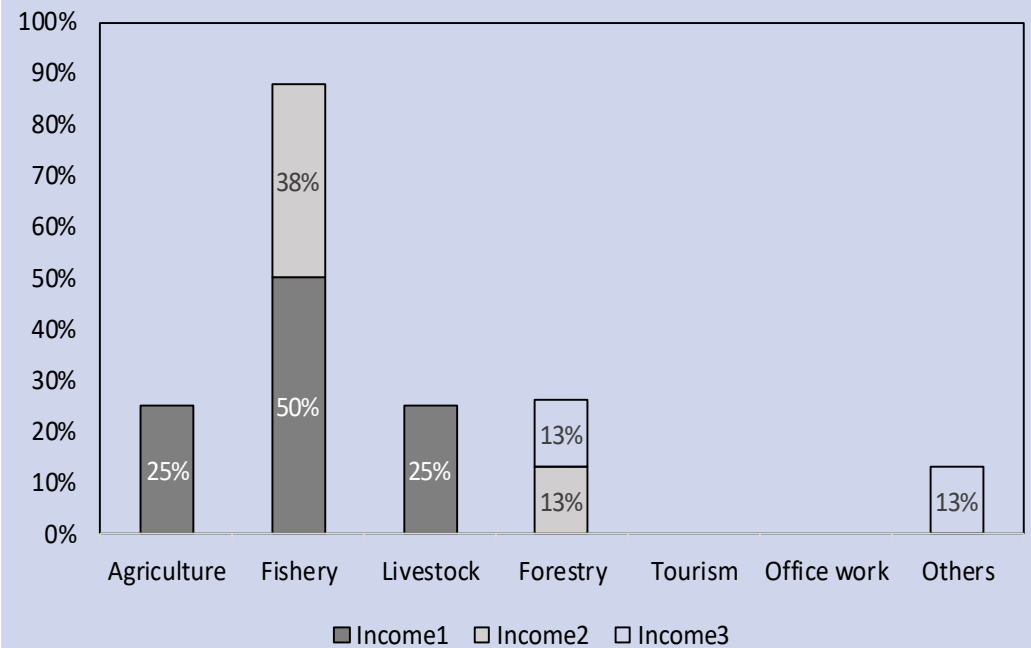
11. Kondaktem priliminari sevei

I kat samfala simpol method blong socio-ekonomik sevei.

Intaviu sevei yusum pepa



Intaviu sevei yusum simpol kwestenea



11. Kondaktem priliminari sevei

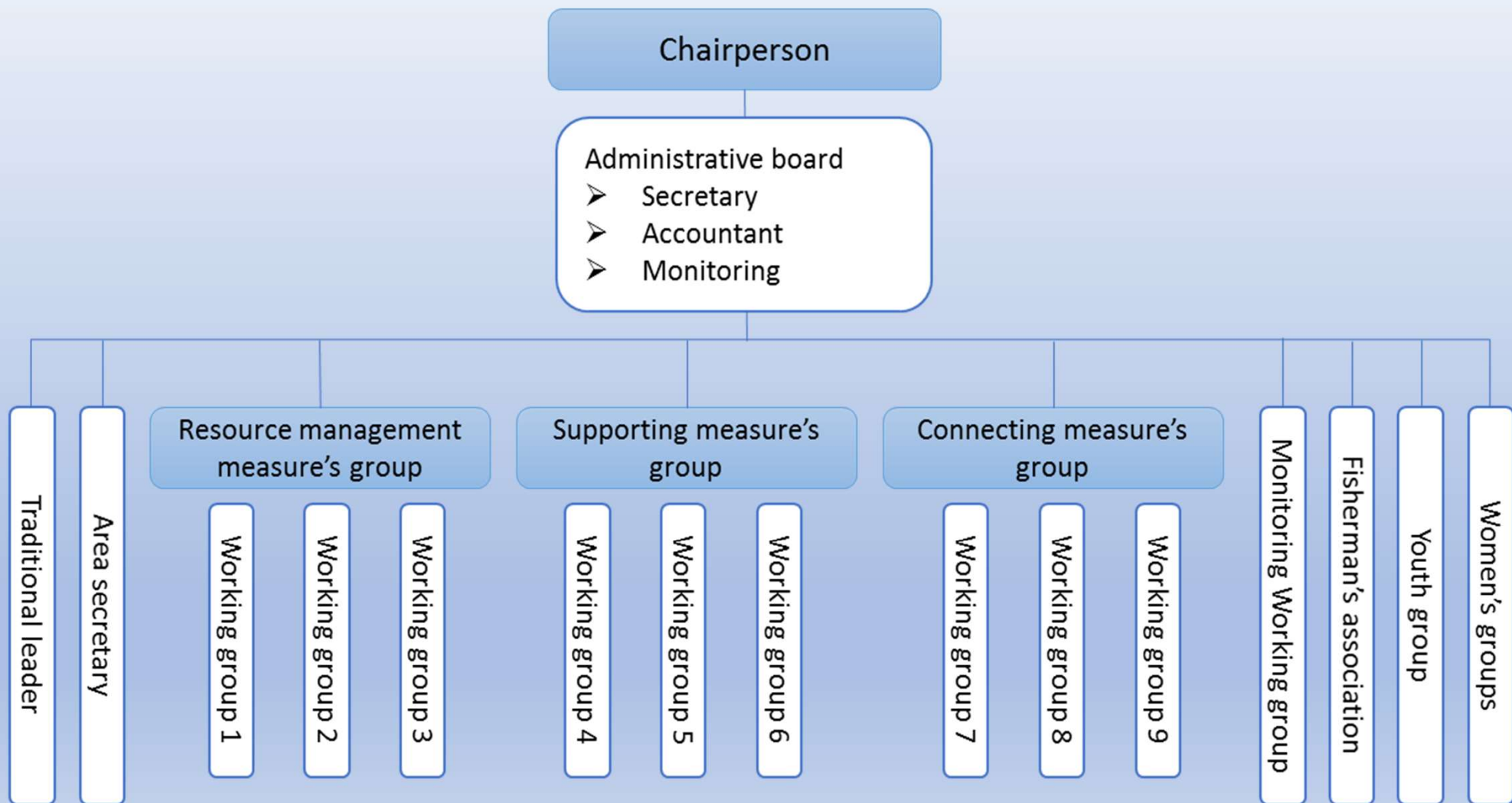
Purpose blong karemaot priliminari sevei hemi blong;

(1) priliminari infomesen blong target kommuniti

(2) tool blong resem aweness long kommuniti blong risos manejmen

(3) beis-laen data bifo implimentesen blong olgeta aktivitis

12. Establismen blong CB-CRM kimmiti



13. Disaenem mo divelopem tentative plan

Blong disaenem mo divelopem wan tentative CB-CRM plan, i kat faev step everiwan.

Step 1: Explenesen blong CB-CRM

Olgeta beisik konsept blong CB-CRM olsem we i stap i mas klia gud long olgeta patisipens.

13. Disaenem mo divelopem tentative plan

Step 2: Situesenn analysis blong olgeta kostel risos long target komuniti

Holem wan komuniti wokshop mo diskasem olgeta samting ya:

(1) Wetem ol patisipens:

“Wanem olgeta taep blong problem we i stap long ol kostem risos?”

“From wanem olgeta kostel risos i stap go daon?”

“Wanem hemi kosem olgeta problem ya?”

(2) Divaedem ol patisipens i go long ol smol grup folem olgeta problematik spisis o ol themes blong analaeze m ol kos mo backgraon long moa diteil

“Wanem hemi kosem problem ya?”

13. Disaenem mo developem tentative plan

Step 3: Diskasen mo disisen blong kostel risos manejen mesa

Holem wan komuniti wokshop mo diskas blong karem moa aedia blong tentative risos manejen mesa

“Wanem nao yumi save mekem blong impruvum situesen o solvem olgeta problem ya?”

Step 4: Listim daon olgeta aedia blong olgeta komuniti sapoting mesa aktiviti

Holem wan komuniti wokshop mo diskas blong sherem samfala aedia blong ol aktiviti beis long sekta we i kavremap olgeta strength mo wiknes blong komuniti. Exampol blong sekta divisen: A) Agrikalja, b) Forestri mo laefstock, c) Fiseri, mo d) Turism

13. Disaenem mo divelopem tentative plan

Step 5: Praeorotaesem olgeta aedia blong kommuniti sapoting mesa

Holem wan kommuniti wokshop mo diskasem hao wanwan aktiviti we oli proposem long list ya hemi rileit long risos manejmen mo hao blong ensurem sustenabiliti.



Foto: CB-CRM wokshop long Emae aelan, Shefa Provins

Tenkiu tumas

Simpol Guide blong Community Based-Coastal Resource Management (CB-CRM)



(2) Socio-ekonomik sevei



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

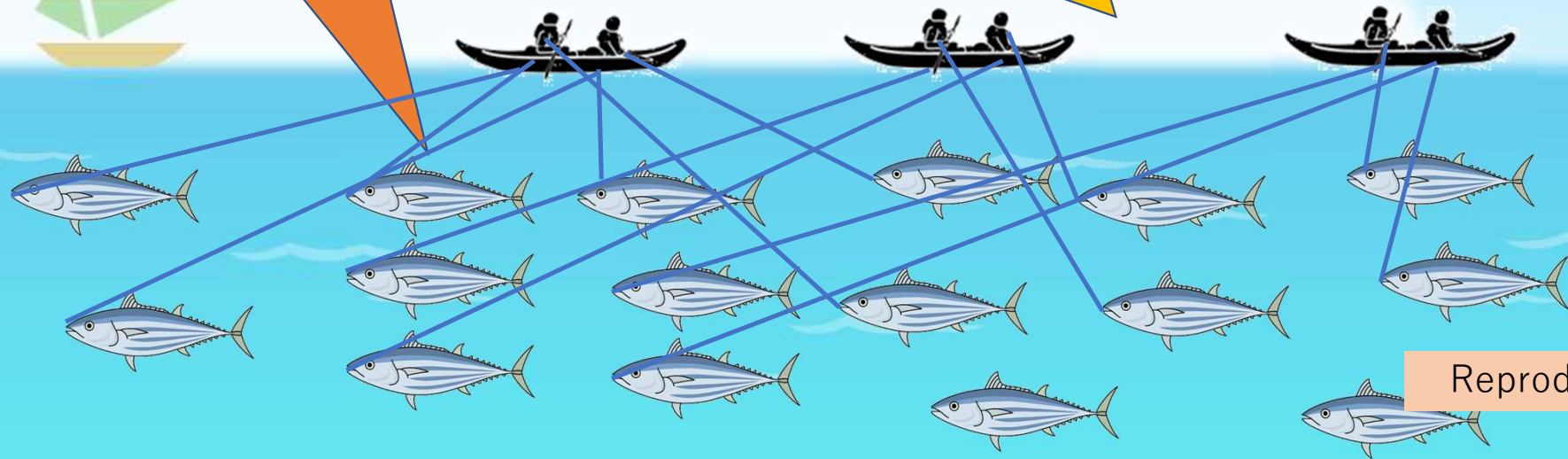


Necesiti blong kostel risos manejmen

Riprodaksen
blong fis hemi
kat wan limit

Sapos namba blong
fisaman i go antap mo
ol fising gia hemi gud,
bambae caj volum
hemi go antap.

Hemi no posibol blong
namba blong fis hemi go
antap mo nokat limit



Costal resos manajmen i necesari lo komuniti

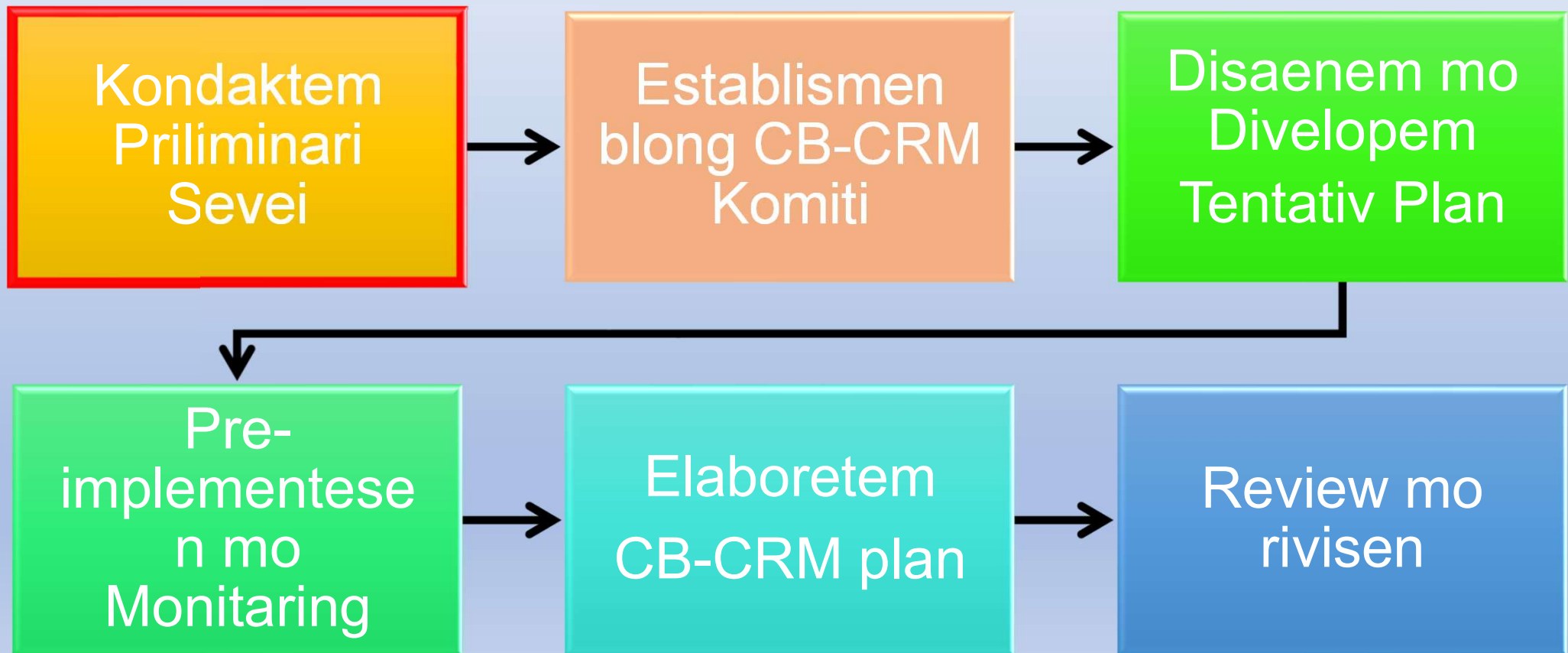


Be olsem wanem lo situasen naolia, mo wanem nao ol taket spisis, ol ples, taket fising gia mo ol sesen?



Hemi useful spos yu kondaktem wan socio-ekonomik sevei.

Posesen blo Socio-ekonomik sevei lo flo blo CB-CRM planing



From wannem Socio-ekonomik sevi I impoten?

Semak aktivitis, samak ekuipmen



Semak result ???????????????

Purpus blo socio-ekonomik sevei

- Blo desinem ol stret aproj we l bes lo socioekonomik situasen
- Blo gat besline data blo fuja monitaring mo evaluasen



Wanem kaen infomasen nao umi nidim?①

- **Ekonomik aspek**

- Men inkam sos blo ol man mo woman
- Blo save levul mo impotens blo fiseris
 - Fising aktiviti we oli stap mekem oltaem/namba blo bot o kenu / namba blo ol man weh oli huk
 - Blo save levul blo fising efot

Wanm kaen infomaseen nao umi nidim?②

- Ples weh oli stap huk lehem oltaem
- Blo save weta i gat hae fising presa insaed lo rif mo l gat competisen blo fising graon
- Fis distribusen
- Blo save l gat sam problem lo fis distribusen

Wanem kaen infomasi na yumi nidim③

- **Resos aspek**

- Men resos managemen aktivitis
- Blo save level blo fising managemen na oia
- Situasi na oia fiseri resos na oia
- Blo save oia lokal populasen recognise na oia fiseri resos situasi

Wanem kaen infomasi na yumi nidim?④

- Ekonomik impak hemi resalt blo reduksen lo ol fiseris resoses
- Sastainabiliti blo fiseris managemen aktivitis
- Blo gat besline data blo evaluatem ol resos managemen aktivitis

Wanem kaen infomasen nao yumi nidim?⑤

- **Sosol aspek**

- Facsenel level blo resos managemen grup
 - Blo save populasen reconisen blo ol lokol mo weta resos managemen grup we l stap naoia l wok gud l stap.

Wanem kaen infomasen nao yumi nidim?⑥

➤ Facsenel levon blo tradisenel tribol sistem

- Blo save weta aproj lo wanwan tribs lo fiseris managemen I efektif or nogat

OI deferens blo social status bitwin man mo woman (Genda kap)

- Blo save wanem kaen aproj nao I stret blo fulmap spes bitwin man mo woman.

Wanem kaen infomasen nao yumi nidim?⑦

- **Aspek blo kavenens**

- Facsenel levon blo sistem blo ol chif
 - Blo save wanem kaen aproj I stret blo mekem chif sistem I strog
 - Facsenel levon blo aria kaonsel
 - Blo save wanem kaen aproj nao I stret blo mekem aria kaonsel I strog

Practis blo Preliminari sevei (socio-economic sevei)

- Intewiw sevei usum ol bigfala pepa.
- Oli brekem daon ol kwestinia blo sevei

Oli Simplifiem inteviw sevei (Historikal jens)

Exampol 1:

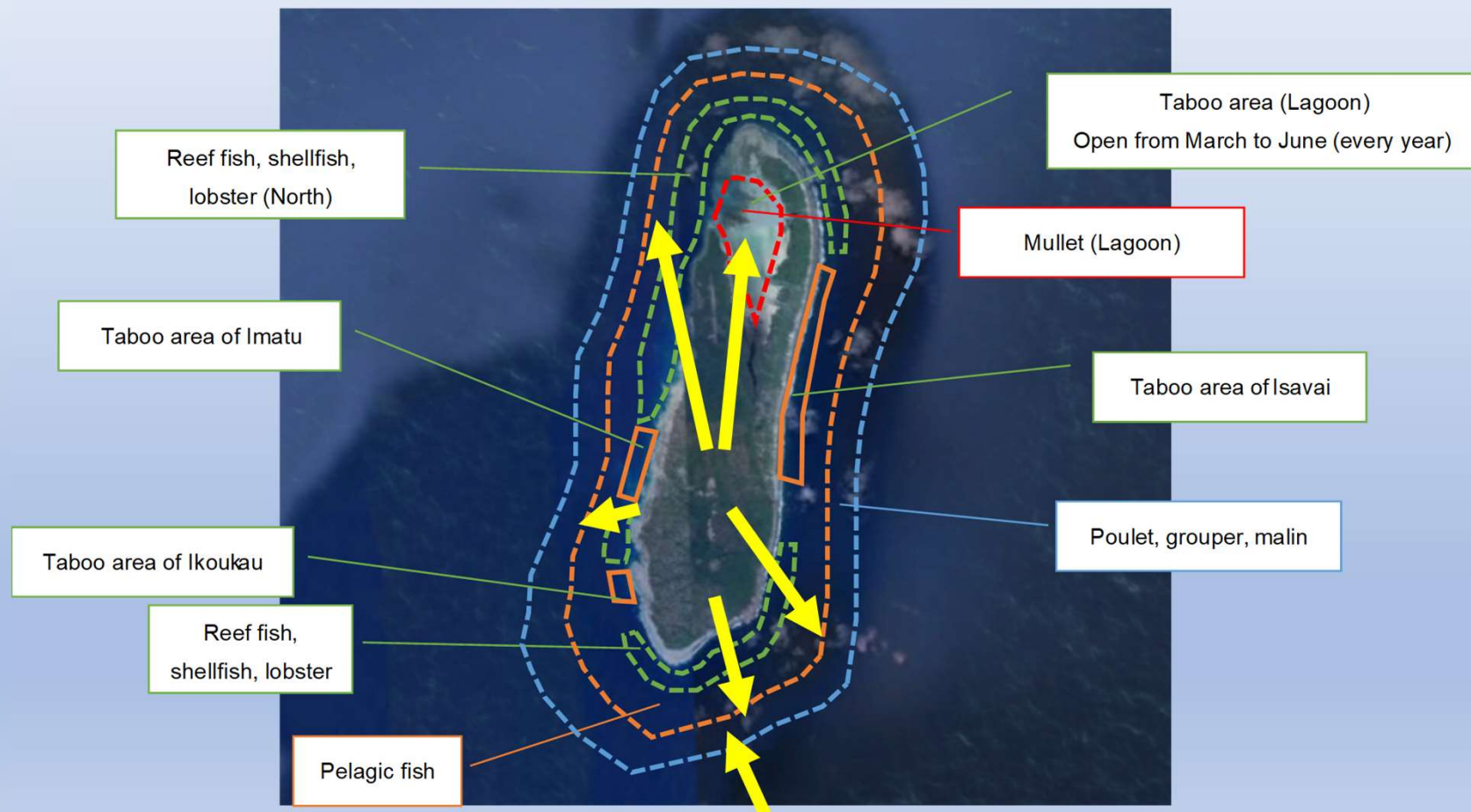
- Jens lo siz blo fis
- Jens lo caj volum
- Jens lo operasen awa
- Jens lo distens blo go lo fising graon

	Men taket fis	Jens lo fis siz bitwin pas 10 yas mo naoia	Jens lo caj volum bitwin pas 10 yas mo naoia	Jenz lo operasen awa bitwin pas 10 yas mo naoia		Jens lo distens l go lo fising graon bitwin 10 yas l pas mo naoia	
				10 yas i pas	Naoia	10 yas i pas	Naoia

Exampol 2: Fising situasen

Fising metod (Namba blo fisaman)	Volum blo averaj caj	Frekwensi blo Operasen	Cos blo fising operasen

Simpol interview sevei (Maping blo men fising graon)

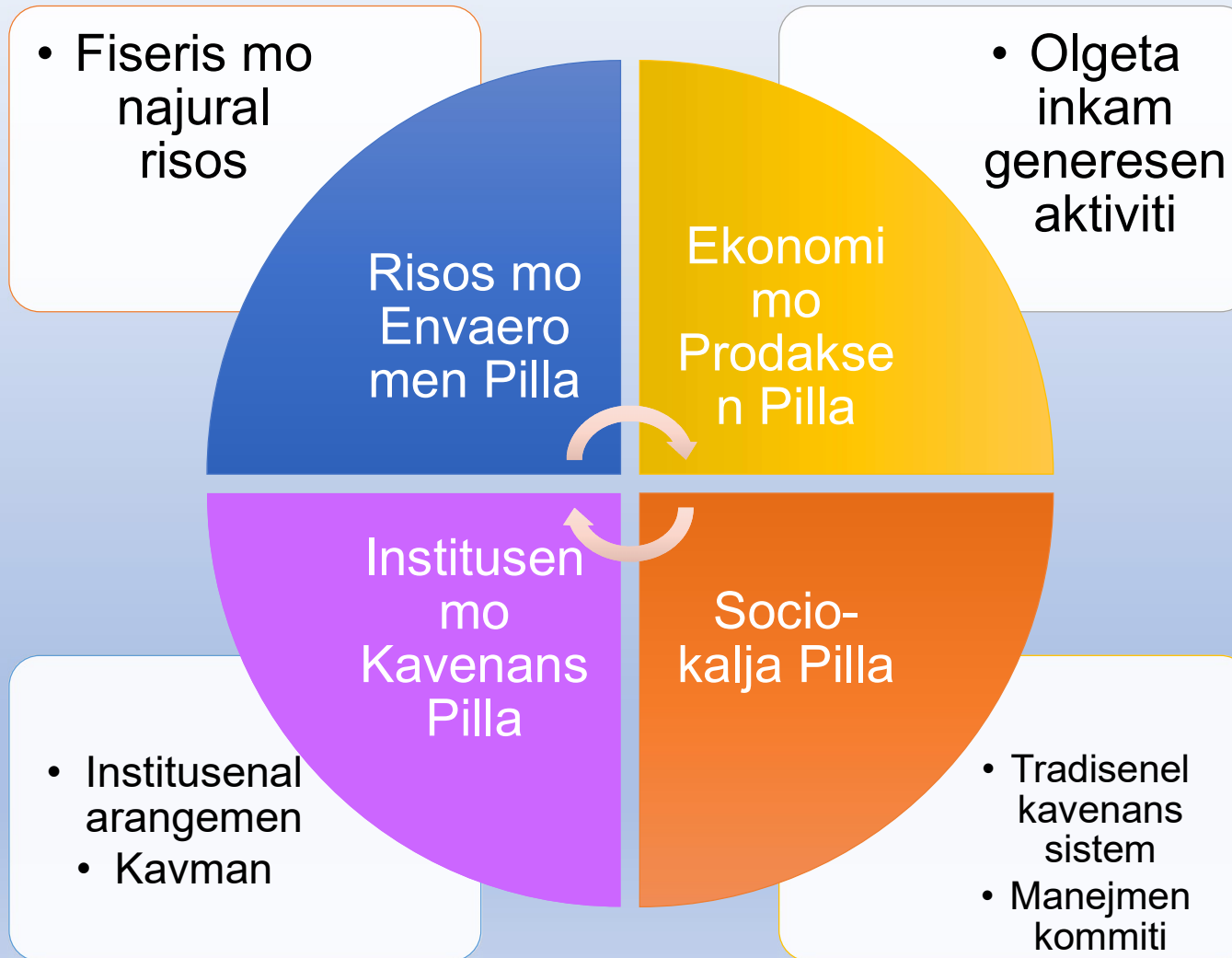


Ol simpel Socio-ekonomik sevei

- Kwestinia sevei
Blo holem taet
situasen naolia.



Kwestinia I bes lo ol fo pillas



Content blo ol kwestenia shet ①

1.0 Preliminari infomasen

- Provins
- Viliy komuniti
- Nem
- Deit

Content blo ol kwestenia shet ②

2.0 Resos mo Envaeromen pilla

2.1 Awenes blo resos manejmen

2.1.1~2.1.3

→ I gat fulap colom blo ansa I stap be wan
kwestin I gat wan colom nomo blo fulumap

Content blo ol kwestenia shet ③

3.0 Ekonomi mo Produksen pilla

3.1 Ekonomi lo wan haoshol

- Mas fulmap ol ekonomik aktiviti blo tugeta man mo woman (spos oli askem kwestin lo man, man wei I askm kwestin ba I mas askem ol ekonomik aktiviti blo woman blehem too. Lo ges blo wan perent, fulmap blo wan nmo)
- 3.2 → fulumap wan colom nmo.

Content blo ol kwestenia shet ④

4.0 Sosol mo kaljarel pilla

4.1~4.3

→ fulumap wan colom blo wanwan kwestin
mo tikim ✓

Content blo ol kwestinia shet ⑤

5.0 Institusen mo kavenens pilla

5.1~5.2

→ fulumap wan colom nomo blo wanwan kwestin

→ I gat wan sensitiv kwestin weh hemi blo chef nomo. explain that Anonymity is secured.

Tankiu tumas

IMPLEMENTATION GUIDELINES

of community Based Fisheries Management (CBFM) for the Republic of Vanuatu



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

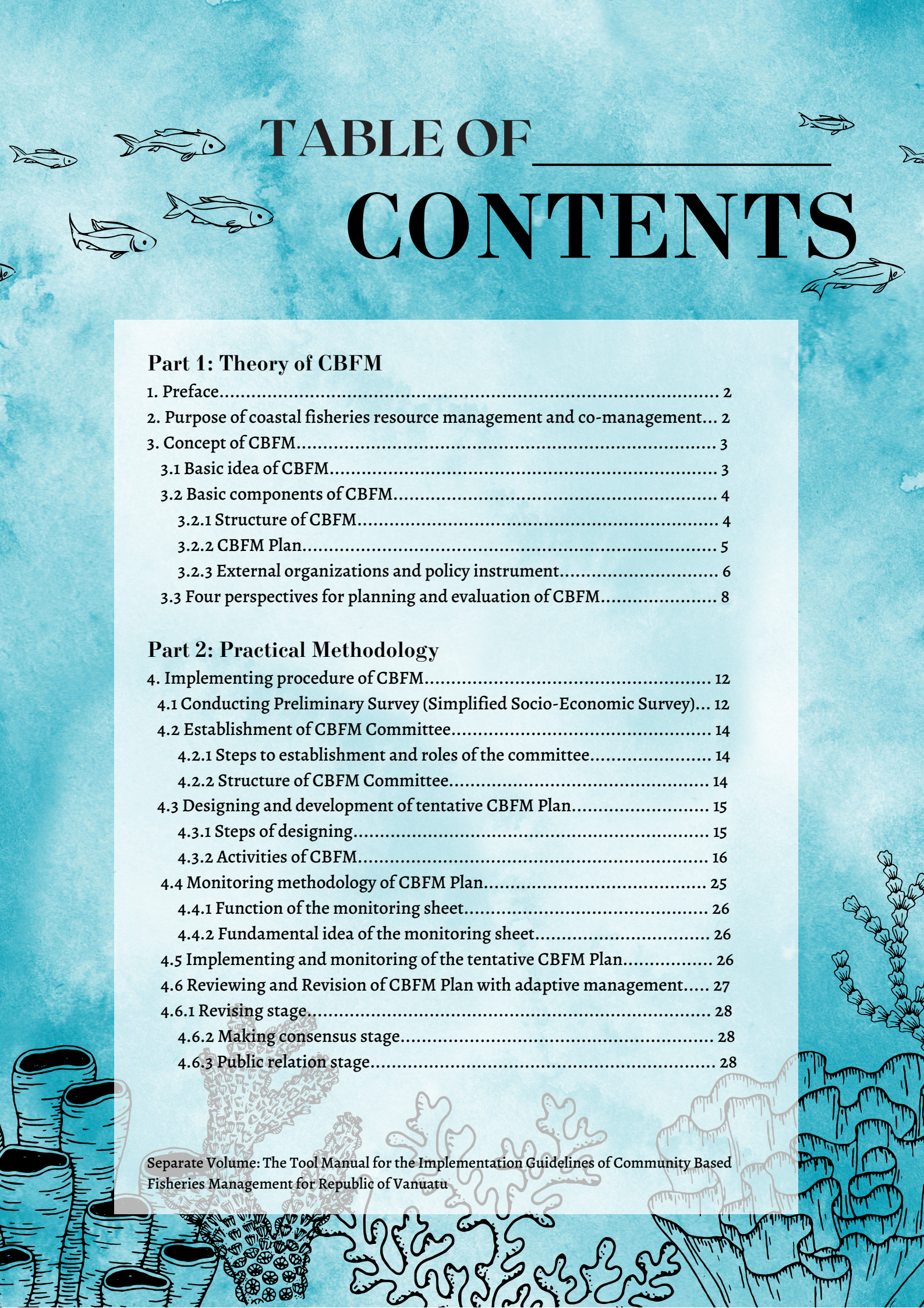


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Separate Volume: The Tool Manual for the Implementation Guidelines of Community Based Fisheries Management for Republic of Vanuatu



PART 1: Theory of CBFM



1. Preface

The Project for Promotion of Grace of the Sea in the Coastal Village has been undertaken by Vanuatu Fisheries Department (VFD) and Japan International Cooperation Agency (JICA) on the three phases, namely, 2006 - 2009 as Phase 1, 2011 - 2014 as Phase 2 and 2016 - 2021 as Phase 3. Within the project, methodology of the Community Based Fisheries

Management (hereinafter referred to as CBFM) has been developed. This implementation guidelines are a guide for series of PDCA (Plan, Do, Check and Action) on CBFM reflecting practical experience gained in the project. It also reflects valuable experiences of other projects implemented by VFD and international donors. The concrete contents are highly effective CBFM planning process, the community structure on implementation and external support, policy instrument, points to be noted on implementation and so on.

The targets of this guidelines are mainly for officers of VFD such as the development officers, community authorized officers who are appointed by the government in rural areas where no VFD officer is assigned, and persons who support planning and implementation of CBFM with local population of coastal communities such as Area Secretary of Provincial Government.

2. Purpose of coastal fisheries resource management and co-management

(1) Necessity of fishery resource management

Fishery resource management is originally a scientific approach to achieve Maximum Sustainable Yield (MSY) in fisheries science and it aims to control the catch amount. However, the reproductive capacity fluctuates depending on the number of spawning stock and environmental conditions, so if fishing is continued beyond the reproductive capacity (if too much of spawning stock are caught), the amount of resources turns to a decreasing trend. Fishery resources are living, and it has the characteristic to be able to reproduce itself unlike mineral resources. Namely, fishery resource management is to confine the catch to the MSY, which means keeping the spawning stock just before the resource turns to decrease trend.

In addition, there is also another idea that the goal of sustainably maximizing fishing income is to set the Maximum Economic Yield (MEY) as the goal of resource management. In any case, the basic idea of fishery resources management is to make effective use of resources on a sustainable basis.

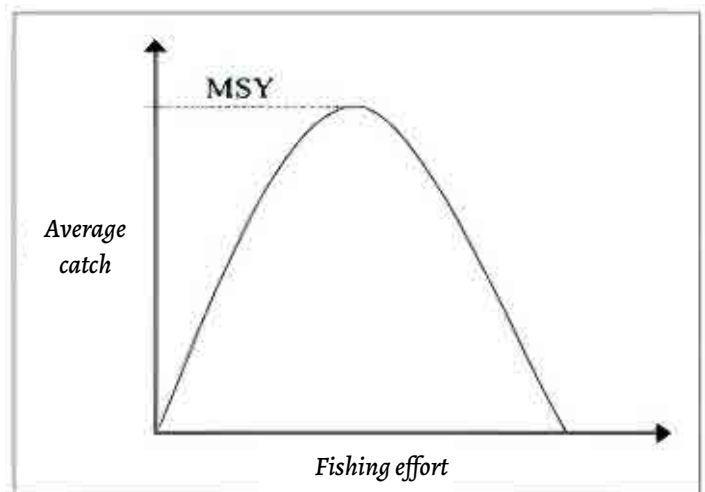
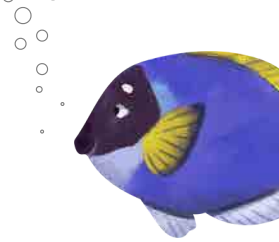


Figure 1: Maximum Sustainable Yield

(2) Concept of co-management

Co-management is a basic idea of CBFM. As the ways of fishery resource management, there are mainly three types such as 1) top-down management by the government, 2) voluntary management by fishers, and 3) co-management with government and fishers.



Top-down management is typified by catch quota system common in European countries. Top-down management aims to prescribing fishing ground, fishing season, catch size and so on by governmental regulations to achieve MSY or MEY. Since it usually introduces regulatory system for specific target species at the national level, it is highly possible that the effect will be high if it is implemented properly. On the other hand, it is difficult to deal with the situation in accordance with local circumstances. Especially, in countries where have various target species and be composed large number of small fishing communities such as Asia-pacific region, it is not easy to enforce covering all fishing activities by the top-down management.

Voluntary management by fishers is typified by the establishment of protected areas by the community initiative in Vanuatu. Voluntary management by fishers can respond flexibly according to the expected roles and surrounding environments of the target site. It is relatively easy to comply because of reasonable rules decided by themselves and the limited target areas. On the other hand, Knowledge, skills and budget are insufficient in many cases for this management method. In addition, since management rules are informal, there would be difficult to control it by the public agency.

Co-management with government and fishers would be model to leverage the good parts of the two types of fishery resource management mentioned above as well as to complement the difficulties of those. In general, fishers can tackle the difficulties and needs for the management activities with officer in charge of the public agency in order to find the countermeasures. They then can summarize it in the management plan (action plan) and authorize it as the official management rule by the public agency.

3. Concept of CBFM

3.1 Basic idea of CBFM

Many resource management projects based on the co-management model have been implemented in most of the Pacific countries including Vanuatu communities. CBFM is one of them with specific characteristics as follows.

1) Targeting not only fishers but also the community's people extensively even though the aims are mainly on fisheries resource management,
2) Involving various elements necessary to implement resource management comprehensively broadly divided into following three groups.

“Management measure” is a series of activities directly relating to fisheries resources management[1]

“Supporting measure” is a series of activities relating to support community livelihood for sustainably, independently and effectively implementing the resource management[2]

“Connecting measure” is a series of activities relating to connect management and supporting measures and also to motivate participating community people to the resource management activities[3]

3) Systematizing and arranging those elements and contents logically

4) Packaging flow of resource management activities such as a) planning, b) implementing, c) monitoring/evaluation and d) revising the plan to promote CBFM effectively and efficiently

Consequently, CBFM is a methodology of participatory resource management that coastal community is situated as the main actor. The community implements activities of the management measure and the supporting measure in an and comprehensive manner by aiming sustainable use of the resources with supports of public agencies based on the co-management model. The goal and basic principles forming CBFM are as follow.

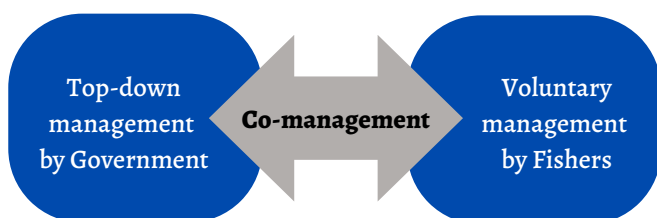


Figure 2: Concept of Co-management

[1] Management measure is inclusive that; controlling fishing efforts (gear, ground, period, target species), illegal fishing surveillance, resource enhancement, reef preservation, etc.

[2] Supporting measure is inclusive that; fishing diversifications such as FAD development, deep bottom fishing development, value addition of fish products and alternative income source development.

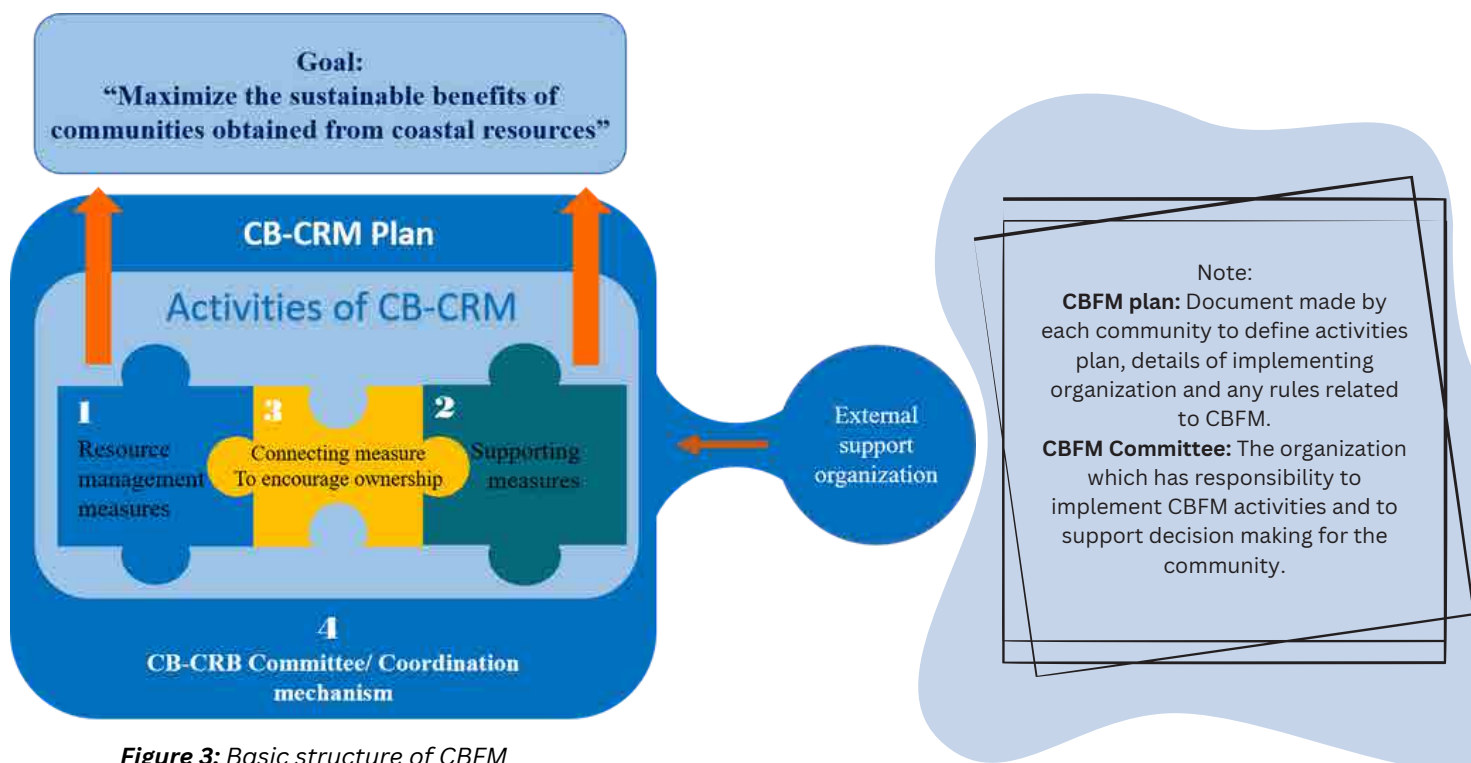
[3] Encouraging local participation measure is inclusive that; awareness raising program, underwater research, eco label, fund raising, etc.

Goal	Maximize the sustainable benefits of communities obtained from coastal resources
Basic Principals	1. Activities are carried out through the ownership of the community 2.1. Both of resource management activities and supporting activities are effectively for sustainable use of resources with practice in comprehensive manner through cooperation with communities and external support organizations. 3. The external supporter acts as a role of facilitator. VFD development officer are expected to take this role to facilitate community discussion on several meetings and workshops. 4. The plan is widely regarded as a part of the regional development plan and ultimately linked with the National Sustainable Development Plan (NSDP) 5. Four perspective for the planning and evaluation of CBFM; “Environment/Resources”, “Economy/Production”, “Socio Culture” and “Institution/Governance” are considered within the activities. 6. The plan is constantly evaluated and revised through monitoring. 7. Community resilience against natural disaster is established from the viewpoint of food security. 8. It conducts scientific and logical monitoring and evaluation.

3.1 Basic components of CBFM

3.2.1 Structure of CBFM

The basic components of CBFM are shown in the following figure. The basic components of CBFM are (1) CBFM plan, (2) CBFM Measures, (3) CBFM Committee/Coordination Mechanism, and (4) External support organization/institution (fig.3). Each detail is explained below.



3.2.2 CBFM Plan

(1) Scope of the plan

CBFM aims to implement and comprehensive fisheries resource management by community as main actor. However, the support from public agencies is also an essential. For receiving the smooth assistance from public agencies, the scope of the plan would be consistent with the government’s policy. It is therefore desirable that the CBFM plan is a part of the regional development plan in the broader scope. In the context, the CBFM plan would be preferable to be associated with the administrative unit such as a provincial government covering the target community, furthermore a national level development plan.

Further, since it is necessary to have public effectiveness and enforceability, it needs to be officially approved or registered by Ministry of Agriculture, Livestock and Biosecurity.

(2) Composition of the plan

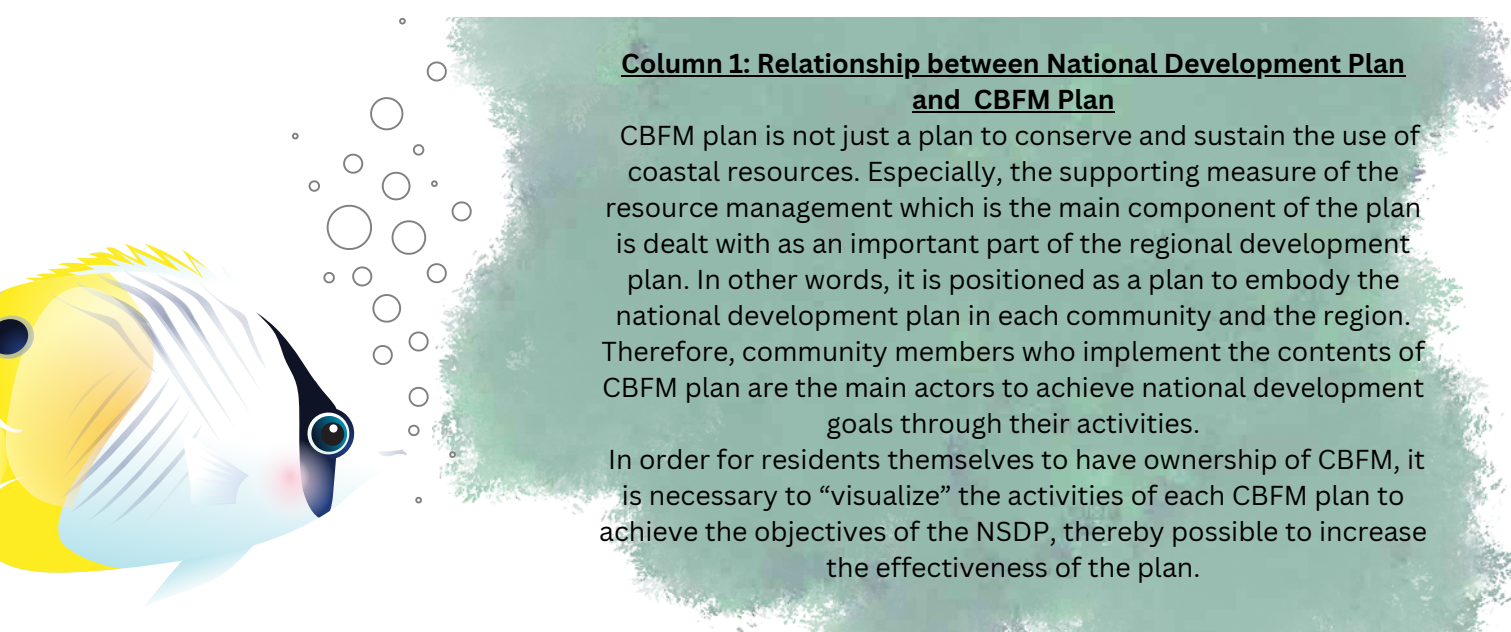
The CBFM plan should include the following items.

Table 1. Composition of the CBFM plan

Items	Contents
Target area	Target areas or communities for CBFM are defined.
CBFM Committee	The fundamental structures such as name of the committee or substituting organization, the chairperson, the list of board members, the committee members, the role and authority, the term of office are specified.
Contents of Activities	There are the three items such as <u>resource management</u> measure to manage fisheries resources, <u>supporting measure</u> to support community’s livelihood and <u>connecting measure</u> [4] to connect management and supporting measure. The contents of activities such as the name, the targets, the methods, the period and responsible person should be clarified.
Community based Coordination Mechanism	The mechanism for implementing concrete activities corresponding to the community needs is described. This includes the composition of each activity such as the group centering on the committee, the meeting for problem solving/consensus building, the mechanism of notifying decision items and results of activities to community members, the person in charge.

[4] For details of each measure, refer to “3.2.2 Activities of CBFM”.

External support system	This includes the information such as the name of the external support organization, demarcation between the community and external support organization, authority, duty, budget allocation, period to support. External support organizations are supposed to be public sector such as Fisheries Department and international donors.
Method of Monitoring and Review of the Plan	The indicators for goals and progress evaluation for each measure should be decided. In addition, procedures and methods for review such as the period of reviewing the plan, procedures for proposal and approval by the committee and consultation with external support organizations. should be determined. In case of implementing planning and evaluating (monitoring, reviewing) of the CBFM plan, “four perspectives” as 1) resources & environment, 2) economy & production, 3) socio culture and 4) institution & governance, are utilized for the regional development [5] .



Column 1: Relationship between National Development Plan and CBFM Plan

CBFM plan is not just a plan to conserve and sustain the use of coastal resources. Especially, the supporting measure of the resource management which is the main component of the plan is dealt with as an important part of the regional development plan. In other words, it is positioned as a plan to embody the national development plan in each community and the region. Therefore, community members who implement the contents of CBFM plan are the main actors to achieve national development goals through their activities.

In order for residents themselves to have ownership of CBFM, it is necessary to “visualize” the activities of each CBFM plan to achieve the objectives of the NSDP, thereby possible to increase the effectiveness of the plan.

3.2.3 External organizations and policy instrument

The external organization and policy instrument support the community from the outside about various aspects concerning the implementation of CBFM, and it is one of the important elements of CBFM.

First of all, the external support organizations aim to support community from outside such as VFD, a community support department of a local government, each administrative organization related to tourism, agriculture, cooperatives, regional development, NGOs, international organizations, donors and so on. VFD in particular is expected to play a central role in external support organizations and has the role of a planner or coordinator that supports necessary technologies and funds while involving other Ministries and Departments, NGOs and donors. In addition, external support organizations are not merely unilateral support, but are positioned as partners working with the community on CBFM. The resource management is the national level challenge in the first place, and it is necessary that both community and public agency work on the issues. The public agency has usually confronted issues such as legal development, development of management tools, budgetary measure, response to species to be managed throughout the country.

The community should take care of several issues according to the role and responsibility with mutual collaboration. The information, know-how and lessons learned extracted from the activities can be fed back to the policy, skills and technology development.

[5] For details of it, refer to “3.2.5 Four pillars to design and evaluation of CB-CRM”.

The external support system refers to various systems that support the community working on CBFM as well. This system includes approval of the CBFM plan by government, provision of equipment and financing, setting and approval of MPA by Department of Environmental Protection and Conservation, micro credit service by financial institutions/NGOs, trainings related to management and running of the cooperatives, technical trainings related to the development of income sources, women' empowerment by organization/NGOs. In particular, administrative approval schemes are very important for activating the CBFM plan formulated by the community. Without this, the plan is merely a private rule of the community, and people outside the community are not obligated to comply with it, so the effectiveness of management will not be guaranteed. It is desirable to arrange such external support organizations and systems in advance and to propose what kind of support can be obtained according to the community plan and needs.

Table 2. Major external support organizations and policy instruments

	External support organizations	Role/Institution
1	Ministry of Agriculture, Livestock, Forestry, Fisheries and Biosecurity (MALFFB)	- Official approval system of CBFM plan
2	Vanuatu Fisheries Department (VFD)	- Planner/coordinator to implement CBFM in collaboration with the community. - Technical support - Procurement of equipment - Accreditation and training of community extension officers - Endorsement community protected area (taboo area)
3	Provincial government /Area Council	-Collaboration with regional development plan. Various indirect support.
4	Ministry of Environment	- Establishment/approval of MPA
5	Financial institution /NGO	- Provision of micro credit service
6	Vanuatu Maritime College	- Trainings on fishing gears and methods, and outboard motor repair

7	Department of Cooperatives	- Training on the establishment and management of cooperatives - Training on business skills
8	Department of Tourism	- Training on tourism business skill
9	Chamber of Commerce and Industry	- Business development service - Business information

Column 2: What is the role expected to external support organizations and policy instruments?

CBFM is mainly based on community, and the most fundamental role expected to the external support organizations is to “cuddle” the community members. In other words, it is a catalyzer to promote the resource management activities and the supporting activities by community, a consultant who gives expertise to community, an instructor who directly convey new technologies and a coordinator who supports the resource management committee and arranges necessary specialists, equipment and money.



3.3 Four perspectives for planning and evaluation of CBFM

The “four perspectives” of CBFM are developed independently by the Project for Promotion of Grace of the Sea in the Coastal Village (GOS project) for effective and efficient coastal resource management activities based on the analytical method, territorial approach for regional development. This concept is used for understanding the current situation and analyzing the problems based on four perspectives such as 1) resources & environment, 2) economy & production, 3) socio culture and 4) institution & governance in planning stage (baseline survey, planning) and evaluation stage (monitoring, revision).

Specifically, it is necessary to check the composition of the CBFM committee, the action plan, the roles and uses of the external support organizations and policy instruments from the respective perspectives without fail. Setting indicators on the monitoring sheet and reviewing the plan after receiving the monitoring results are checked from each perspective as well. The outline of the four perspectives and concepts of check items are shown in Figure 4. The details of each perspectives are shown below.

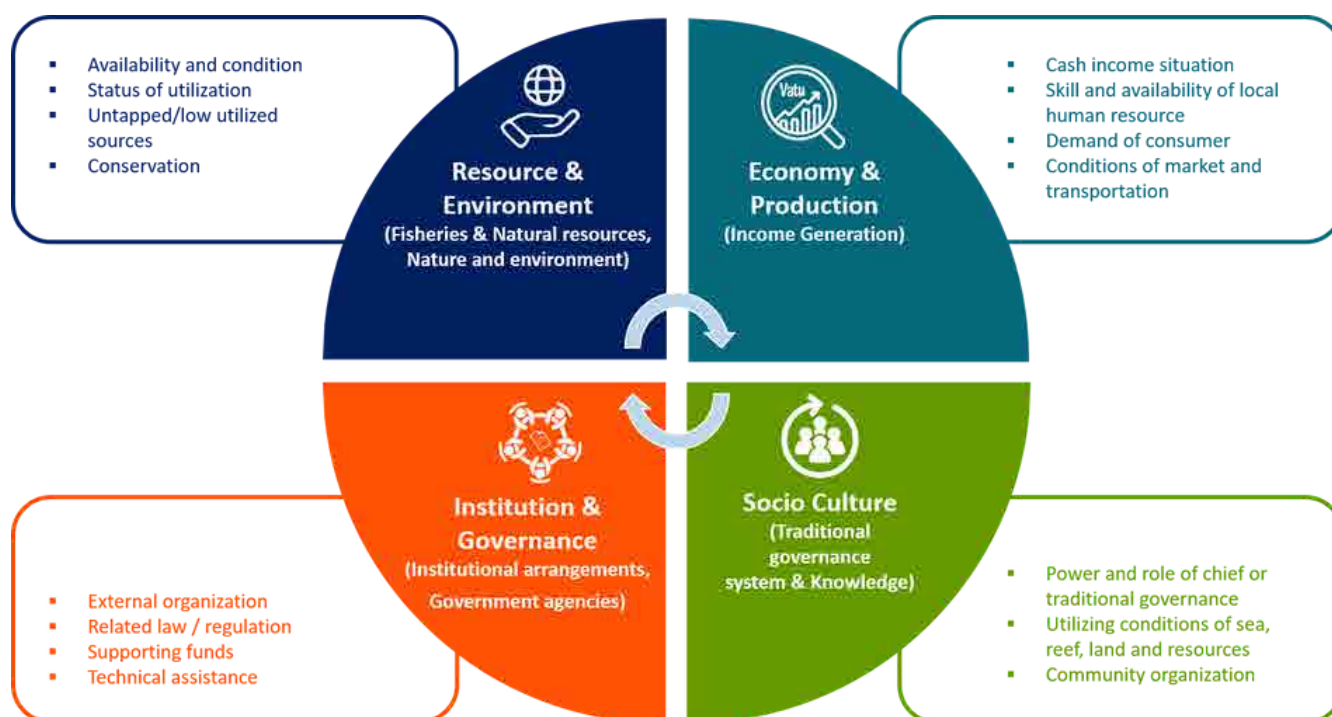
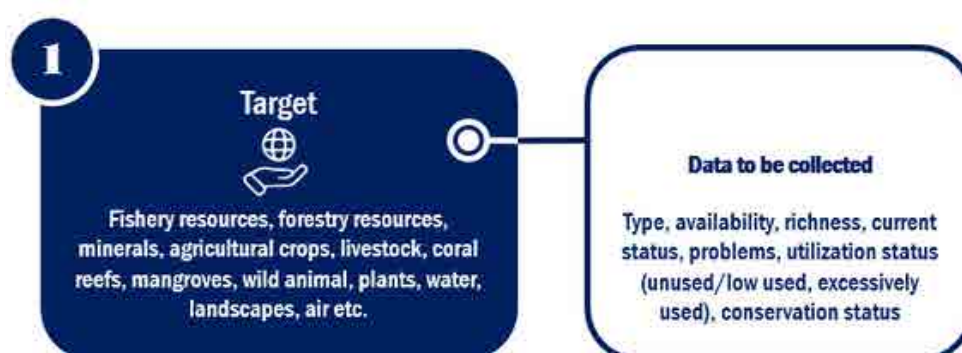


Figure 4: Four perspectives on CBFM

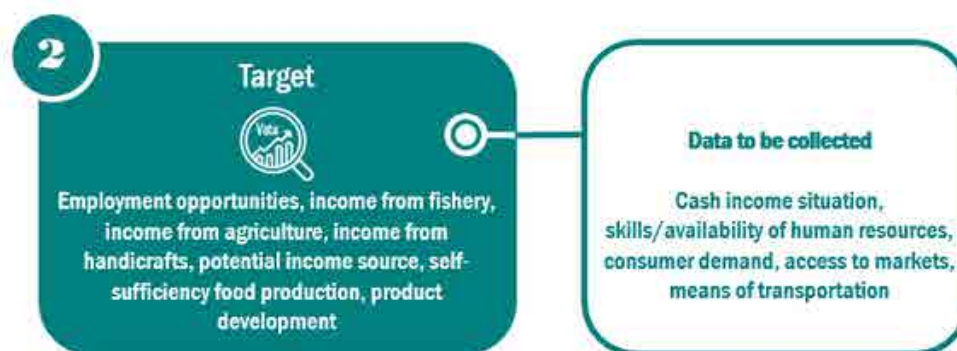
(1) Resource & Environment perspective

This perspective is on the natural environment such as various natural resources including marine resources, topography and landscape belonging to the community. This perspective is mainly necessary for understanding the current situation and analyzing the problems of the natural resource condition around target community. The target and data to be collected regarding this perspective are as follows.



(2) Economy & Production perspective

The perspective is on economic and production activities such as income sources of community people and the production of necessary supplies for living. This perspective is mainly necessary for understanding the current situation and analyzing the problems of local livelihood of target community. The target and data to be collected regarding this perspective are as follows.



(3) Socio culture perspective

This perspective is on social and cultural conditions such as the traditional governance system within the community, knowledge, customs and rules. This perspective is mainly necessary for understanding the current situation and analyzing the problems of the traditional mechanisms of management and coordination of target community. The target and data to be collected regarding this perspective are as follows.



(4) Institution & Governance perspective

The perspective is necessary for understanding the current situation and analyzing the problems on the political and administrative organizations and institutions outside the community. In particular, it refers to an external organization and policy instruments as a position to support community activities. The target and data to be collected regarding this perspective are as follows.



Based on the above, an example of data to be collected at the planning stage (baseline survey, planning) and the evaluation stage (monitoring, revision) are shown below. However, as these contents change variously depending on the location and situation, it should be referred to as an example only.

Table 3. An example of items to be confirmed in each stage

	Resource & Environment	Economy & Production	Socio culture	Institution & Governance
1) Preliminary survey	- What kind of fishery resources are utilized? - Is there a resource problem? - What are unused resources?	- What income sources are there? - Average cash income - Potential income sources - Distance to markets - Means of transportation	- Role and authority of traditional leaders - Traditional rules/taboo - Social hierarchy - Sea/land use	- Status of support by government and donors - Support needs
2) Elaborating CBFM plan	- Fish species to be managed - Management measure - Resources and availability to use for supporting measure	- Is the means of improving value addition of fishery products appropriate? - Selection of alternative income sources - Profitability	- Is the composition of the CBFM committee appropriate? - Do the planned activities not have any restriction? - Do the activities not have benefit to a particular group?	- Role of VFD /items of activities - Relevant organization/ refining available systems - Items of technical support - Input equipment
3) Monitoring	- Effect of management - Difficulties - Management of resources used for supporting measure	- Sales/income target - Profitability	- Management status of the committee - Fairness of management measure - Beneficiaries of supporting measure - Presence /absence of conflict	- Input results - Expecting effects their gaps and the reasons
4) Revision	- Reflecting to management issues - Solution of issues on using resources for supporting measure	- Target of supporting measure/ scale/ goal etc.	- Items/ content/ targets of management measure - Target of supporting measure	- Input plan

PART 2: Practical Methodology



4. Implementing procedure of CBFM

The flow of procedure for implementing CBFM is shown in figure 5. The details of procedure are described as follows.

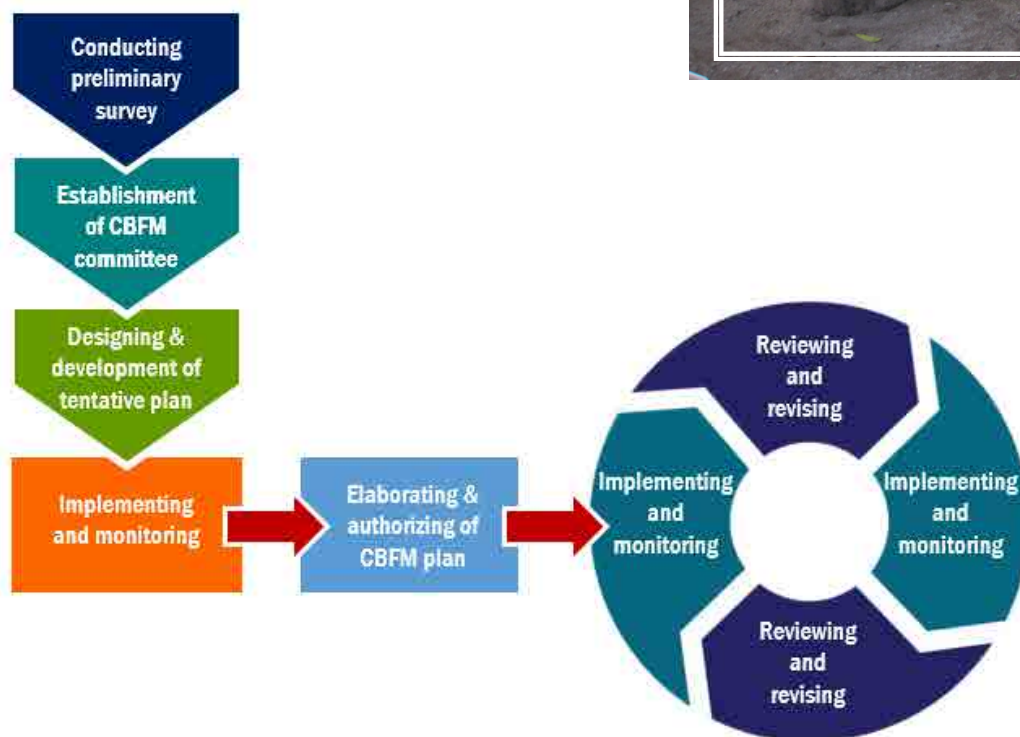


Figure 5: Implementing procedure of CBFM

4.1 Conducting Preliminary Survey

(1) Simplified Socio-Economic Survey

This is a simplified survey to collect a minimum information necessary for selecting the target community and for a baseline for implementing CBFM. The volume of the contents should be the level that one or two surveyors go around the candidate community where is interested in carrying out CBFM and make a survey about one half day to one day. Information to be covered in the survey is as shown in Table 4.

This survey will target basic information for the facilitator to support formulation of the community's CBFM plan[6].

[6] For details of it, refer to "3-2-1 Integrated CB-CRM Plan".

Table 4: Items for preliminary survey

Category	Survey items
1. Community's basic information	Number of households, population, distance from city/town, situation of infrastructure such as road, airport and ports
2. Structure of fishery	Number of fishers, existence of cooperatives and contents of the activities, number of boats (Canoe, canoe with outboard motor, FRP[7] boat with outboard motor), main fishing gear and methods, main resource
3. Situation of resource/environment	Awareness of the resource problems (Decreasing resource volume, downsizing of fish size, difference of distance to fishing ground), awareness on necessity of management
4. Situation of economy/production	Main income source and industry, items and the amount of income and expenditure by households, actual situation of sales of fishery product (place to sale, unit price and the method)
5. Situation of socio culture	System of utilization of traditional land and sea (ownership, owners, exclusive use), equality in resource utilization, existence of resource management organization, authority/function for resource management by traditional leaders
6. Situation of institution/governance	Presence or absence of human resources, policy instruments, activities and problems for community support by local administrative organization

(2) Natural resource survey

As preliminary survey, the natural resource survey would be better as simple and short as possible though the survey should collect basic information of the current status of the target area. Prior to the survey, interviewing to community members is indispensable to understand the present status of coastal resources and existing traditional management areas (taboo areas).

The natural research is then implemented by the research specialists such as staff of fishery department based on basic underwater visual census targeting low mobile species such as large snails, giant clams, sea cucumbers, corals and lobster. It is preferable to obtain the cooperation of local residents for the survey. The case example of basic procedure is shown below though there are many manuals for the underwater survey to show the procedure can be also referred.

[7] Fiber Reinforced Plastic

- (1) Identify the target sites based on the interviews to community members.
- (2) Observe the bottom condition around target sites by free diving in order to understand general condition of bottom topography and habitat.
- (3) Set five 50 m transects in the site. The interval is depended on the size of target site.
- (4) Record GPS positions of start points and azimuth direction of each transect.
- (5) By free diving, 2 divers move along the transect line with observation of the 2m wide (2 m wide x 2 divers = 4 m wide) area and count and record the number of target species previously determined. In the survey, the divers try to observe the underneath of rock and boulder if possible.
- (6) Number of individuals and approximate size of target species recorded in the target sites are statistically analyzed for estimating the amount of target species.

4.2 Establishment of CBFM Committee

4.2.1 Steps to establishment and roles of the committee

Following the “4.1 Conducting Preliminary Survey”, establishment of CBFM Committee, the implementing agency of CBFM in the community, that leads the participants in each process of planning, implementation, monitoring and review stages. Namely it is a coordination mechanism to make various decisions for CBFM. It is also desirable to have a advisory function for the local administration in village level such as Chief councils.

At first, the facilitator encourages the community to hold a representative meeting of the residents, and explain 1) the necessity of resource management, 2) the purpose and activities of CBFM, 3) the role and composition of the committee. On that basis, it is necessary to confirm whether there is an existing organization that will take on this role and to support the establishment of a new one. Items to be decided on establishing the committee are 1) Target community and sea area, 2) Authority and duty of the committee, 3) Selection of committee members (traditional leaders, representative of fishers’ organization, women’s group and youth group), 4) Selection of chairperson, 5) Selection of executive member (secretary, treasurer, person in charge of monitoring), and 6) Working group in charge of each measure of CBFM activities (After selection of activities).

4.2.2 Structure of CBFM Committee

Members of the committee should be decided by discussion of each community, but it supposed to be consisted with representatives of each working group, traditional leaders of the community, representatives of fishery organizations, representatives of local organizations such as women’s groups and youth groups, responsible for local administration (Area Secretary). In addition, chairpersons and other executive officers such as secretary, accountant and person in charge of monitoring are appointed and a board of directors is organized. As a subordinate to the committee, sub-committees are organized specifically to implement each activity (management measure, supporting measure and Participation promoting measure) and to carry out monitoring.

Further, if there is already an equivalent organization in the community, it can be substituted by having the function of the CBFM committee for that organization, and it is not necessary to organize it newly. The example of the structural composition is shown in figure 6.

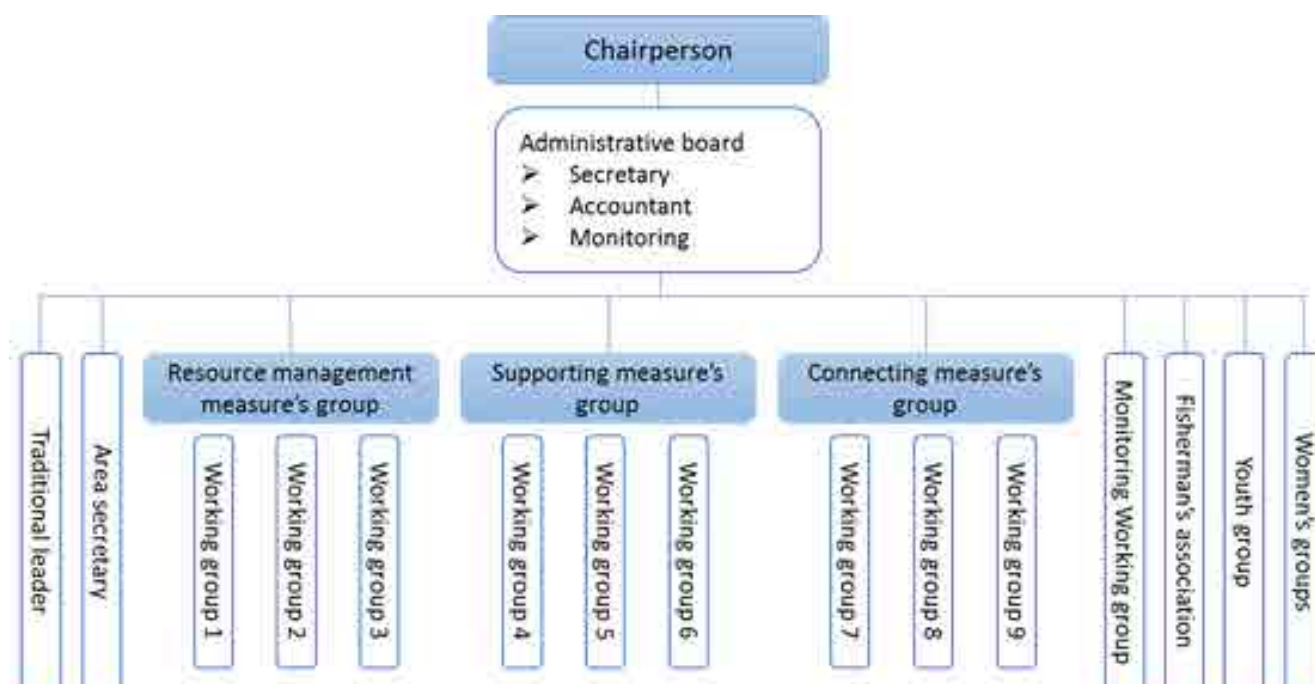


Figure 6: Example of structural composition of CBFM committee

Column 3: CBFM committee as a coordination mechanism

There are various existing organizations such as Chief Council, youth and women's group, religious affiliation and fishermen's association in the community. In addition, some communities or islands have organized Vanua-Thai[8]. Furthermore, it is assumed that a resident group is formed for each economic activity to implement the supporting measure of CBFM.

CBFM committee plays a role of encouraging relevant organizations of the community including existing or newly formed residents' organizations to actively participate in CBFM activities.

The members can be persons who belong to existing organization or may be persons who are newly selected. However, it is desirable to consist of appropriate persons who have a good understanding of CBFM concepts and monitoring methods as coordinators within the community.

4.3 Designing and development of tentative CBFM Plan

4.3.1 Steps of designing

Following the "4.2 Establishment of CBFM Committee", a tentative CBFM plan is formulated with the committee as the main body. For the position and composition of the CBFM plan, see refer "3.2.1 CBFM Plan".

A facilitator such as VFD officer with person in charge of local government (e.g. Area secretary in provincial government) as possible holds a workshop in the community which starts the resource management activities. The facilitator explains 1) purpose and basic idea of CBFM, 2) significance and method of the monitoring, and 3) items to be included in the activities. Secondly, it is planned the tentative CBFM using methods such as strength and weakness analysis or brainstorming[9]. Thirdly,

[8] It is a resource management group established by NGO, Wan Smol Bag.

[9] For details of it, refer to Manual for Implementation of trainings for the Integrated CB-CRM for Fisheries Development Officers, 5.2 Workshop".

evaluation is made on the tentative CBFM plan based on the monitoring sheet[10] (see “4.4 Monitoring methodology of CBFM Plan”). Finally, review and modify the tentative plan based on results of the evaluation to complete updated version, desirably within one year.

In addition, the facilitator also supports the committee to document the results decided by the consultation as a tentative CBFM plan. The plan is disclosed to community people including committee and widely communicate to community using poster etc.

The items of activity which to be included in the plan are shown below.

4.3.2 Activities of CBFM

In this section, examples of the tools of CBFM such as tools for the resource management measure, the supporting measure and the Participation promoting measure are summarized.

The resource management measure and the supporting measure are supported mutually, and sustainable management of fisheries resources in the coastal area is realized by balanced implementation of both sides. In addition, the Participation promoting measure has the function of firmly connecting the supporting measure to the resource management measure. As it was, the resource management measure and supporting measure are car's wheels of CBFM, and the Participation promoting measure becomes the axle to connect these.

(1) Resource management measure

The resource management measure is structured direct resource management tools such as stopping the reduction of resources and restoring already reduced resources. Here are 1) regulatory management tools” to reduce fishing pressure through various catch restrictions, and 2) “positive improvement management tools” to increase resources positively and implementing fishery management.

1) Regulatory management tools

For regulatory management tools, regulations on four factors of fishery, 1) fish species, 2) fishing gears and methods, 3) fishing ground, and 4) fishing period are assumed (Table 5).

[10] For details of it, refer to Manual for Implementation of trainings for the Integrated CB-CRM for Fisheries Development Officers, 6. Necessary knowledge and techniques as a monitor of monitors”.

Table 5: Tools of resource management measure for “regulatory management”

Kind of tools	Contents
Control by fish species	It is a regulatory tool concerning the catch amount and catch size of target species(resources). The example of this is to control catch of green snail and/or sea cucumber.
Control by fishing gears and methods	It is a regulatory tool to prohibit the use or restricting the numbers of specific fishing gears and methods. The example of this tool is mesh size of gill net and use of dynamite.
Control by fishing ground	It is a regulatory tool on restricting fishing in specific waters area. It is necessary to specify the area of the sea to be regulated by position information etc. Taboo area and Marine Protected Area (MPA) are classified here.
Control by fishing period	It is a regulatory tool to restrict catch for specific time/periods. The example of this is such as prohibiting catch for specific fish species for a certain period of time, or restricting catch during the spawning season.

The contents of these tools overlap each other (for example, a control by fish species includes factors of fishing method, ground and period, and on the contrary, a control by fishing ground includes factors of fish species, methods and period as well), and it is sometime difficult to classify clearly. In that case, the resource management measure would be undertaken by multiple tools based on the resource problem occurred in the area.

Column 4: Case of management measure in North Efate

In the case of the CBFM plan in North Efate, a basis of the management measure was expansion of taboo area. This is classified as “Control by fishing ground”. However, in their plan, community people did not impose a total fishing ban in the management area, but they also specified banned species and banned fishing method in the management area. From this example, it is obvious that each regulation overlaps each other.

Part of resource management measure in North Efate

Management are and location (Control by fishing ground)	Banned Species (Control by species)	Banned Fishing method (Control by fishing gears and methods)
Vatunmanko S17°37' 828" E168°12' 643" – Loubouluk S17°39' 176" E168°11' 266"	Trochus, Green Snail, Prawn, Land Crab, Sea Crab, Fish (including Aquarium fish), Turtle, Giant Clam, Chiton (Tamuruku), Sea cucumber, Clam shells and Octopus	- Dive fishing during day and night.

In addition, the following tool examples are given in Table 6 as reinforcement tools to ensure compliance with these regulatory approaches mentioned above.

Table 6: Reinforcement tools to ensure compliance with the “regulatory management”

Kind of tools	Contents
Spatial Total Allowable Catch (TAC) setting	The Spatial TAC can be considered as the best option to manage commercial invertebrate resources on community level collaborated with scientists and government agency. This methodology ensures that fishing pressure is set at a sustainable level according to the resource status in respective fishing grounds in order to prevent over exploitation.
Establishment of Fisheries Coordination Committee	It is a measure to establish a structure for joint management of the resources and fishing grounds that are being used by fishers from multiple regions such as deep-sea bottom fishes or offshore reefs between islands.
Fishing ground Surveillance	It is an activity of fishery surveillance aiming at controlling and prevention of fisheries that violate law and CBFM plan. However, it should be considered that authority is necessary to arrest violators. It is desirable to cooperate and coordinate with the police and/or the coast guard.

2) Resource propagation tools

Many tools can be considered for the “resource propagation tools” as part of the management measure. Following activities are considered effective in the Pacific island region (Table 7). These activities are expected to directly address the improvement of community members’ awareness of the resource management, contrary to the regulatory approach which restricts fishers’ activities.

Table 7: Tools of resource management measure for “resource propagation”

Kind of tools	Contents
Translocation of broodstock of shellfishes	It is targeted to relatively low mobile species such as green snail and giant clam. For these species, raising the broodstock density by gathering large individuals in specific area promotes the self seeding, increases the reproductive rate and enhances the increase of resources.
Establishment of artificial nursery ground for larval and juvenile lobster	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. It would be effective to deploy artificial seaweed in combination with small blocks as hiding places for juvenile and young lobster on sandy bottom in MPA for providing new nursery ground for lobster in order to enhance the lobster resource.
Coral reef preservation	The environment of coral reef is conserved through cleaning the ocean bottom inside coral reefs and exterminating acanthasters and promotes the multiplication of resources. The transplantation of coral tips would be effective too.
Cleaning of beach	It is aimed to maintain and to improve the fishing ground environment through cleaning up gathered garbage on the coast and preventing from returning the garbage such as plastics and others to the sea again.
Mangrove area preservation	It promotes multiplication of resources through cleaning and restricting of logging within the mangrove area, maintaining and improving the environment through reforestation. The nursery tree planting would be also effective.

(2) Supporting measure

The main purpose of supporting measure is to maintain the livelihood of members of target community especially local fishers under the impact of resource management measures such as fishery regulations as well as to support resource management measures through the contribution from incomes by supporting measures. The supporting measure can be divided into three approaches such as 1) “Diversification of fishing” with development of low used or unused resources to maintain fish catch and income while reducing catch pressure to the coastal resources, 2) “Value addition of fish products” that can be expected to maintain and improve income without increasing the catch amount and 3) “Alternative income source development” to compensate incomes from fish catch reduced by management. Concrete activities are assumed to be diverse depending on the economic potential of each target regions and communities. Several activities demonstrated in Vanuatu are introduced here.

1) Diversification of fishing

Several fish species are sorted out as low used or unused resources. These species are as a) large pelagic fish such as tunas in the offshore, b) small pelagic fish such as horse mackerel and sardines, c) deep-bottom fish such as *Etelis coruscans* (Longtail poulet in Vanuatu) and d) diamond back squid which is distributed in medium depth water.

To develop these resources, there would be several ways such as a) fishing ground development by deploying Fish Aggregating Devices (FADs), b) introduction of fishing gears and methods for bottom fish and diamond back squid fishery, and c) development of sailing/small outboard motorized canoe which can be built and operated at low cost as shown in Table 8.

Table 8: Tools of the supporting measure for “diversification of fishing”

Kind of tools	Contents
FAD development for large pelagic fishes	Introduction of FAD and appropriate fishing methods (middle depth trolling, dropline etc.)
FAD development for small pelagic fishes	Sustaining the supply of bait for bottom fish by deploying small and shallow water FAD
Deep sea bottom fishing development	Introduction of effective fishing gears and methods, and improvement of quality control on the boat (Utilization of ice or ice pack etc.)

Diamondback squid fishing development	Development of diamondback squid fishing. Resource development through appropriate fishing methods including developing new markets.
Hybrid canoe development (Sailing/outboard engine)	Promotion of development of fishing outside the reef with low cost

2) Value addition of fish products

Value addition of fishery products consists of several activities such as a) reduction of distribution cost through maintaining freshness/reduction of post-harvest loss/joint shipment of products., b) development of processed products and value addition of sale of cooked seafoods targeting for tourists (e.g. Fish Cafe) and c) expansion of stable sales of fish at low cost inside the village and region as shown in Table 9.

Table 9: Tools of the supporting measure for “value addition of fish products”

Kind of tools	Contents
Improvement of fish distribution system	It aims to increase the profit rate through maintaining freshness/reducing post-harvest loss and reducing distribution cost by joint shipment within the community.
Fish processing	It aims to add high value of catch through developing fillets, vacuum packing, frozen and smoked products, mince and other fish products.
Local handicraft development for shell craft	Souvenirs using shellfish as the material in the community are developed. However, the management is necessary to utilize shellfish resources, and it is proposed to utilize only shells that have been used as edible or already dead.

Fish café (Local fish restaurant/take away)	Cooked fishery products are locally sold mainly for tourists and visitors from outside the community. It is not only for value addition but also reducing distribution cost. However, it is a condition that stable demand can be expected.
Community fish market	Freezing facilities are provided in the villages and profit rate is increased through stable supply within the region, long term preservation and reduction of distribution cost by selling locally.

3) Alternative income source development

Alternative income source development is to introduce livelihood improvement activities not directly related to fishery and to provide means not to rely on natural fishery resources as shown in Table 10.

Table 10: Tools of supporting measure for “alternative income source development”

Kind of tools	Contents
Aquaculture development	It is positioned as a cash income means for residents’ self-sufficiency or sales. In addition, in the event of disasters, it will be expected to function as an urgent food source. Tilapia and fresh water prawn in inland aquaculture, tridacna in sea water aquaculture are promising fish species.
Development of eco-tourism	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.
Development of road market	Stores on the road where traffic is heavy rather than in villages are set up and sell local products such as seafoods and shell-crafting.

(3) Connecting measure

The connecting measure plays a role in connecting the resource management measures and supporting major organically. The connecting measure is not directly related to resource management measure but it collaterally supports to the resource management through the activities and encourages the community members to participate in resource management activities. In addition, it is possible to set multiple tools of connecting measure simultaneously.

The strength of consciousness to resource management is related to the high degree of dependence on fisheries resources. Therefore, the tools of supporting measure that do not depend on fishery resources would be weakly motivated to participate in resource management measure. The figure 7 is a schematic diagram drawn based on this assumption.

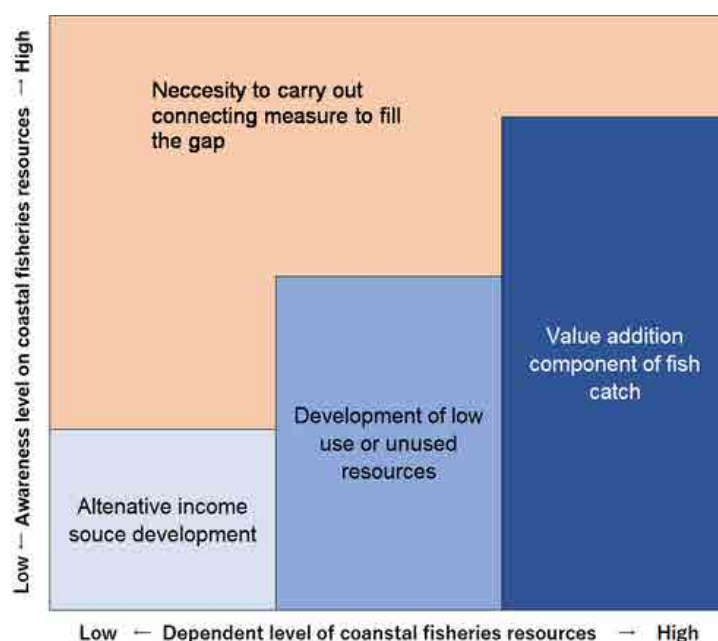


Figure 7: Relationship between supporting measure and connecting measure

Table 11: Tools of connecting measure

Kind of tools	Contents
Data collection on catch and fish distribution	For improvement of the current management measure, the data of the actual status of fishing activity such as fish catch and fishing effort catch is collected. It might be utilized for the scientific management. It responds to the supporting measure dependent on fishery resources such as FAD and development of deep-bottom fish resources. In addition, since this data can be used for estimating catch amount, it is useful for financial institutions to confirm the repayment capacity of the local borrower because it records daily catches or income of him or her. Therefore, it is also a tool that connects resource management measure and supporting measure in a bi-directional way as it can be one of measure to promote fisheries development. In fact, statistical data raises awareness of stakeholders on management measure and supporting measure at the same time.

Activities on awareness raising and education	Community people's understanding and cooperation are very important for promoting resource management. This activity aims to enlighten community members including fishers in order to strengthen regional and nationwide resource management systems. in target areas, This activity also scopes to promote educational activities for children for future generation.
Sports events	Sports event is an important tool for promoting participation of community members including fishers. Sports events attract younger generations who are not usually interested in community activities. The participants are usually not biased toward political or economic interests. In conjunction with the event, it can be utilized as opportunities for various kinds of awareness raising and public relation activities, soliciting to management activities, forming groups, scouting next generation leaders.
Research and study	By participatory approach, basic information for resource management is obtained through underwater visual census and/or hearing survey on the past trend of resources from community members. In case of underwater visual census, it corresponds to the supporting measure to utilize reef resources for tourism. It can be a powerful encouraging local participation tool that raises stakeholder's awareness on the resource management measure. However, these activities must be carried out in the correct manner under the guidance of specialists such as the Fisheries Department.
Eco-tag (Eco label)	It aims to develop tags (labels) as certification of commercial products to prove that they are fish or shells caught under appropriate resource management. In addition to making standards for accreditation, it is desirable to obtain approval from government agencies. It is corresponded to the supporting measure and management measure due to subject to utilize the resources such as shell crafting.
Fund raising for resource management activities	Residents contribute a part of the profit obtained from the supporting measure of the resource management activities to support the resource management. This can relate to every supporting measure, and it has a high affinity for the activities that do not rely on natural fishery resources, among others.

Providing labor force to resource management activities

Even though a part of the residents cannot lead the management activities with their ownerships, they participate in the resource management activities such as coastal cleaning and surveillance and control by providing their labor force.

4.4 Monitoring methodology of CBFM Plan

Monitoring is carried out to assess and improve the implementation status of CBFM. “CBFM monitoring sheet” is utilized to monitor consistently from the planning of the CBFM plan, implementation of activities to reviewing of the plan. The figure below shows the structure of CBFM monitoring and the detail is described below.



Figure 8: Structure of CBFM monitoring

4.4.1 Function of the monitoring sheet

There are two functions of the monitoring sheet for CBFM as follows.

(1) Checklist for planning CBFM

The first function is a checklist to confirm items to be considered during planning of activities when a community wants to start resource management activities.

(2) Monitoring for progress and achievement status

The second function is a checklist to monitor the status of the progress and the achievement after the activities are started.

4.4.2 Fundamental idea of the monitoring sheet

Monitoring for CBFM has the following features and effects.

(1) Self-evaluation: Monitoring is basically done by the community members which implement the resource management activities. Through the self-evaluation, it is expected that the community members can review the contents of activities efficiently and can understand the strengths and weaknesses of the activities. In addition, it is also expected that ownership of activities will be improved without considering “we are evaluated by outside”.

(2) Easy to compare with other communities: Comparison with activities of other communities becomes easier by using the common format. The monitoring sheet can be a mutual learning tool for multiple communities to improve their activities while referring to the activities of each other.

(3) Creation of network: It becomes a tool to create the network among the activity sites as the same reason above. In addition to the mutual learning, the network complements their strengths and weaknesses, and has many effects such as building a cooperative system for common issues.

(4) Adaptive management: Adaptive management becomes possible from the effects mentioned above (1) to (3). In other words, it is a tool for the community to review the activity plan developmentally through self-evaluation, lessons learnt from their failures and expanding activities succeeded.

(5) Emphasis on continuity: Since points rating method are employed for the monitoring sheets, the score will increase gradually if their activities progress. On the contrary, if there is a problem in their activities, the score will be lowered. Therefore, it encourages to continue their efforts to increase the score.

(6) Effective improvement of administrative support: Since administrators can easily grasp the success points and problems of each activity, it is easier to support for problem solving.

For details of monitoring method and monitoring sheet, refer to “Manual for Implementation of trainings for CBFM for Fisheries Development Officers, 6. Necessary knowledge and techniques as a monitor of monitors”.

4.5 Implementing and monitoring of the tentative CBFM Plan

While the resource management measure, supporting measure and the encouraging local participation measure included in the tentative CBFM plan are in implementation stage, the effectiveness is verified and the difficulties are identified. The verification period is approximately one year. The implementation method varies according to the measure, but it is carried out under the ownership of the committee/sub-committee according to the concept. However, since the community is often short in technical and financial resources, the facilitator needs to actively lead the activities of the committee/sub-committee by utilizing the external

support organization and policy instruments. During the verification period, monitoring sheets are utilized to confirm the implementation system of CBFM, the progress and results of each activity. Especially, at the end of the verification period, it is necessary to revise the plan based on the result, and therefore, a comprehensive evaluation should be carried out. For monitoring methods and the sheets, see 4-4 Monitoring methodology of CBFM plan.

4-6 Reviewing and Revision of CBFM Plan with adaptive management

Revise of tentative CBFM plan is carried out based on monitoring results. To review the plan, from the evaluation and consultation of the monitoring results to the announcement to stakeholders, the procedure is shown in Figure 9. The contents of review include the way of coordination mechanism including committee/sub-committee, methods, targets, indicators for evaluation of each activity, etc. Although this activity is conducted through initiative of the CBFM committee, it is necessary for the facilitator to provide close support. The procedure is shown in Figure 9.



Figure 9: Reviewing procedure of CBFM Plan

The detail of the procedure is described as below.

4.6.1 Revising stage

The monitoring results of the activities of the tentative CBFM plan will be discussed in detail in the CBFM committee and the tentative plan will be evaluated. The points to be evaluated are (1) the way of coordination mechanism including the committee/subcommittee, (2) the outcome of each activity of the management measure, (3) the result of each activity of the supporting measure, (4) the result of each activity of the encouraging local participation measure and (5) additional activities of each measure, etc. With the evaluation result, draft of revised CBFM plan is formulated. The committee will carry out the revision, but the facilitator needs to provide close support. Moreover, the monitoring of CBFM also leads to the understanding of the present status of the Coastal Strategy and National Sustainable Development Plan (NSDP) 2016 to 2030 NSDP.

4.6.2 Making consensus stage

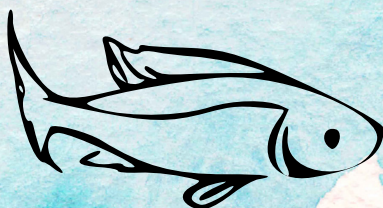
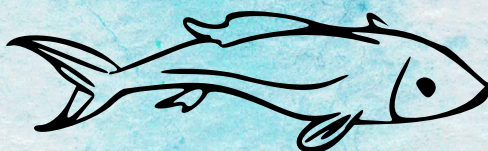
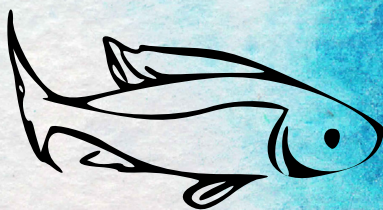
With the draft of revised plan, the community workshop is organized to collect several opinions and build consensus among the community. Revised plan is modified based on the opinion and discussion made at the community workshop. This is called the community-adopted version. Regarding this community-adopted version, it is a time to carry out procedures to obtain official approval by VFD or other related authorities. Regarding this procedure, conditions varies from country to country, but in countries where such a system is not defined, it is necessary for the administrative side to prepare the system in advance.

4.6.3 Public relation stage

The CBFM plan, which has been officially approved by the administration, is printed for distribution to each stakeholder, and is summarized the outline in a poster etc. With this, the contents of the CBFM plan are informed within community people thoroughly and the poster is distributed to neighboring villages and local administrative organizations and other relevant parties in order to gain understanding from many stakeholders and make efforts to publicize.

After that, monitoring is continuously carried out to continue the activities of CBFM and it is periodically reviewed once a year. In addition, ministries concerned with fisheries collect this monitoring sheet from each community working on CBFM, and assess the current situation, extract problems and lessons learned, and reflect them in policies relating to CBFM.

End



Implementation Guidelines of Integrated Community Based Coastal Resource Management (CBCRM)



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



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PART 1: Theory of Integrated CBCRM

1. Preface

The Vanuatu Fisheries Department, with the support of the Japan International Cooperation Agency (JICA), has been implementing the Project for Promotion of Grace of the Sea in the coastal village in active participation of communities and government from 2006 to 2024. The main objective of this project was the sustainable use of fishery resources within the reef, but it was an integrated activity that included the coastal area, including the land surrounding the reef and the reef outer garden to the outside. In coastal resource management, not only in Vanuatu, but also in other countries in the Pacific, it is essential for local people to take the initiative in the management of coastal resources. In this project, the extension staff of the Governmental institution in charge of Fisheries worked together with local residents to develop a coastal resource management plan from their perspective, focusing not only on the knowledge needed to sustainably use coastal resources but also on how to motivate residents to participate in coastal resource management activities. This process culminated in the development of an integrated community-based resource management methodology. This implementation guidelines are a guide for a series of PDCA (Plan, Do, Check, and Action) for CBCRM that reflect the practical experiences gained in the project. It also reflects the valuable experience of other projects implemented by SPC and other international organizations, and we believe that it is applicable to a certain extent in the wider region of Oceania.

Specific content includes the planning process for effective Integrated CBCRM, community structures and external support for implementation, policy instruments, and implementation considerations. The main audiences for this guidelines are fisheries extension staff of Governmental institution in charge of Fisheries, community extension volunteers appointed by the government in coastal areas where extension staff is not assigned, local government officers who work with residents of coastal communities to assist in the planning and implementation of Integrated CBCRM and representative of the fisheries communities.

2. Purpose of coastal fisheries resource management and co-management

(1) Necessity of fishery resource management

Fishery resource management is originally a scientific approach to achieve Maximum Sustainable Yield (MSY) in fisheries science and it aims to control the catch amount. However, the reproductive capacity fluctuates depending on the number of spawning stock and environmental conditions, so if fishing is continued beyond the reproductive capacity (if too much of spawning stock are caught), the amount of resources turns to a decreasing trend. Fishery resources are living, and it has the characteristic to be able to reproduce itself unlike mineral resources. Namely, fishery resource management is to confine the catch to the MSY, which means keeping the spawning stock just before the resource turns to decrease trend.

In addition, there is also another idea that the goal of sustainably maximizing fishing income is to set the Maximum Economic Yield (MEY) as the goal of resource management. In any case, the basic idea of fishery resources management is to make effective use of resources on a sustainable basis.

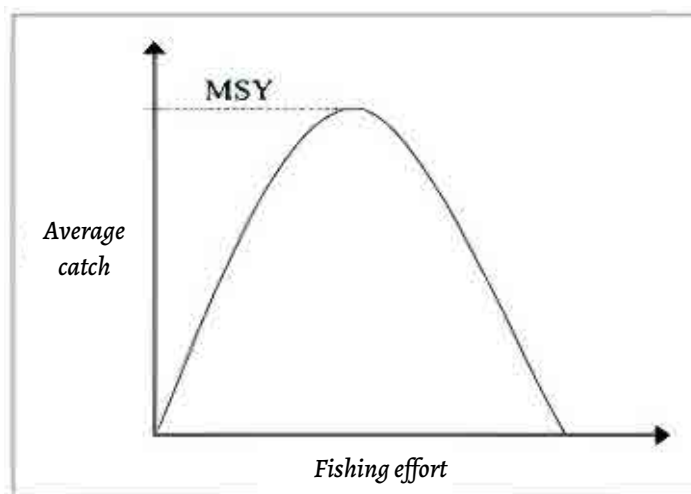


Figure 1: Maximum Sustainable Yield

(2) Concept of co-management

Co-management is a basic idea of Integrated CBCRM. There are mainly three types such as 1) top-down management by the government, 2) voluntary management by fishers, and 3) co-management with government and fishers.



Top-down management is typified by catch quota system common in European countries. Top-down management aims to prescribing fishing ground, fishing season, catch size and so on by governmental regulations to achieve MSY or MEY. Since it usually introduces regulatory system for specific target species at the national level, it is highly possible that the effect will be high if it is implemented properly. On the other hand, it is difficult to deal with the situation in accordance with local circumstances. Especially, in countries where have various target species and be composed large number of small fishing communities such as Asia-pacific region, it is not easy to enforce covering all fishing activities by the top-down management

Voluntary management by fishers is typified by the establishment of protected areas by the community initiative in Vanuatu. Fishers/tribal, resource owners or users practice voluntary management in Solomon Islands. Voluntary management by fishers can respond flexibly according to the expected roles and surrounding environments of the target site. It is relatively easy to comply because of reasonable rules decided by themselves and the limited target areas. On the other hand, Knowledge, skills and budget are insufficient in many cases for this management method. In addition, since management rules are informal, it would be difficult to control it by the public agency.

Co-management with government and fishers/resource owners would be model to leverage the good parts of the two types of fishery resource management mentioned above as well as to complement their difficulties. In general, fishers can tackle the difficulties and needs for the management activities with officer in charge of the public agency in order to find the countermeasures. They then can summarize it in the management plan (action plan) and authorize it as the official management rule by the public agency.

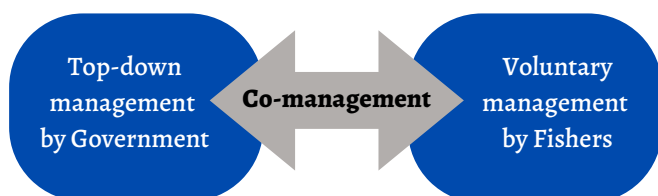


Figure 2: Concept of Co-management

3. Concept of Integrated CBCRM

3.1 Basic idea of Integrated CBCRM

Many resource management projects based on the co-management model have been implemented in most of the Pacific countries including Vanuatu communities. Integrated CBCRM is one of them with specific characteristics as follows.

1) Targeting not only fishers but also the community people extensively even though the aims are mainly on fisheries resource management,
2) Involving various elements necessary to implement resource management comprehensively broadly divided into following three groups.

“Management measure” is a series of activities directly relating to fisheries resources management[1]

“Supporting measure” is a series of activities relating to support community livelihood for sustainably, independently and effectively implementing the resource management[2]

“Connecting measure” is a series of activities relating to connect management and supporting measures and also to motivate participating community people to the resource management activities[3]

3) Systematizing and arranging those elements and contents logically

4) Packaging flow of resource management activities such as a) planning, b) implementing, c) monitoring/evaluation and d) revising the plan to promote Integrated CBCRM effectively and efficiently

Consequently, Integrated CBCRM is a methodology of participatory resource management with coastal community as the main actor. The community implements activities of the management measure and the supporting measure in a comprehensive manner by aiming sustainable use of resources with the support of public agencies based on the co-management model. The goal and basic principles forming Integrated CBCRM are as follows.

[1] Management measure is inclusive that; controlling fishing efforts (gear, ground, period, target species), illegal fishing surveillance, resource enhancement, reef preservation, etc.

[2] Supporting measure is inclusive that; fishing diversifications such as FAD development, deep bottom fishing development, value addition of fish products and alternative income source development.

[3] Encouraging local participation measure is inclusive that; awareness raising program, underwater research, eco label, fund raising, etc.

Goal	Maximize the sustainable benefits of communities obtained from coastal resources
Basic Principals	1. Activities are carried out through the ownership of the community with consideration of gender and social inclusion. 2. Both resource management activities and supporting activities are effectively for sustainable use of resources with practice in comprehensive manner through cooperation with communities and external support organizations. 3. The external supporter acts as a role of the facilitator. Fisheries officer are expected to take this role to facilitate community discussion and community empowerment on several meetings and workshops. 4. The plan is widely regarded as a part of the regional development plan and ultimately linked with the National Development Plan. 5. Four perspective for the planning and evaluation of Integrated CBCRM; “Environment/Resources”, “Economy/Production”, “Socio Culture” and “Institution/Governance” are considered within the activities. 6. The plan is constantly evaluated and revised through monitoring. 7. Community resilience against natural disaster is established from the viewpoint of food security. 8. It conducts scientific and logical monitoring and evaluation.

3.2 Basic components of Integrated CBCRM

3.2.1 Structure of Integrated CBCRM

The basic components of Integrated CBCRM are shown in the following figure. The basic components of Integrated CBCRM are (1) Integrated CBCRM plan, (2) Integrated CBCRM Measures, (3) Integrated CBCRM Committee/Coordination Mechanism, and (4) External support organization/institution (fig.3). Each detail is explained below.

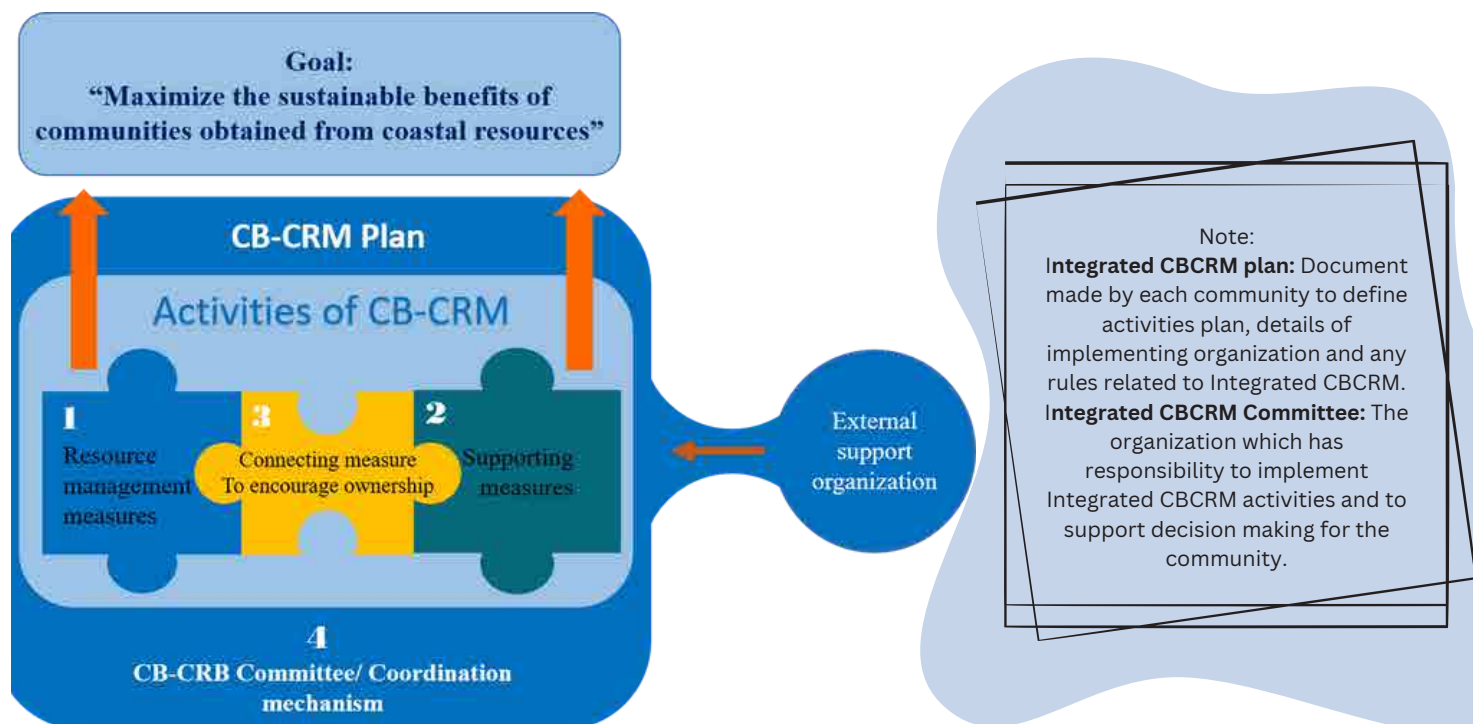


Figure 3: Basic structure of Integrated CBCRM

3.2.2 Integrated CBCRM Plan

(1) Scope of the plan

Integrated CBCRM aims to implement and comprehensive fisheries resource management by community as the main actor. However, the support from public agencies is also essential. For receiving the smooth assistance from public agencies, the scope of the plan would be consistent with the government's policy. It is therefore desirable that the Integrated CBCRM plan is a part of the regional development plan in the broader scope. In the context, the Integrated CBCRM plan would be preferable to be associated with the administrative unit such as a provincial government covering the target community, furthermore a national level development plan.

Further, since it is necessary to have public effectiveness and enforceability, it needs to be officially approved or registered by Ministry or relevant government agency.

(2) Composition of the plan

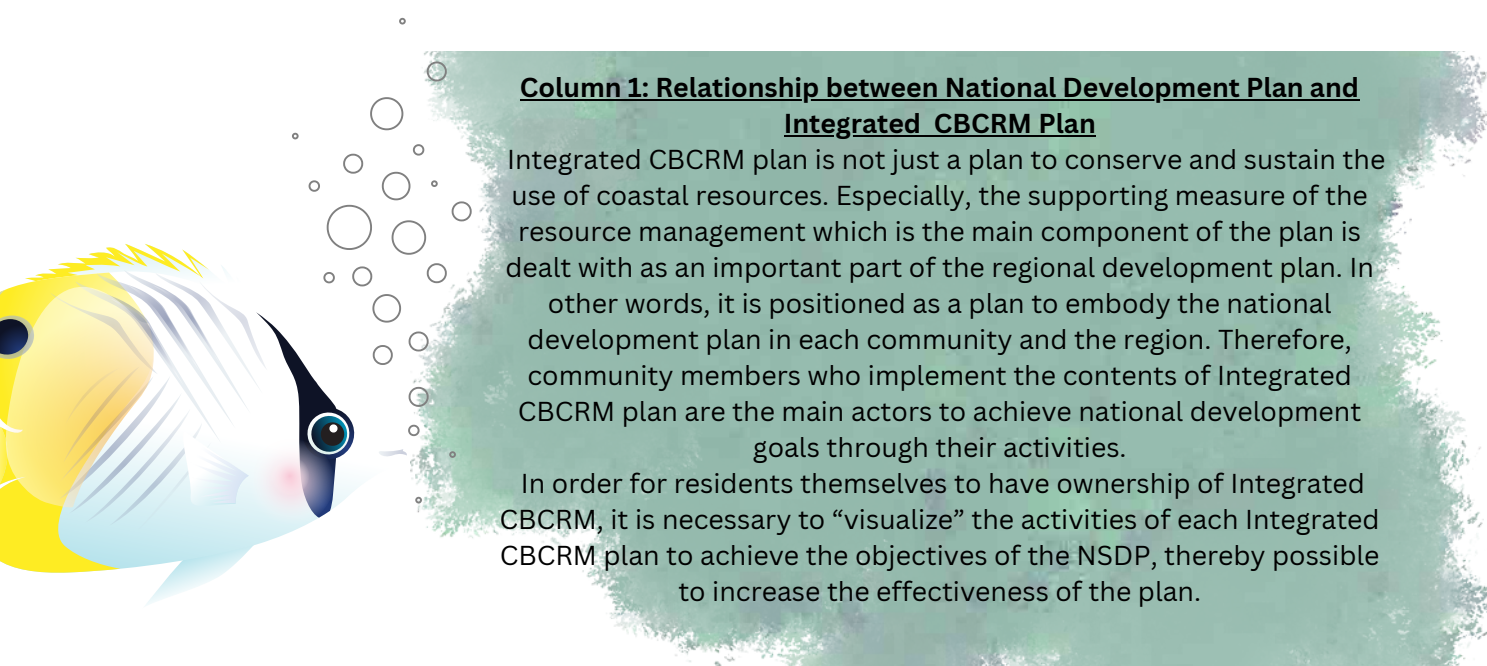
The Integrated CBCRM plan should include the following items.

Table 1. Composition of the Integrated CBCRM plan

Items	Contents
Target area	Target areas or communities for Integrated CBCRM are defined.
CBCRM Committee	The fundamental structures such as name of the committee or substituting organization, the chairperson, the list of board members, the committee members, the role and authority, the term of office are specified.
Contents of Activities	There are three items such as <u>resource management</u> measure to manage fisheries resources, <u>supporting measure</u> to support community's livelihood and <u>connecting measure</u> [4] to connect management and supporting measure. The contents of activities such as the name, the targets, the methods, the period and responsible person should be clarified.
Community based Coordination Mechanism	The mechanism for implementing concrete activities corresponding to the community needs is described. This includes the composition of each activity such as the group centering on the committee, the meeting for problem solving/consensus building, the mechanism of notifying decision items and results of activities to community members, the person in charge.

[4] For details of each measure, refer to "4.3.2 Activities of Integrated CBCRM".

External support system	This includes the information such as the name of the external support organization, demarcation between the community and external support organization, authority, duty, budget allocation, period to support. External support organizations are supposed to be public sector such as Fisheries Department and international donors.
Method of Monitoring and Review of the Plan	The indicators for goals and progress evaluation for each measure should be decided. In addition, procedures and methods for review such as the period of reviewing the plan, procedures for proposal and approval by the committee and consultation with external support organizations. should be determined. In case of implementing planning and evaluating (monitoring, reviewing) of the Integrated CBCRM plan, “four perspectives” as 1) resources & environment, 2) economy & production, 3) socio culture and 4) institution & governance, are utilized for the regional development [5] .



3.2.3 External organizations and policy instrument

The external organization and policy instrument support the community from the outside about various aspects concerning the implementation of Integrated CBCRM, and it is one of the important elements of Integrated CBCRM.

First of all, the external support organizations aim to support community from outside such as fisheries agencies, a community support department of a local government, each administrative organization related to tourism, agriculture, cooperatives, regional development, NGOs, international organizations, donors and so on. Fisheries agencies in particular is expected to play a central role in external support organizations and has the role of a planner or coordinator that supports necessary technologies and funds while involving other Ministries and Departments, NGOs and donors. In addition, external support organizations are not merely unilateral support, but are positioned as partners working with the community on Integrated CBCRM. The resource management is the national level challenge in the first place, and it is necessary that both community and public agency work on the issues. The public agency has usually confronted issues such as legal development, development of management tools, budgetary measure, response to species to be managed throughout the country.

[5] For details of it, refer to “3.3 Four perspectives for planning and evaluation of Integrated CBCRM”.

The community should take care of several issues according to the role and responsibility with mutual collaboration. The information, know-how and lessons learned extracted from the activities can be fed back to the policy, skills and technology development.

The external support system refers to various systems that support the community working on Integrated CBCRM as well. This system includes approval of the Integrated CBCRM plan by government, provision of equipment and financing, setting and approval of MPA by Department of Environmental Protection and Conservation, micro credit service by financial institutions/NGOs, trainings related to management and running of the cooperatives, technical trainings related to the development of income sources, women' empowerment by organization/NGOs. In particular, administrative approval schemes are very important for activating the Integrated CBCRM plan formulated by the community. Without this, the plan is merely a private rule of the community, and people outside the community are not obligated to comply with it, so the effectiveness of management will not be guaranteed. It is desirable to arrange such external support organizations and systems in advance and to propose what kind of support can be obtained according to the community plan and needs.

Table 2. Major external support organizations and policy instruments

	External support organizations	Role/Institution
1	Ministry in charge of fisheries	- Official approval system of Integrated CBCRM plan
2	Fisheries agency/ department	- Planner/coordinator to implement Integrated CBCRM in collaboration with the community. - Technical support - Procurement of equipment - Accreditation and training of community extension officers - Endorsement of community protected area (taboo area)
3	Provincial government /Area Council	-Collaboration with regional development plan. Various indirect support.
4	Ministry of Environment	- Establishment/approval of MPA
5	Financial institution /NGO	- Provision of micro credit service
6	Educational institution related fisheries/ maritime	- Trainings on fishing gears and methods, and outboard motor repair

7	Department of Cooperatives	- Training on the establishment and management of cooperatives - Training on business skills
8	Department of Tourism	- Training on tourism business skill
9	Chamber of Commerce and Industry	- Business development service - Business information

Column 2: What is the role expected for external support organizations and policy instruments?

Integrated CBCRM is mainly based on community, and the most fundamental role expected to the external support organizations is to “motivate” the community members. In other words, it is a catalyzer to promote the resource management activities and the supporting activities by community, a consultant who gives expertise to community, an instructor who directly conveys new technologies and a coordinator who supports the resource management committee and arranges necessary specialists, equipment and money.



3.3 Four perspectives for planning and evaluation of Integrated CBCRM

The “four perspectives” of Integrated CBCRM are developed independently by the Project for Promotion of Grace of the Sea in the Coastal Village (GOS project) for effective and efficient coastal resource management activities based on the analytical method and territorial approach for regional development. This concept is used for understanding the current situation and analyzing the problems based on four perspectives such as 1) resources & environment, 2) economy & production, 3) socio culture and 4) institution & governance in planning stage (baseline survey, planning) and evaluation stage (monitoring, revision).

Specifically, it is necessary to check the composition of the Integrated CBCRM committee, the action plan, the roles and uses of the external support organizations and policy instruments from the respective perspectives without fail. Setting indicators on the monitoring sheet and reviewing the plan after receiving the monitoring results are checked from each perspective as well. The outline of the four perspectives and concepts of check items are shown in Figure 4. The details of each perspectives are shown below.

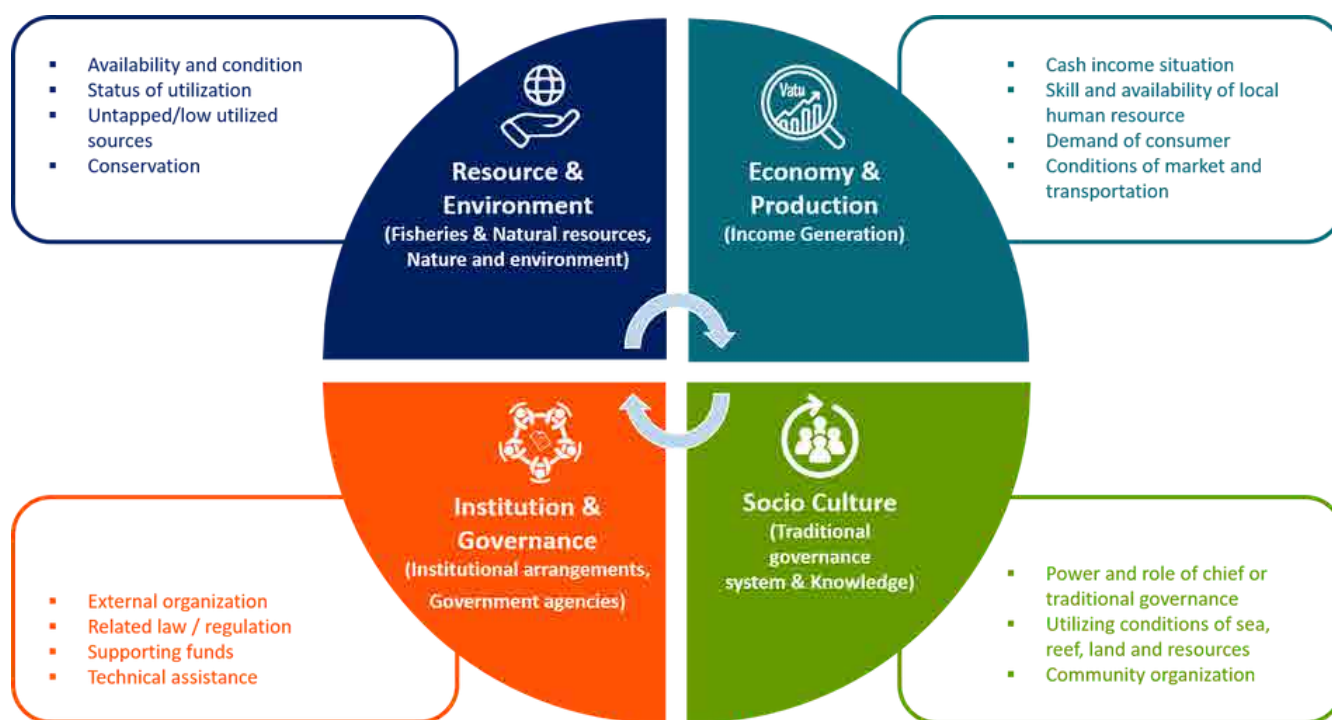
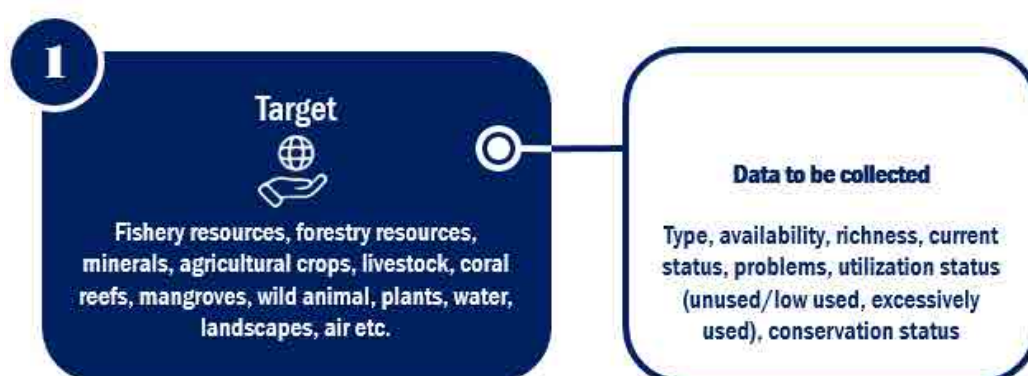


Figure 4: Four perspectives on Integrated CBCRM

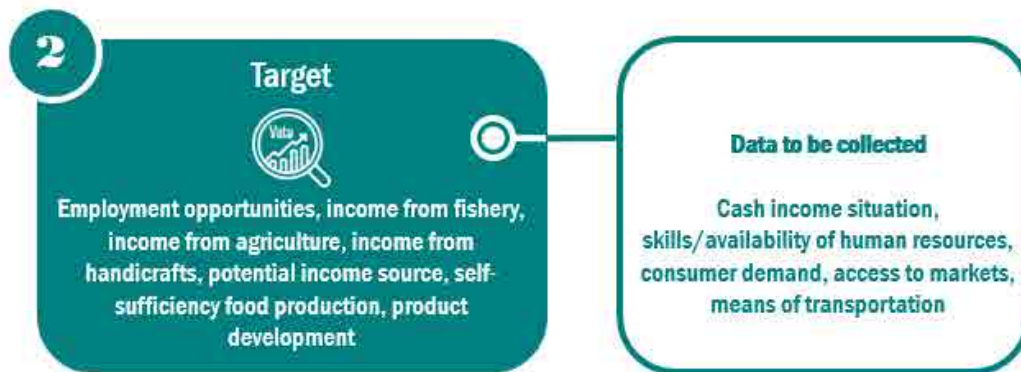
(1) Resource & Environment perspective

This perspective is on the natural environment such as various natural resources including marine resources, topography and landscape belonging to the community. This perspective is mainly necessary for understanding the current situation and analyzing the problems of the natural resource condition around target community. The target and data to be collected regarding this perspective are as follows.



(2) Economy & Production perspective

The perspective is on economic and production activities such as income sources of community people and the production of necessary supplies for living. This perspective is mainly necessary for understanding the current situation and analyzing the problems of local livelihood of target community. The target and data to be collected regarding this perspective are as follows.



(3) Socio culture perspective

This perspective is on social and cultural conditions such as the traditional governance system within the community, knowledge, customs and rules. This perspective is mainly necessary for understanding the current situation and analyzing the problems of the traditional mechanisms of management and coordination of target community. The target and data to be collected regarding this perspective are as follows.



(4) Institution & Governance perspective

The perspective is necessary for understanding the current situation and analyzing the problems on the political and administrative organizations and institutions outside the community. In particular, it refers to an external organization and policy instruments as a position to support community activities. The target and data to be collected regarding this perspective are as follows.



Based on the above, an example of data to be collected at the planning stage (baseline survey, planning) and the evaluation stage (monitoring, revision) are shown below. However, as these contents change variously depending on the location and situation, it should be referred to as an example only.

Table 3. An example of items to be confirmed in each stage

	Resource & Environment	Economy & Production	Socio culture	Institution & Governance
1) Preliminary survey	- What kind of fishery resources are utilized? - Is there a resource problem? - What are unused resources?	- What income sources are there? - Average cash income - Potential income sources - Distance to markets - Means of transportation	- Role and authority of traditional leaders - Traditional rules/taboo - Social hierarchy - Sea/land use	- Status of support by government and donors - Support needs
2) Elaborating Integrated CBCRM plan	- Fish species to be managed - Management measure - Resources and availability to use for supporting measure	- Is the means of improving value addition of fishery products appropriate? - Selection of alternative income sources - Profitability	- Is the composition of the Integrated CBCRM committee appropriate? - Do the planned activities not have any restriction? - Do the activities not have benefit to a particular group?	- Role of VFD /items of activities - Relevant organization/ refining available systems - Items of technical support - Input equipment
3) Monitoring	- Effect of management - Difficulties - Management of resources used for supporting measure	- Sales/Income target - Profitability	- Management status of the committee - Fairness of management measure - Beneficiaries of supporting measure - Presence /absence of conflict	- Input results - Expecting effects their gaps and the reasons
4) Revision	- Reflecting to management issues - Solution of issues on using resources for supporting measure	- Target of supporting measure/ scale/ goal etc.	- Items/ content/ targets of management measure - Target of supporting measure	- Input plan

PART 2: Practical Methodology



4. Procedure for Implementing Integrated CBCRM

The flow of procedure for implementing Integrated CBCRM is shown in figure 5. The details of procedure are described as follows.

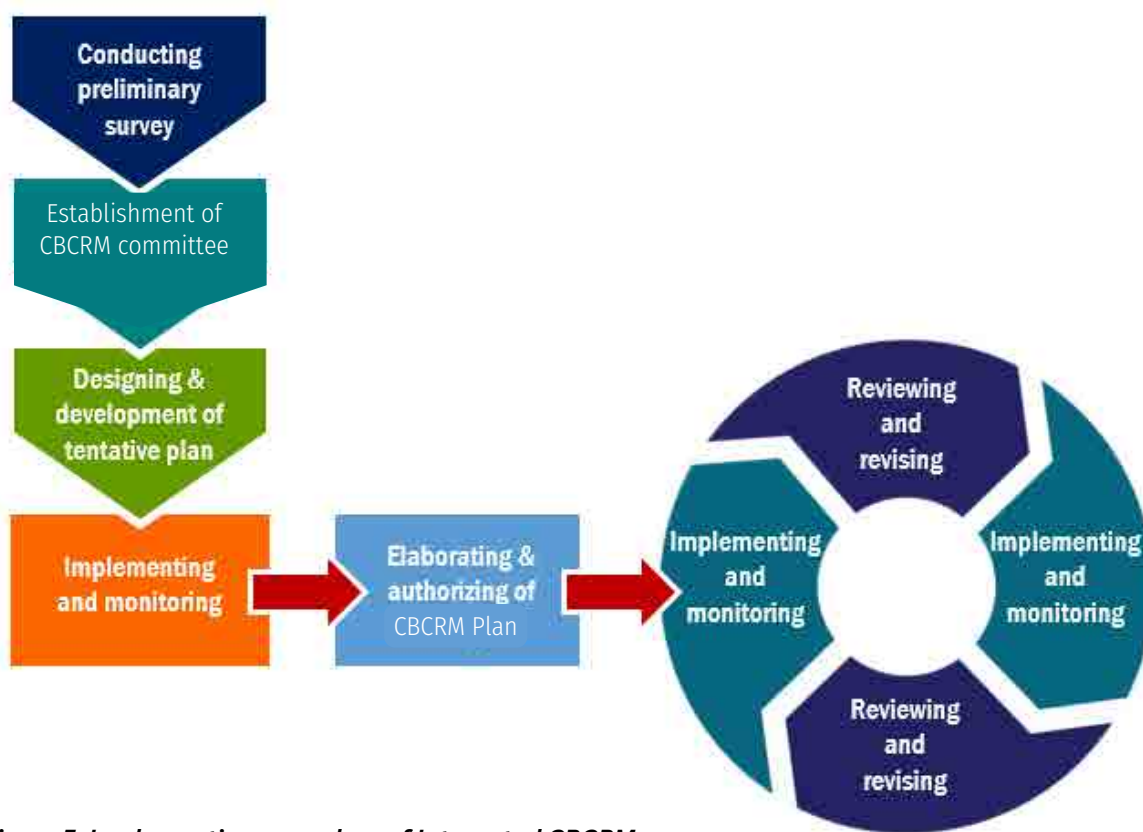


Figure 5: Implementing procedure of Integrated CBCRM

4.1 Conducting Preliminary Survey

(1) Simplified Socio-Economic Survey

This is a simplified survey to collect a minimum information necessary for selecting the target community and for a baseline for implementing Integrated CBCRM. The volume of the contents should be the level that one or two surveyors go around the candidate community that are interested in carrying out Integrated CBCRM and make a survey about one half day to one day. Information to be covered in the survey is as shown in Table 4.

This survey will target basic information for the facilitator to support formulation of the community's Integrated CBCRM plan[6].

[6] For details of it, refer to “3-2-1 Integrated CB-CRM Plan”.

Table 4: Items for preliminary survey

Category	Survey items
1. Community's basic information	Number of households, population, distance from city/town, situation of infrastructure such as road, airport and ports
2. Structure of fishery	Number of fishers, existence of cooperatives and contents of the activities, number of boats (Canoe, canoe with outboard motor, FRP[7] boat with outboard motor), main fishing gear and methods, main resource
3. Situation of resource/environment	Awareness of the resource problems (Decreasing resource volume, downsizing of fish size, difference of distance to fishing ground), awareness on necessity of management
4. Situation of economy/production	Main income source and industry, items and the amount of income and expenditure by households, actual situation of sales of fishery product (place to sale, unit price and the method)
5. Situation of socio culture	System of utilization of traditional land and sea (ownership, owners, exclusive use), equality in resource utilization, existence of resource management organization, authority/function for resource management by traditional leaders
6. Situation of institution/governance	Presence or absence of human resources, policy instruments, activities and problems for community support by local administrative organization

(2) Natural resource survey

As preliminary survey, the natural resource survey would be better as simple and short as possible though the survey should collect basic information of the current status of the target area. Prior to the survey, interviewing community members is indispensable to understand the present status of coastal resources and existing traditional management areas (taboo areas).

The natural research is then implemented by the research specialists such as staff of fishery department based on basic underwater visual census targeting low mobile species such as large snails, giant clams, sea cucumbers, corals and lobster. It is preferable to obtain the cooperation of local residents for the survey. The case example of basic procedure is shown below though there are many manuals for the underwater survey to show the procedure that can be also referred to.

[7] Fiber Reinforced Plastic

- 1) Identify the target sites based on the interviews with community members.
- 2) Observe the bottom condition around target sites by free diving in order to understand general condition of bottom topography and habitat.
- 3) Set five 50 m transects in the site. The interval is depended on the size of target site.
- 4) Record GPS positions of start points and azimuth direction of each transect.
- 5) By free diving, 2 divers move along the transect line with observation of the 2m wide (2 m wide x 2 divers = 4 m wide) area and count and record the number of target species previously determined. In the survey, the divers try to observe the underneath of rock and boulder if possible.
- 6) Number of individuals and approximate size of target species recorded in the target sites are statistically analyzed for estimating the amount of target species.

4.2 Establishment of Integrated CBCRM Committee

4.2.1 Steps to establishment and roles of the committee

Following the “4.1 Conducting Preliminary Survey”, establishment of Integrated CBCRM Committee, the implementing agency of Integrated CBCRM in the community, that leads the participants in each process of planning, implementation, monitoring and review stages. Namely it is a coordination mechanism to make various decisions for Integrated CBCRM. It is also desirable to have an advisory function for the local administration in village level such as Chief councils/House of Chief.

At first, the facilitator encourages the community to hold a representative meeting of the residents, and explain 1) the necessity of resource management, 2) the purpose and activities of Integrated CBCRM, 3) the role and composition of the committee. On that basis, it is necessary to confirm whether there is an existing organization that will take on this role and supports the establishment of a new one. Items to be decided on establishing the committee are 1) Target community and marine area, 2) Authority and duty of the committee, 3) Selection of committee members (traditional leaders, representative of fishers’ organization, women’s group and youth group), 4) Selection of chairperson, 5) Selection of executive member (secretary, treasurer, person in charge of monitoring), and 6) Working group in charge of each measure of Integrated CBCRM activities (After selection of activities).

4.2.2 Structure of Integrated CBCRM Committee

Members of the committee should be decided by discussion of each community, but it is supposed to consist of representatives of each working group, traditional leaders of the community, representatives of fishery organizations, representatives of local organizations such as women’s groups and youth groups, responsible for local administration (Area Secretary). In addition, chairpersons and other executive officers such as secretary, accountant/treasurer and person in charge of monitoring are appointed and a board of directors is organized. As a subordinate to the committee, sub-committees are organized specifically to implement each activity (management measure, supporting measure and Participation promoting measure) and to carry out monitoring.

Further, if there is already an equivalent organization in the community, it can be substituted by having the function of the Integrated CBCRM committee for that organization, so it is not necessary to organize a committee. The example of the structural composition is shown in figure 6.

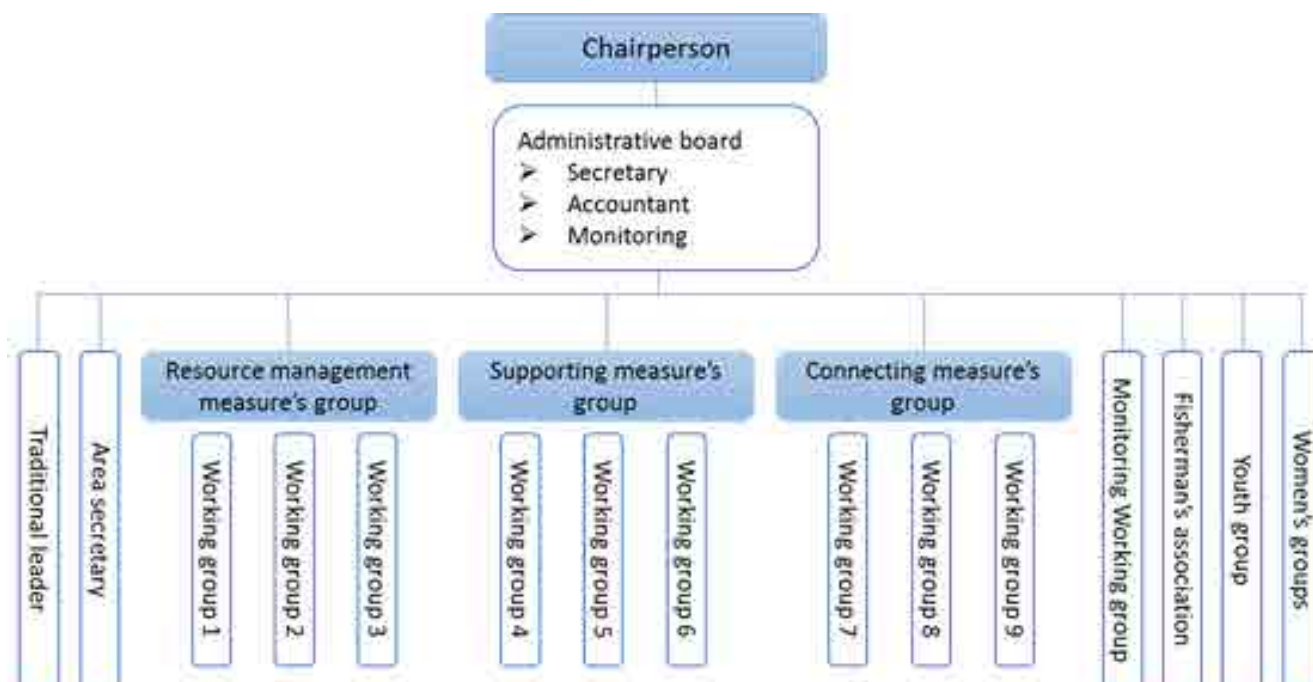


Figure 6: Example of structural composition of Integrated CBCRM committee

Column 3: Integrated CBCRM committee as a coordination mechanism

There are various existing organizations such as Chief Council, youth and women's group, religious affiliation and fishermen's association in the community. In addition, some communities or islands have organized Vanua-Thai[8]. Furthermore, it is assumed that a resident group is formed for each economic activity to implement the supporting measure of Integrated CBCRM.

Integrated CBCRM committee plays a role of encouraging relevant organizations of the community including existing or newly formed residents' organizations to actively participate in Integrated CBCRM activities.

The members can be individuals who belong to existing organization or may be individuals who are newly selected. However, it is desirable to consist of appropriate individuals who have a good understanding of Integrated CBCRM concepts and monitoring methods as coordinators within the community.

[8] It is a resource management group established by NGO, Wan Smol Bag..

4.3 Designing and development of tentative integrated CBCRM Plan

4.3.1 Steps of designing

Following the “4.2 Establishment of Integrated CBCRM Committee”, a tentative Integrated CBCRM plan is formulated with the committee as the main body. For the position and composition of the Integrated CBCRM plan, see refer “3.2.1 Integrated CBCRM Plan”.

1st Step: A facilitator such as fisheries officer with person in charge of local government (e.g. Area secretary in provincial government) or trained NGO/community personalas possible holds a workshop in the community which starts the resource management activities. The facilitator explains i) purpose and basic idea of Integrated CBCRM, ii) significance and method of the monitoring, and iii) items to be included in the activities.

2nd Step: It is planned the tentative Integrated CBCRM using methods such as strength and weakness analysis or brainstorming[9].

3rd Step: Evaluation is made on the tentative Integrated CBCRM plan based on the monitoring sheet[10] (see “4.4 Monitoring methodology of Integrated CBCRM Plan”).

4th Step: Review and modify the tentative plan based on results of the evaluation to complete updated version, desirably within one year.

In addition, the facilitator also supports the committee to document the results decided by the consultation as a tentative Integrated CBCRM plan. The plan is disclosed to community people including committee and widely communicate to community using poster etc.

The items of activity which have to be included in the plan are shown below.

4.3.2 Activities of Integrated CBCRM

In this section, examples of the tools of Integrated CBCRM such as tools for the resource management measure, the supporting measure and the connecting measure as participation promoting measure are summarized.

The resource management measure and the supporting measure are supported mutually, and sustainable management of fisheries resources in the coastal area is realized by balanced implementation of both sides. In addition, the Participation promoting measure has the function of firmly connecting the supporting measure to the resource management measure. As it was, the resource management measure and supporting measure are car's wheels of Integrated CBCRM, and the Participation promoting measure becomes the axle to connect these.

(1) Resource management measure

The resource management measure includes management tools such as minimizing pressure on resources and restoring the productivity of resources. The management tools are as follows 1) Regulatory management tools” to reduce fishing pressure through various catch restrictions, and 2) Resource propagation tools as “Effective fisheries management tools” to increase resources abundance by implementing fishery management.

1) Regulatory management tools

Regulatory management tools refers to the regulations that we can put in place for managing of the fishery resources and control of fishery activities. This includes i) Catch restriction by species, ii) fishing gears or method restriction , iii) fishing ground, and iv) fishing seasons.

[9] For details of it, refer to Manual for Implementation of trainings for the Integrated CB-CRM for Fisheries Development Officers, 5-2 Workshop”

[10] For details of it, refer to Manual for Implementation of trainings for the Integrated CB-CRM for Fisheries Development Officers, 6. Necessary knowledge and techniques as a monitor of monitors”.

Table 5: Regulatory Management Tools

Kind of tools	Activity/Description
Catch restriction by species	It is a regulatory tool concerning the catch amount for example by quantity, numbers or weight and catch size of target species(resources). This is to control catch of target species such as green snail, sea cucumber, etc.
Fishing gear or method restrictions	It is a regulatory tool to prohibit the use or restricting the numbers of specific fishing gears and methods. The example of this tool is mesh size of gill net, use of dynamite, no night diving, no scuba diving, etc..
Control by fishing ground	It is a regulatory tool on restricting fishing in specific marine areas. It is necessary to specify the marine areas to be regulated for example specify taboo area and Marine Protected Area (MPA).
Control by fishing seasons	It is a regulatory tool to restrict fishing activities for specific time/periodsseasons. For example, prohibiting fishing for specific fish species during certain period of time such as spawning season.

The contents of these tools overlap each other (for example, a control by fish species includes factors of fishing method, ground and period, and on the contrary, a control by fishing ground includes factors of fish species, methods and period as well), and it is sometimes difficult to classify clearly. In that case, the resource management measure would be undertaken by multiple tools based on the resource problem occurring in the area.

Column 4: Case of management measure in North Efate

In the case of the Integrated CBCRM plan in North Efate, a basis of the management measure was expansion of taboo area. This is classified as “Control by fishing ground”. However, in their plan, community people did not impose a total fishing ban in the management area, but they also specified banned species and banned fishing method in the management area. From this example, it is obvious that each regulation overlaps each other.

Part of resource management measure in North Efate

Management are and location (Control by fishing ground)	Banned Species (Control by species)	Banned Fishing method (Control by fishing gears and methods)
Vatunmanko S17°37' 828" E168°12' 643" – Loubouluk S17°39' 176" E168°11' 266"	Trochus, Green Snail, Prawn, Land Crab, Sea Crab, Fish (including Aquarium fish), Turtle, Giant Clam, Chiton (Tamuruku), Sea cucumber, Clam shells and Octopus	- Dive fishing during day and night.

In addition, the following tool examples are given in Table 6 as reinforcement tools to ensure compliance with these regulatory tools mentioned above.

Table 6: Reinforcement Tools to Ensure Compliance

Kind of tools	Activity/Description
Spatial Total Allowable Catch (TAC)	The quota management can be considered as the best option to manage commercial invertebrate resources on community level with collaboration between scientists and government agency. This methodology ensures that fishing pressure is set at a sustainable level according to the resource status in respective fishing grounds in order to prevent over exploitation. For example, prior to any harvest for invertebrate's resources, a stock assessments should be conducted within a specific area of interest to determine the harvestable stock biomass. TAC will be derived from the harvestable stock biomass.
Establishment of Fisheries Management Committees	It is a measure to establish community based committees for joint management of shared resources and fishing grounds that are being used by fishers from multiple regions, such as deep-sea bottom fishes or offshore reefs between islands.
Fishing ground surveillance	It is an activity for fishery surveillance aiming at controlling and preventing fishers from violating rules and Integrated CBCRM plan. However, it should be considered that authority is necessary to arrest violators/poachers/offenders. It is desirable to cooperate and coordinate with the police and/or the coast guard.

2) Resource propagation tools

Resource propagation tools refers to activities that support fisheries stock enhancement either through aquaculture approaches or technology or natural stock restoration. Following activities are considered effective in the Pacific Islands Region (Table 7). These activities are expected to directly address the improvement of community members' awareness of the resource management, contrary to the regulatory approach which restricts fishers' activities.

Table 7: Tools for Resource Propagation as Management Measures

Kind of tools	Activities/Description
Translocation of broodstock of shellfishes	It is targeted to relatively low mobile species such as green snail and giant clam. For these species, raising the broodstock density by gathering large individuals in specific area promotes the self seeding, increases the reproductive rate and enhances the increase of resources.
Establishment of artificial nursery ground for larval and juvenile lobster	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. It would be effective to deploy artificial seaweed in combination with small blocks as hiding places for juvenile and young lobster on sandy bottom in MPA for providing new nursery ground for lobster in order to enhance the lobster resource.
Coral reef preservation	The environment of coral reef is conserved through cleaning the ocean bottom inside coral reefs and exterminating acanthasters and promotes the multiplication of resources. The transplantation of coral tips would be effective too.
Cleaning of beach	It is aimed to maintain and to improve the fishing ground environment through cleaning up gathered garbage on the coast and preventing from returning the garbage such as plastics and others to the sea again.
Mangrove area preservation	It promotes multiplication of resources through cleaning and restricting of logging within the mangrove area, maintaining and improving the environment through reforestation. The nursery tree planting would be also effective.

(2) Supporting measure

The main purpose of supporting measure is to maintain the livelihood of members of target community especially local fishers under the impact of resource management measures such as fishery regulations as well as to support resource management measures through the contribution from incomes by supporting measures. The supporting measure can be divided into three approaches such as 1) “Diversification of fishing” with development of low used or unused resources to maintain fish catch and income while reducing catch pressure to the coastal resources, 2) “Value addition of fish products” that can be expected to maintain and improve income without increasing the catch amount and 3) “Alternative income source development” to compensate incomes from fish catch reduced by management. Concrete activities are assumed to be diverse depending on the economic potential of each target regions and communities. Several activities demonstrated in Vanuatu are introduced here.

1) Diversification of fishing

Several fish species are sorted out as low used or unused resources. These species are a) large pelagic fish such as tunas in the offshore, b) small pelagic fish such as horse mackerel and sardines, c) deep-bottom fish such as *Etelis coruscans* (Longtail poulet in Vanuatu) and d) diamond back squid which is distributed in medium depth water.

To develop these resources, there would be several ways such as a) fishing ground development by deploying Fish Aggregating Devices (FADs), b) introduction of fishing gears and methods for bottom fish and diamond back squid fishery, and c) development of sailing/small outboard motorized canoe which can be built and operated at low cost as shown in Table 8.

Table 8: Tools of the Supporting Measure for “Diversification of Fishing”

Kind of tools	Activities/Description
FAD development for large pelagic fishes	Introduction of FAD and appropriate fishing methods (middle depth trolling, dropline etc.)
FAD development for small pelagic fishes	Sustaining the supply of bait for bottom fish by deploying small and shallow water FAD
Deep sea bottom fishing development	Introduction of effective fishing gears and methods, and improvement of quality control on the boat (Utilization of ice or ice pack etc.)

Diamondback squid fishing development	Development of diamondback squid fishing. Resource development through appropriate fishing methods including developing new markets.
Hybrid canoe development (Sailing/outboard engine)	Promotion of development of fishing outside the reef with low cost

2) Value addition of fish products

Value addition of fishery products consists of several activities such as a) reduction of distribution cost through maintaining freshness/ reduction of post-harvest loss/ joint shipment of products., b) development of processed products and value addition of sale of cooked seafoods targeting for tourists (e.g. Fish Cafe) and c) expansion of stable sales of fish at low cost inside the village and region as shown in Table 9.

Table 9: Tools of the Supporting Measure for “Value Addition of Fish Products”

Kind of tools	Activities/Description
Improvement of fish distribution system	It aims to increase the profit rate through maintaining freshness/ reducing post-harvest loss and reducing distribution cost by joint shipment within the community.
Fish processing	It aims to add high value of catch through developing fillets, vacuum packing, frozen and smoked products, mince and other fish products.
Local handicraft development for shell craft	Souvenirs using shellfish as the material in the community are developed. However, the management is necessary to utilize shellfish resources, and it is proposed to utilize only shells that have been used as edible or already dead.

Fish café (Local fish restaurant/take away)	Cooked fishery products are locally sold mainly for tourists and visitors from outside the community. It is not only for value addition but also reducing distribution cost. However, it is a condition where stable demand can be expected.
Community fish market	Freezing facilities are provided in the villages and profit rate is increased through stable supply within the region, long term preservation and reduction of distribution cost by selling locally.

3) Alternative income source development

Alternative income source development is to introduce livelihood improvement activities not directly related to fishery and to provide means not to rely on natural fishery resources as shown in Table 10.

Table 10: Tools of Supporting Measure for “Alternative Income Source Development”

Kind of tools	Activities/Description
Aquaculture development	It is positioned as a cash income means for residents’ self-sufficiency or sales. In addition, in the event of disasters, it will be expected to function as an urgent food source. Tilapia and fresh water prawn in inland aquaculture, tridacna in sea water aquaculture are promising fish species.
Development of eco-tourism	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.
Development of road market	Stores on the road where traffic is heavy rather than in villages are set up and sell local products such as seafoods and shell-crafting.

(3) Connecting measure

The connecting measure plays a role in connecting the resource management measures and supporting major organically. The connecting measure is not directly related to resource management measure but it collaterally supports the resource management through the activities and encourages the community members to participate in resource management activities. In addition, it is possible to set multiple tools of connecting measure simultaneously.

The strength of consciousness to resource management is related to the high degree of dependence on fisheries resources. Therefore, the tools of supporting measure that do not depend on fishery resources would be weakly motivated to participate in resource management measure. Figure 7 is a schematic diagram drawn based on this assumption.

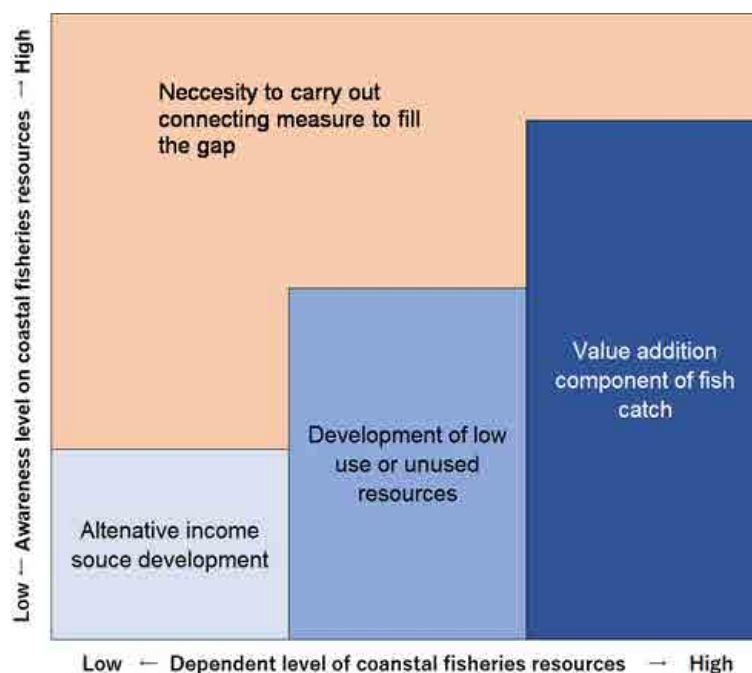


Figure 7: Relationship between supporting measure and connecting measure

Table 11: Tools of Connecting Measure

Kind of tools	Activities/Description
Data collection on catch and fish distribution	For improvement of the current management measure, the data of the actual status of fishing activity such as fish catch and fishing effort catch is collected. It might be utilized for the scientific management. It responds to the supporting measure dependent on fishery resources such as FAD and development of deep-bottom fish resources. In addition, since this data can be used for estimating catch amount, it is useful for financial institutions to confirm the repayment capacity of the local borrower because it records daily catches or income for him or her. Therefore, it is also a tool that connects resource management measure and supporting measure in a bi-directional way as it can be one of the measure that promotes fisheries development. In fact, statistical data raises awareness of stakeholders on management measure and supporting measure at the same time.
Activities on awareness raising and education	Community people's understanding and cooperation are very important for promoting resource management. This activity aims to enlighten community members including fishers in order to strengthen regional and nationwide resource management systems. in target areas, This activity also scopes to promote educational activities for children for future generation.

Sports events	Sports event is an important tool for promoting participation of community members including fishers. Sports events attract younger generations who are not usually interested in community activities. The participants are usually not biased toward political or economic interests. In conjunction with the event, it can be utilized as opportunities for various kinds of awareness raising and public relation activities, soliciting to management activities, forming groups, scouting next generation leaders.
Research and study	By participatory approach, basic information for resource management is obtained through underwater visual census and/or hearing survey on the past trend of resources from community members. In case of underwater visual census, it corresponds to the supporting measure to utilize reef resources for tourism. It can be a powerful encouraging local participation tool that raises stakeholder's awareness on the resource management measure. However, these activities must be carried out in the correct manner under the guidance of specialists such as the Fisheries Department.
Eco-tag (Eco label)	It aims to develop tags (labels) as certification of commercial products to prove that they are fish or shells caught under appropriate resource management. In addition to making standards for accreditation, it is desirable to obtain approval from government agencies. It is corresponds to the supporting measure and management measure due to subject to utilize the resources such as shell crafting.
Fund raising for resource management activities	Residents contribute a part of the profit obtained from the supporting measure of the resource management activities to support the resource management. This can relate to every supporting measure, and it has a high affinity for the activities that do not rely on natural fishery resources, among others.
Providing labor force to resource management activities	Even though a part of the residents cannot lead the management activities with their ownerships, they participate in the resource management activities such as coastal cleaning and surveillance and control by providing their labor force.

4.4 Monitoring methodology of Integrated CBCRM Plan

Monitoring is carried out to assess and improve the implementation status of Integrated CBCRM. “Integrated CBCRM monitoring sheet” is utilized to monitor consistently from the planning of the Integrated CBCRM plan, implementation of activities to reviewing of the plan. The figure below shows the structure of Integrated CBCRM monitoring and the detail is described below.



Figure 8: Structure of Integrated CBCRM monitoring

4.4.1 Function of the monitoring sheet

There are two functions of the monitoring sheet for Integrated CBCRM as follows.

(1) Checklist for planning Integrated CBCRM

The first function is a checklist to confirm items to be considered during planning of activities when a community wants to start resource management activities.

(2) Monitoring for progress and achievement status

The second function is a checklist to monitor the status of the progress and the achievement after the activities have started.

4.4.2 Fundamental idea of the monitoring sheet

Monitoring for Integrated CBCRM has the following features and effects.

- 1) Self-evaluation: Monitoring is basically done by the community members who implement the resource management activities. Through the self-evaluation, it is expected that the community members can review the contents of activities efficiently and can understand the strengths and weaknesses of the activities. In addition, it is also expected that ownership of activities will be improved without considering “we are evaluated by outsiders”.
- 2) Easy to compare with other communities: Comparison with activities of other communities becomes easier by using the common format. The monitoring sheet can be a mutual learning tool for multiple communities to improve their activities while referring to the activities of each other.
- 3) Creation of network: It becomes a tool to create the network among the activity sites as the same reason above. In addition to the mutual learning, the network complements their strengths and weaknesses, and has many effects such as building a cooperative system for common issues.
- 4) Adaptive management: Adaptive management becomes possible from the effects mentioned above 1) to 3). In other words, it is a tool for the community to review the activity plan developmentally through self-evaluation, lessons learnt from their failures and expanding activities that have succeeded.

- 5) Emphasis on continuity: Since points rating method are employed for the monitoring sheets, the score will increase gradually if their activities progress. On the contrary, if there is a problem in their activities, the score will be lowered. Therefore, it encourages them to continue their efforts to increase the score.
- 6) Effective improvement of administrative support: Since administrators can easily grasp the success points and problems of each activity, it is easier to support for problem solving.

For details of monitoring method and monitoring sheet, refer to “Manual for Implementation of trainings for Integrated CBCRM for Fisheries Development Officers, 6. Necessary knowledge and techniques as a monitor of monitors”.

4.5 Implementing and monitoring of the tentative Integrated CBCRM Plan

While the resource management measure, supporting measure and the encouraging local participation measure included in the tentative Integrated CBCRM plan are in implementation stage, the effectiveness is verified and the difficulties are identified. The verification period is approximately one year. The implementation method varies according to the measure, but it is carried out under the ownership of the committee/sub-committee according to the concept. However, since the community is often short in technical and financial resources, the facilitator needs to actively lead the activities of the committee/sub-committee by utilizing the external support organization and policy instruments. During the verification period, monitoring sheets are utilized to confirm the implementation system of Integrated CBCRM, the progress and results of each activity. Especially at the end of the verification period, it is necessary to revise the plan based on the result, and therefore, a comprehensive evaluation should be carried out. For monitoring methods and the sheets, see 4-4 Monitoring methodology of Integrated CBCRM plan.

4.6 Reviewing and Revision of Integrated CBCRM Plan with adaptive management

Revision of tentative Integrated CBCRM plan is carried out based on monitoring results. To review the plan, from the evaluation and consultation of the monitoring results to the announcement to stakeholders, the procedure is shown in Figure 9. The contents of review include the way of coordination mechanism including committee/sub-committee, methods, targets, indicators for evaluation of each activity, etc. Although this activity is conducted through initiative of the Integrated CBCRM committee, it is necessary for the facilitator to provide close support. The procedure is shown in Figure 9.

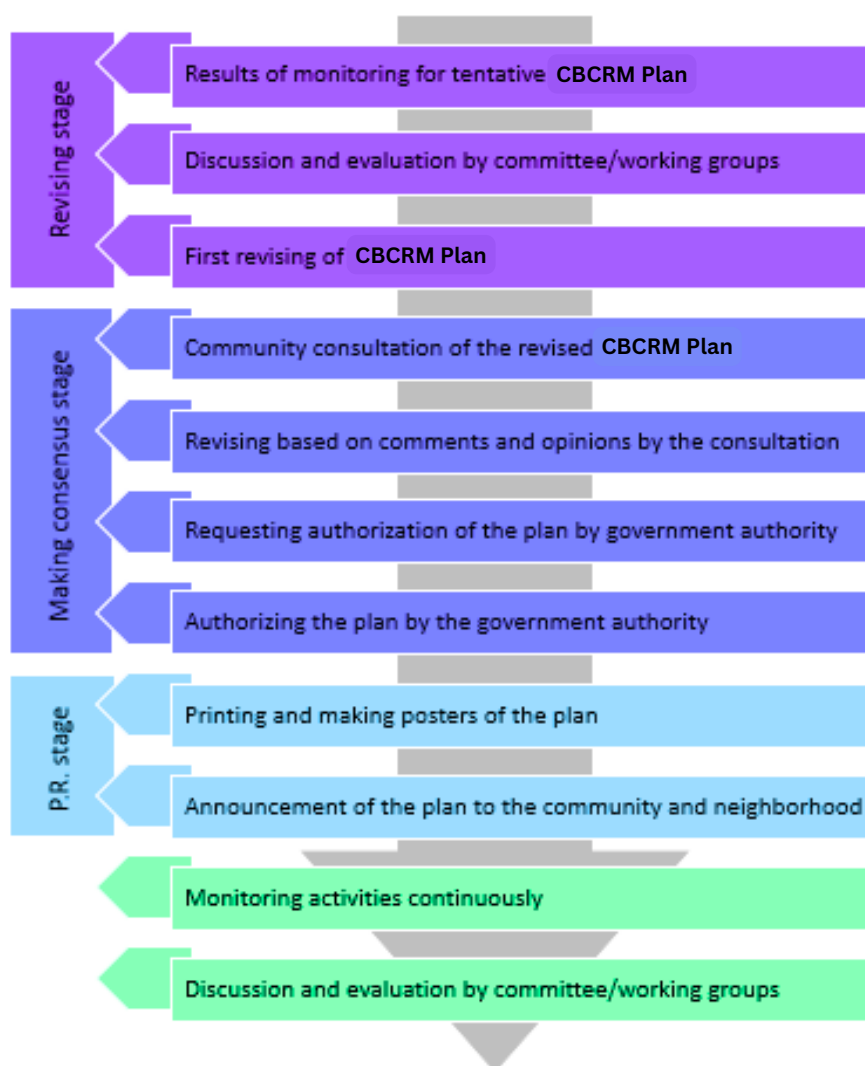


Figure 9: Reviewing procedure of Integrated CBCRM Plan

The detail of the procedure is described as below.

4.6.1 Revising stage

The monitoring results of the activities of the tentative Integrated CBCRM plan will be discussed in detail in the Integrated CBCRM committee and the tentative plan will be evaluated. The points to be evaluated are (1) the way of coordination mechanism including the committee/subcommittee, (2) the outcome of each activity of the management measure, (3) the result of each activity of the supporting measure, (4) the result of each activity of the encouraging local participation measure and (5) additional activities of each measure, etc. With the evaluation result, draft of revised Integrated CBCRM plan is formulated. The committee will carry out the revision, but the facilitator needs to provide close support. Moreover, the monitoring of Integrated CBCRM also leads to the understanding of the present status of the Coastal Strategy and National Development Plan.

4.6.2 Making consensus stage

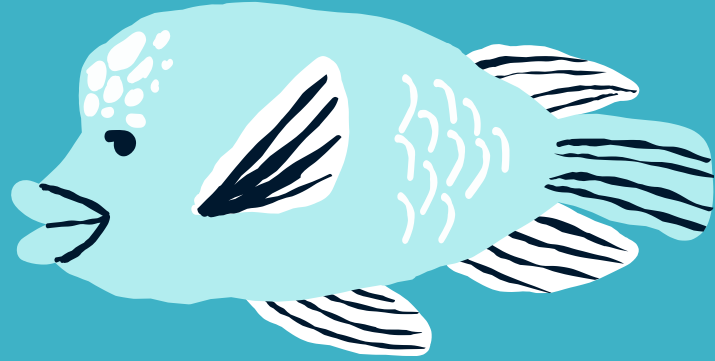
With the draft of revised plan, the community workshop is organized to collect several opinions and build consensus among the community. Revised plan is modified based on the opinion and discussion made at the community workshop. This is called the community-adopted version. Regarding this community-adopted version, it is a time to carry out procedures to obtain official approval by the fisheries agencies or other related authorities. Regarding this procedure, conditions varies from country to country, but in countries where such a system is not defined, it is necessary for the administrative side to prepare the system in advance.

4.6.3 Public relation stage

The Integrated CBCRM plan, which has been officially approved by the administration, is printed for distribution to each stakeholder, and it summarizes the outline in a poster etc. With this, the contents of the Integrated CBCRM plan are informed within community people thoroughly and the poster is distributed to neighboring villages and local administrative organizations and other relevant parties in order to gain understanding from many stakeholders and make efforts to publicize.

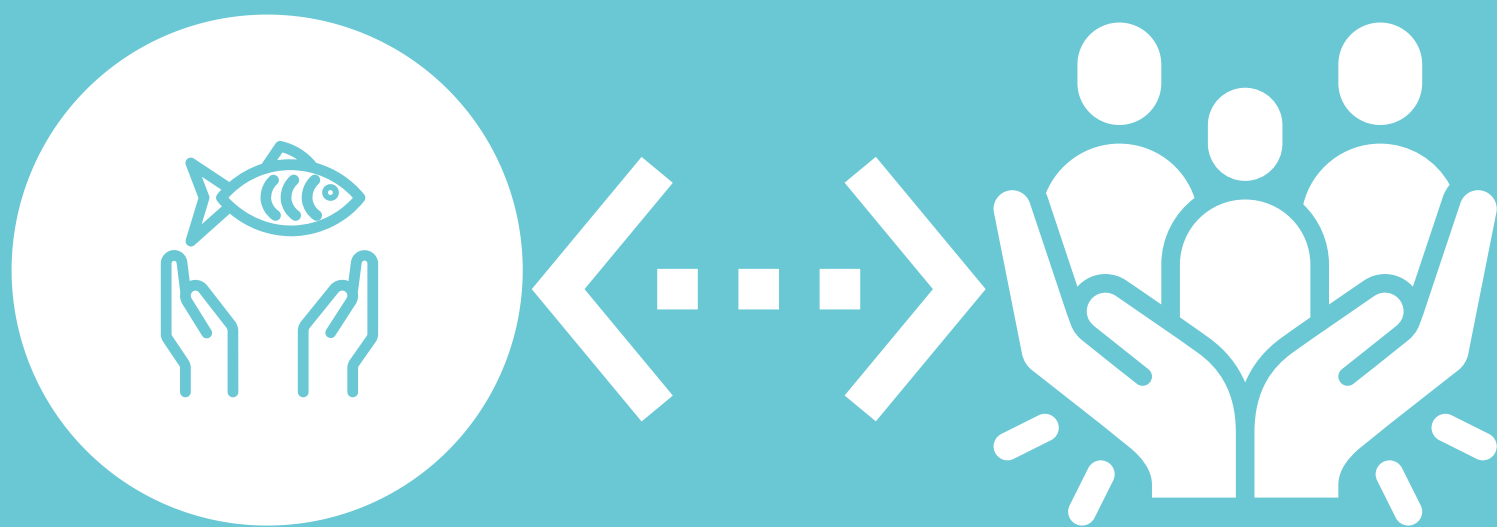
After that, monitoring is continuously carried out to continue the activities of Integrated CBCRM and it is periodically reviewed once a year. In addition, ministries concerned with fisheries collect this monitoring sheet from each community working on Integrated CBCRM, and assess the current situation, extract problems and lessons learned, and reflect them in policies relating to Integrated CBCRM.

End





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.

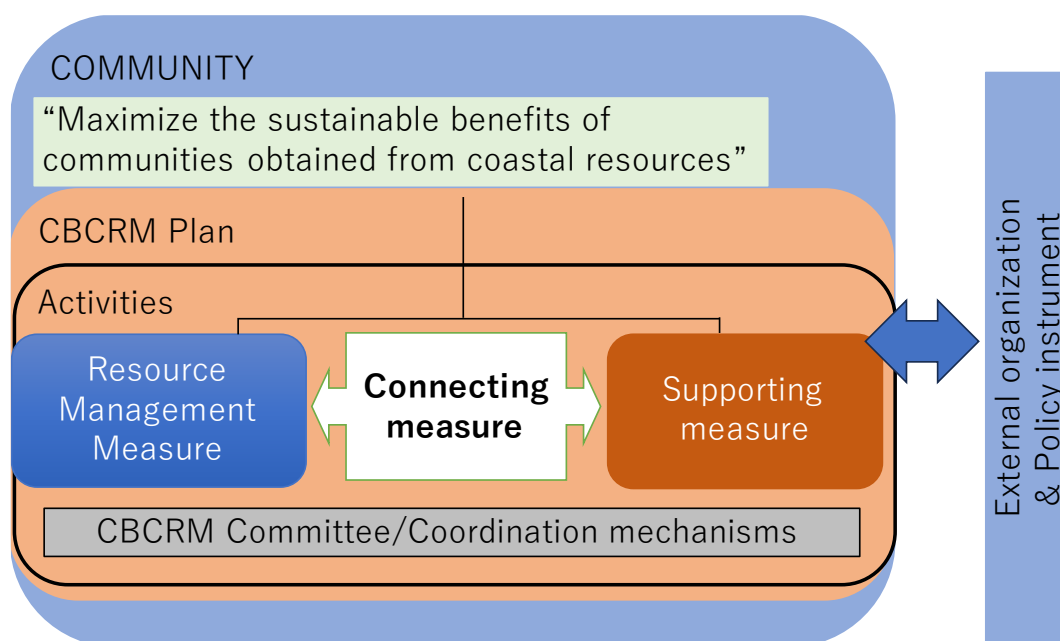


Figure 1: Basic structure of the Integrated CBCRM

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	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. Items to be defined in the regulation of fish species <table border="1"> <tr> <td>Target species</td><td>(e.g. rabbitfish)</td></tr> <tr> <td>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 (e.g. XX beach / YY reef / ZZ taboo area)</td></tr> <tr> <td>Target period (e.g. January to May / through year)</td></tr> <tr> <td>Target fishing gears (e.g. gill net / spear gun / all fishing gears)</td></tr> </table>  Aneityum, Lelema  Aneityum, Lelema  Lelema Controlled species in the CBCRM Plan in Aneityum (Tafea Province) and Lelema (North Efate, Shafa Province), Vanuatu	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)
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)								
Items for evaluation of the achievement	- 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	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. Items to be defined on the regulation of fishing gears and methods <table> <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>Scope of regulation</td><td> <table> <tr> <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> </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	<table> <tr> <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 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)
Target fishing gear and method	(e.g. gill net / spear gun)												
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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	- 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	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). Item to be defined on the regulation of fishing ground <table><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> Taboo area (Regulated area) in the CBCRM Plan of Aneityum, Vanuatu	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	- Number of violators/vessels - Status of public awareness of the regulation for fishing ground													

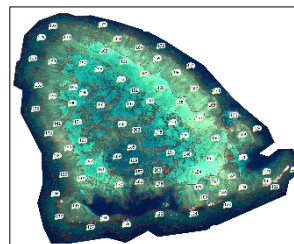
MT-4 Control by fishing seasons

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	- 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	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. 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. 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. 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.
Items for evaluation of the achievement	- 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	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. 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.
Items for evaluation of the achievement	- 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.

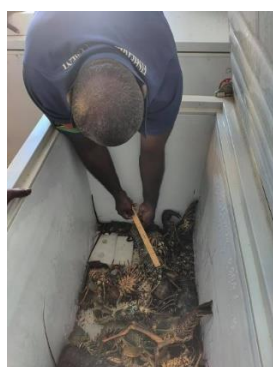
On the three islands of Emae, Makira, and Mataso in Shefa Province of Vanuatu where bottom fishing is thriving, a Deep-Bottom Fish Fishery Management (DBFFM) Liaison Conference was established in cooperation with the provincial government for making the deep-bottom fish fishery sustainable. The purpose 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	The typical methods of surveillance are as follows, 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	- 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	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.
Purpose	It aims to promote the increment of standing stock of the target species in the area.
Implementation methods	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. Giant clam spawning school in Mangaliliu, Vanuatu

Item for evaluation of the achievement	- 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
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MT-9 Establishment of artificial nursery for larval and juvenile lobster

Brief overview of this tool	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.  Juvenile Lobsters collected in verification
Purpose	It aims to provide new nursery ground for lobster and other invertebrates in order to enhance the resources.
Implementation methods	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. 
Items for evaluation of the achievement	- 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	The most efficient and easiest method to exterminate COTs is an injection of acetic acid into COTs in situ. 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. Acetic acid is easy to dissolve in water and diffuses quickly, so it has little impact on the environment
Items for evaluation of the achievement	- 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 disposes 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	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 are 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	- 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	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	- 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

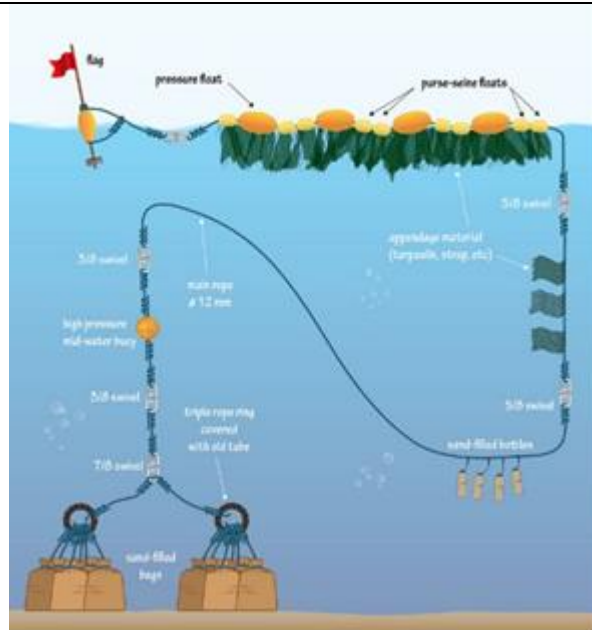
	Name of Tools	Serial No.
4-1 Diversification of fishing		
1	FAD development for large pelagic fishes	ST-1
2	FAD development for small pelagic fishes	ST-2
3	Deep sea bottom fishing development	ST-3
4	Diamondback squid fishing development	ST-4
5	Hybrid canoe development (Sailing/outboard engine)	ST-5
4-2 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
5	Community fish market	ST-10
6	Quality control and hygiene management	ST-11
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

Brief overview of this tool	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. This tool leads the development of large pelagic fishery, and fisher's benefits (income/self-consumption).
Purpose	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.
Implementation methods	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.

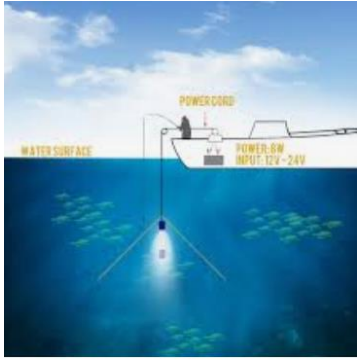
Relationship with resource management	<Direct relevance level with resource management: High> Fishing efforts and pressures by fishers is dispersed from shallow coastal areas to offshore through development of large pelagic fisheries. In addition, it can be expected to raise awareness about resource management through participation of fishers on deployment of FAD and record of catch data etc.
Items for evaluation of the achievement	- 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	<Social and economic conditions> - 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. <Natural and environmental condition> - 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. <Technical conditions> - 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.

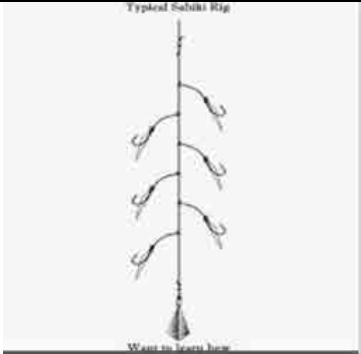


FAD developed by the Project for Promotion of Grace of the Sea in the Coastal Village/ JICA

ST-2 FAD development for small pelagic fishes

Brief overview of this tool	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. 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. 
Purpose	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.
Implementation methods	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.
Relationship with resource management	< Direct relevance level with the resource management: High> 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.

	In addition, the data recording for small pelagic fish will also contribute to understand the present status of the fish stock.
Items for evaluation of the achievement	- 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.
Conditions to implement	< Social and economic conditions > - The consensus in the community regarding the deployment and use of FAD. <Natural and environmental condition> - 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.) <Technical conditions> - It is available an instructor for production and deployment. - It is possible to procure fish aggregating lights (underwater light or kerosene lamp)  Construction of FAD  Underwater fish aggregating light

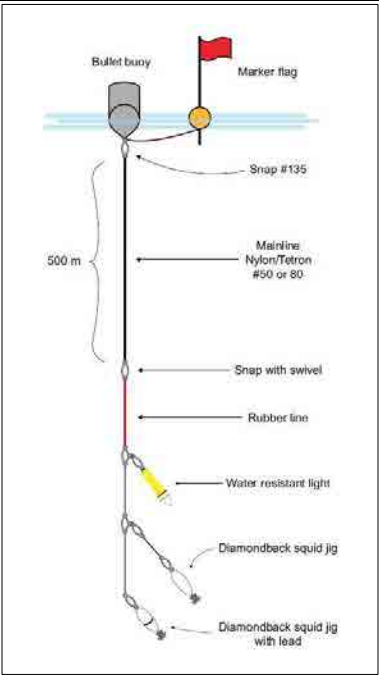
	 Typical Sabiki Rig Went to Japan here Design of Sabiki	 Hooks for Sabiki
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ST-3 Deep sea bottom fishing development

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	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	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	< Direct relevance level with the resource management: High > 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 to this activity, it deepens to understand the present status of the standing stocks and to raise the awareness of resource management.
Items for evaluation of the achievement	- 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	< Social and economic condition > - Existence of fishing boats with outboard engine in target community - Existence of ice making and supply facilities

	- Existence of market - No conflict with neighboring communities regarding of fishing ground <Natural and environment condition> - 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 <Technical condition> - 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

Brief overview of this tool	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.
Purpose	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.
Implementation methods	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. 
Relationship with resource management	< Direct relation level with the resource management: High> 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.
Items for evaluation of the achievement	- 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

Conditions to implement	< Social and economic condition > - 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 <Natural and environment condition> - Existence of fishing ground with appropriate water depth (more than hundreds meter depth) near the target community <Technical condition> - 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	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	< Direct relation level with the resource management: High> Contributing to reduction of the fishing pressure around reef resources
Items for evaluation of the achievement	- 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	< Social and economic condition > - Interest level for sailing technique- Attainability and condition of financing <Natural and environment condition> - Existence of good fishing ground in the sailing accessible range <Technical condition> - Existence of technical instructor of sailing - Possibility of obtaining four horsepower outboard engine

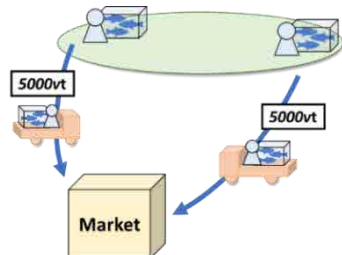
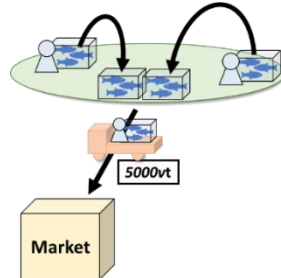
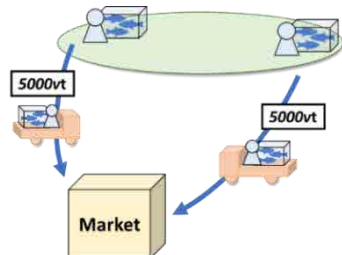
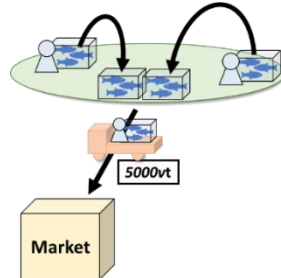
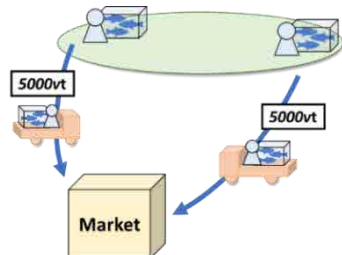
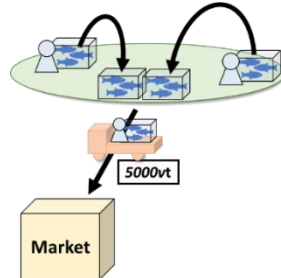


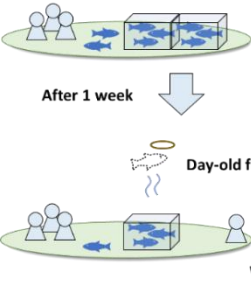
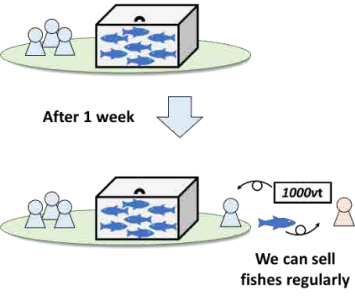
Hybrid canoe in Vanuatu

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	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	< Direct relevance level with resource management: low – medium > The relevance between the improvement of fish distribution and the resource management varies with the nature of measures. - 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).

	- 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)									
Items set for the purpose to be achieved	- 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									
Conditions to implement	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. <table><tr><td></td><td>Current situation/ inhibiting factor</td><td>After improvement</td></tr><tr><td>Individual shipment</td><td> Each fisher ships the fish to market individually. The waste of distribution cost is occurred. </td><td> Joint shipment enables the reduction of the transportation </td></tr><tr><td>Occurrence of Post-harvest loss of fishery resources</td><td> Customer and/or demands of fish are insufficient and it causes the post-harvest loss of unsold fish. </td><td> Fish preservation is possible through installation of freezers realize planned shipment of fish. </td></tr></table>		Current situation/ inhibiting factor	After improvement	Individual shipment	Each fisher ships the fish to market individually. The waste of distribution cost is occurred. 	Joint shipment enables the reduction of the transportation 	Occurrence of Post-harvest loss of fishery resources	Customer and/or demands of fish are insufficient and it causes the post-harvest loss of unsold fish.	Fish preservation is possible through installation of freezers realize planned shipment of fish.
	Current situation/ inhibiting factor	After improvement								
Individual shipment	Each fisher ships the fish to market individually. The waste of distribution cost is occurred. 	Joint shipment enables the reduction of the transportation 								
Occurrence of Post-harvest loss of fishery resources	Customer and/or demands of fish are insufficient and it causes the post-harvest loss of unsold fish.	Fish preservation is possible through installation of freezers realize planned shipment of fish.								

		In our village, there is no Freezer  After 1 week Day-old fishes We could not sell fishes...	In our village, we have a Freezer  After 1 week 1000vt We can sell fishes regularly	
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ST-7 Fish processing

Brief overview of this tool	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. 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.
Purpose	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.
Implementation methods	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.
Relationship with resource management	<Direct relevance level with resource management: Medium> 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. 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. 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.

Items for evaluation of the achievement	- Proper handling and processing techniques are introduced - Processed fish makes higher profits than fresh fish
Conditions to implement	< Social and economic condition > - Proper facilities and equipment for handling and processing are available. - There are demands for processed fish products < Natural and environmental condition > - Proper fish for processing is caught around project sites. < Technical condition > - Training for hygiene control, handling, processing and marketing are provided. Fish processing training at Santo Island, Vanuatu

ST-8 Local handicraft development for shell craft

Brief overview of this tool	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. 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.
Purpose	It aims to manage shellfish resources such as Trochus and to generate cash income of community women at the same time.
Implementation methods	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.
Relationship with resource management	<Direct relevance level with resource management: Medium> 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. 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.
Items for evaluation of the achievement	- 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)
Conditions to implement	<Social and economic condition> - 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)

Brief overview of this tool	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. 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.
Purpose	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.
Implementation methods	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.
Relationship with resource management	<Direct relevance level with resource management: Medium> 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.

Items for evaluation of the achievement	- The number of opening days, the number of participants - Sales revenue, profit - Sales volume by species: To monitor not over fishing specific species
Conditions to implement	< Social and economic condition > - Prospect to increase the number of consumers such as tourists from outside - Finance for investment to start up < Natural and environmental condition > - Enough fishery resources in the area except threatened species < Technical condition > - Training on menu development, cooking and hygiene Fish café in Aneityum island in Vanuatu

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	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	<Direct relevance level with resource management: Medium> 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. 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.

Items for evaluation of the achievement	- 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.
Conditions to implement	< Social and economic condition > - 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. < Natural and environmental condition > - Enough fish resources are available for marketing in the communities except fish whose population seems to have decreased. < Technical condition > - Business management training which include running market and accounting system would be provided.  Community fish market in case of Vanuatu

ST-11 Quality control and hygiene management

Brief overview of this tool	(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. (Quality control) 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. 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.
Purpose	This tool aims to keep the freshness and add value of fisheries product.
Implementation methods	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: -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.
Relationship with resource management	<Direct relevance level with resource management: Medium> 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 losses. Therefore, it is expected that fishers do not rely on overfishing and it reduces fishing effort.
Items for evaluation of the achievement	-Use of Fish Quality & Spoilage Training (training materials) -Use of Solar freezer cleaning (1 sheet of paper with lamination)
Conditions to implement	< Social and economic condition >

	- Proper facilities and equipment for handling are available. < Natural and environmental condition > Quality of raw fish is fresh and not degraded when it is landed. < Technical condition > - Training for hygiene management, handling is provided.
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4-3 Alternative income source development

ST-12 Development of inland tilapia culture

Brief overview of this tool	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. 
Purpose	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.
Implementation methods	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).  HDPE sheet (liner) 

	9. Prepare compound feed if available (tilapia feed from Fiji, chicken feed, meat and bone meal, coconut meal, fish meal). Feed Composition of Tilapia Farming <table><tr><th>E</th><th>Composition</th><th>to make one kg</th><th>%</th><th>% Protein</th><th>Price</th></tr><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></table>  Dried pellets (meat and bone meal, coconut meal, mill-meal and wheat added, protein content 20-25%)	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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5	Cassava, (Corn starch, Cassava powder or Wheat flour)	50g	5	0.5	5																																						
		1000g	100%	≈35%	87VUV/kg.																																						
Relationship with resource management	< Direct relationship with resource management : Low > 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.																																										
Items for evaluation of the achievement	- Stability and sustainability of production (number of harvests /durations) - Sales amount and profit of production - Contributions to resource management activities.																																										
Conditions to implement	< Social and economic conditions > - 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). < Natural and environmental condition > - 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.). < Technical condition > - Supply of fish/tilapia 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 bone 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.



Household backyard 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.

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



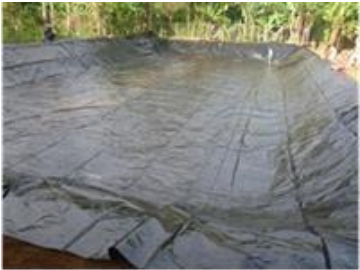
Harvested tilapia.

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



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

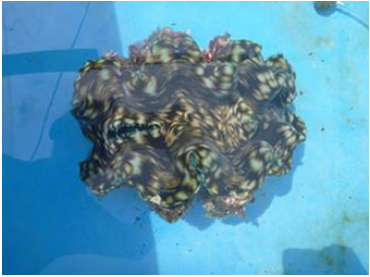
ST-13 Giant freshwater prawn culture

Brief overview of this tool	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. 
Purpose	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.
Implementation methods	Polyculture with tilapia must be require. 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).  HDPE sheet (liner)

	6. Plant island-cabbage around the pond as supplemental feed (this is for tilapia). 7. Rearing local animals for fertilizing pond water. 8. Stock of juveniles (1 to 2 juvenile/1 square meter with at least 3 to 4cm body length). 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). <pre> graph LR A[Cassava using as binder of feed materials] --> B[Measuring the amount of food] B --> C[Mixing of feed materials with water or hot water] C --> D[Mincer using as pelletizer] D --> E[Sun drying] E --> F[Pellet making with locally available feed (meat and bon meal, coconut meal and etc.)] </pre>
Relationship with resource management	< Direct relationship with resource management : Low > 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.
Items for evaluation of the achievement	- Stability and sustainability of production - Sales amount and profit of production - Contributions to resource management activities.
Conditions to implement	< Social and economic conditions > - 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.

	- It is necessary to secure the market and the transportation costs are not expensive. < Natural and environmental condition > - 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.). < Technical condition > - 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

Brief overview of this tool	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. 
Purpose	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.
Implementation methods	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. 

	10. When Juveniles settled to bottom, those juveniles will be picked them up and settle on the concrete blocks. 11. Continuously raise to 1 to 2 cm length in tanks 12. Transplant the grown juveniles to the Taboo area for producing young clams   Juvenile(≒ 10mm) of <i>Tridacna maxima</i>
Relationship with resource management	< Direct relationship with resource management : High > 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.
Items for evaluation of the achievement	- Stability and sustainability of production - Sales amount and profit of production - Contributions to resource management activities
Conditions to implement	< Social and economic conditions > - 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. < Natural and environmental condition > - 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

Brief overview of this tool	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. 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.
Purpose	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.
Implementation methods	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

	4. Prepare minimum infrastructure such as toilet, shower and dressing room. Bungalow will be also attractive. 5. Consider the fish cafes and road markets if it is possible 6. Develop public information tools such as brochure, web-site. 7. Having regular meetings by the members to improve management
Relationship with resource management	< Direct relationship with the resource management: High > 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.
Items for evaluation of the achievement	- Stability and sustainability of operation - Sales amount and profit of activities - Contributions to resource management activities
Conditions to implement	< Social and economic condition > - Securing rich fauna sea and land facing the sea - Making the public awareness tools - Access of the tourist being relatively easy < Natural and environment condition > - 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 <Technical requirements> - 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	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	<Direct relevance level with resource management: Low> 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.
Items for evaluation of the achievement	- 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	<Social and economic condition> - 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

Brief overview of this tool	. It will correspond to supporting measure depending on fisheries resources such as FADs or deep-bottom fish development.
Purpose	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
Implementation methods	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. 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. Example of a sheet for record of fish catch
Items for evaluation of the achievement	- 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

Brief overview of this tool	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.
Purpose	This activity aims to raise awareness for children to be participated the Integrated CBCRM activity through environmental educational opportunity.
Implementation methods	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: • 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. Hands on activities: • Conducting lecture of the history and lifecycle of the species • Observe the spawning of green snail, giant clam, 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, How to continue the Integrated CBCRM environmental educational programs:

	• 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 Students observing the spawning of giant clams in the hatchery
Items for evaluation of the achievement	- 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

Brief overview of this tool	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.
Purpose	It aims to encourages youths to actively participate in resource management activities.
Implementation methods	The sports such as football and/or volleyball are popular in the area. The league matches by community team are programmed. At same time, exhibitions of posters, presentation for awareness raising, lecture for resource management activities to the community people. Giving awards are effective means of awareness rising.
Items for evaluation of the achievement	- Number of sports events implemented - Number of participants for the events - Change in people's awareness on way of thinking to resource management Football tournament corroborated with the Integrated CBCRM project in Emae island, Vanuatu

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.

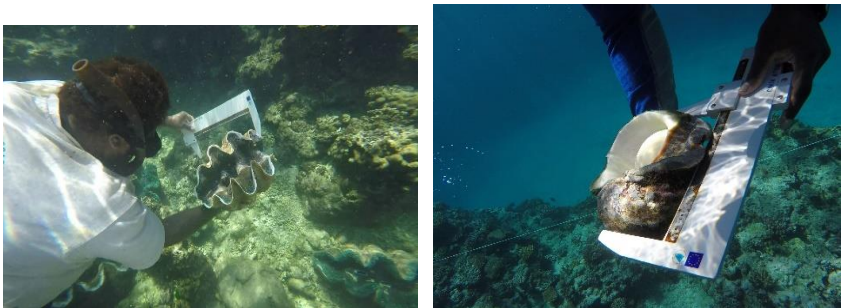
Table Average age of the players and the percentage of people who is involved in the fisheries activities

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	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. 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.
Items for evaluation of the achievement	- 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  Underwater stock assessment for shellfishes in Emae island, Vanuatu

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	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.  Shell crafts with eco-tag in Aneityum island, Vanuatu
Items for evaluation of the achievement	- 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	- 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	- Percentage/number of persons who provide labor force - Change in people’s awareness on way of thinking to resource management

CT-8 Nutritional improvement

Brief overview of this tool	Fish bones, previously discarded, are now used for food, supporting resource management through the effective use of resources. 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.
Purpose	This tool aims to use effectively the fisheries product and improve the nutritional status of target.
Implementation methods	(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. (Household level) To increase calcium intake by making crackers from the bones of reef fish that are thrown away when eating reef fish. (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.  The image block contains three photographs. The first, labeled 'Tuna', shows a pile of dark, charred fish bones on a metal tray, with a blue arrow pointing down to a bowl of brown, powdery bone meal. The second, labeled 'Reef fish', shows a whole green fish being cooked in a pot, with a blue arrow pointing down to a clear plastic container holding several fried, golden-brown fish bones. The third, labeled 'Tilapia', shows several small, fried fish bones on a white surface. Effective use of fish bone
Items set for the purpose to be achieved	• 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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Minutes of the regional seminar for the development of Regional Community Based Coastal Resource Management scale-up strategy

1. Purpose of the Seminar

In Vanuatu, the Integrated Community-Based Coastal Resource Management (CBCRM) approach is developed by implementing the Project for Promotion of Grace of the Sea in the coastal Village funded by Japan International Cooperation Agency. The Vanuatu version of the implementation guideline of Integrated CBCRM for the field officers have been developed by the Project and was officially approved by Vanuatu Fisheries Department (VFD).

In addition to the Integrated CBCRM Guidelines described above, the Tool Manuals and the Training Manuals have also been developed to promote Integrated CBCRM.

In the region, many projects for coastal resource management are being undertaken by individual countries, international organizations such as SPC, and bilateral cooperation projects such as Australia and USAID.

These cooperative activities have produced extremely valuable results through the efforts of the fisheries department in each country. However, when disseminating these results to the entire country, one of the problems of island countries, which are unique in the region, is that it is difficult for the correspondent government organization to provide a appropriate response to the remote islands spread over a vast area of ocean. Under this circumstance, Vanuatu has announced a scaling-up strategy for coastal resource management with the help of the Pathway Project supported by Australia. The SPC has also published a regional version of this and is beginning to work on it.

Needless to say, there is a need to promote dissemination in some way, given the limited increase in the number of fisheries department extension officers in each country.

In this seminar, based on the results of JICA's project in Vanuatu case as a starting point it is aimed to identify common and unique challenges faced by each country, identify specific strategies and activities that can be implemented, and discuss how external partners can provide specific support to address these challenges, as well as the possibility of addressing the issues to be resolved. Namely, The purpose of the seminar is to deepen the discussion and find a certain level of direction.

2. Period

From 31st October to 1st November 2023

3. Venue

Conference room(Le Melanesian room) of Melanesian hotel, Port Vila, Vanuatu

4. Participants

Please refer to attached participants list



Fisheries Department



5. Program

Day 1 (31st October 2023)

Time	Contents	Person in charge
9:00~9:30	Opening remark	Director of VFD
9:30~9:40	Explanation of the purpose of the regional seminar	Dr Akiya Seko (Grace of the Sea Project)
9:40~10:10	A presentation about the development and implementation of their scaling strategy	Representative of Solomon Islands
10:10~10:40	A presentation of the challenge for scaling up of Integrated CBCRM	Representative of each country
10:40~11:00	Refreshment	
11:00~12:00	A presentation of the challenge for scaling up of Integrated CBCRM	Representative of each country
12:00~13:00	A presentation of the field level implementation of GOSIII focusing possible future activities	Mr George Amos (VFD)
13:00~14:00	Lunch	
14:00~17:30	Field visit (Mangaliliu Community Hatchery)	
	Closing of the first day	

Promotion on Grace of the Seas in the Coastal Villages in Vanuatu Phase III



Fisheries Department



Day 2 (1st November 2023)

Time	Contents	Person in charge
9:00~9:10	Opening remark	Regional Director Melanesia of SPC Director General of MSG
9:10~10:30	JICA Strategy on Blue Economy Promotion for Pacific Islands' Countries Project on Pacific Islands Capacity Enhancement for Achieving SDGs14	Mr Nariaki Mikuni(JICA Expert in Palau) Mr Minoru Tamura(JICA Expert in Fiji) Dr Joeli Veitayaki(Local Consultant of SDG14 Project)
10:20~10:40	Refreshment	
10:40~12:00	Presentation of Integrated CBCRM guideline/ Tool Manual/Training	Dr Akiya Seko(GOS) Mr Satoshi Nagashima(GOS) Dr Manabu Echigo(GOS)
12:00~13:00	Lunch	
13:00~14:30	A presentation about the development and implementation of their scaling strategy Discussion on development of Integrated CBCRM scale-up strategy and building a cooperative framework in the countries in the region	Mr Pita Neihapi (Pathway Project) Mr George Amos(VFD) JICA experts
14:30~15:00	Refreshment	
15:00~16:00	Presentation of the result of the discussion	Participants
16:00~16:30	Question and answer	
16:30~16:45	Conclusion	Mr George Amos(VFD)
16:45~17:15	Closing remark	Ms Rika Uemura (Resident representative of JICA Vanuatu office) Director of VFD
	Closing of the regional seminar	



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6.Contents of each program

Day1

1-1.Presentation about the development and implementation of their scaling strategy (Representative of Solomon Islands)

Presentation consist of 1.Introduction, 2.Policy Context, 3.The Mission, vision and National Targets, 4.Programmatic areas, 5.Solomon Islands National Information.

1-2. A presentation of the challenge for scaling up of Integrated CBCRM (Representative of each country)

Each country's presentation consists of 1. Challenges to disseminating (=scaling up) CBCRM activities to the other area, 2. Expectation for external organizations and donors for disseminating your activities.

1-3. A presentation of the field level implementation of GOSIII focusing possible future activities (VFD)

Presentation consists of 1. History of the Project "Grace of the Sea", 2. CBCRM and CBFM activities.

1-4. Field visit (Mangaliliu Community Hatchery)

VFD presented the activities how we collaborate with communities and schools. Then participants observed the spawning of Giant clams in the tank. Finally, Community member presented eco-tourism activity by using the hatchery.

Day2

2-1. Opening remarks (Ms. Mia Rimon, Regional Director Melanesia, SPC)

In a collaborative effort involving fisheries departments from the Pacific region, Ms. Rimon emphasized the importance of prioritizing the needs of the Oceania countries and territories. Acknowledging the diversity of challenges, they urged a focus on practical solutions over excessive meetings. She then called for the coordination and understanding of decentralization issues, and emphasized the necessity for tailored approaches to each country. The commitment to serving member states by providing technical expertise while respecting their autonomy in implementation was also highlighted. The presence of MSG was acknowledged as stressing the collective responsibility in safeguarding coastal communities. The plea for constructive dialogue aimed at effective collaboration concluded the insightful address.

2-2. Opening remarks (Mr. Leonard Louma, Director General, MSG)

Mr. Louma began by acknowledging GOS hosting the regional seminar and welcoming participants from MSG countries to Port Vila. He highlighted MSG's partnership with JICA and the Grace of the Sea Project, aligning with the MSG Fisheries Road Map to address the significance of coastal fisheries for Pacific communities. The role of proper management and sustainable development in the success of the blue economy was emphasized, with a focus on the integrated community-based coastal resource management guidelines. Mr. Louma praised the guidelines of the integrated community-based coastal research management prepared by the Grace of the Sea Project is a document with practical processes. He also stated that it's better to make good use of this guidelines at the broader Pacific regional level. Mr. Louma then mentioned that the potential of aquaculture as a solution to population growth and pressure on natural stocks, emphasizing the need for alternative food sources in marine protected areas. Mr. Louma concluded by expressing hope for continued focus on coastal communities and their development, thanking participants for their contributions.



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2-3. Presentation of JICA Strategy on Blue Economy Promotion for Pacific Islands (Mr Mikuni)

Presentation consists of 1. JICA fisheries cooperation strategy at present, 2. Enhancing self-reliant and sustainability by co-benefits approach, 3. JICA projects based on the co-benefits approach, 4. Promoting dissemination of the outcome by knowledge sharing, 5. Measures increasing effectiveness and efficiency of the cooperation.

2-4. Presentation of Countries Project on Pacific Islands Capacity Enhancement for Achieving SDGs14(Mr Tamura)

Presentation consists of SDG 14 and international commitments, SDG 14 Project in Fiji and South-south cooperation.

2-5. Presentation of Community Based Fisheries Management in the Pacific Islands Region (Dr Joeli)

Presentation consists of 1. State of Fisheries, 2. Social and Economic Importance of Fisheries, 3. Sustainability Challenges in Fisheries, 4. Threats to Fisheries Management, 5. State of Community-based Fisheries Management in the Pacific Islands, 6. Integrated Coastal Management, 7. Some countries Policy (Vanuatu, Kiribati), 8. Sustaining Coastal Fisheries and the SDG 14.

2-6. Presentation of Integrated CBCRM guidelines (Dr Seko)

Presentation consists of 1. Introduction of Implementation guidelines including structure, 2. Four perspective, 3. Implementing procedure of CBCRM.

2-7. Presentation of Integrated CBCRM Tool Manual (Dr Echigo)

Tool manual is developed for Fisheries Development Officers and expected tools for concrete implementation method of CBCRM. The Tool Manual are composed of 1. Resource management measure, 2. Supporting measure and 3. Connecting measure.

2-8. Presentation of Integrated CBCRM Training (Mr Nagashima)

Challenges in south pacific countries are 1. Lack of manpower, 2. Lack of budget, and 3. Limited mean of transport. Based on above background, GOS implemented training for development officers (including on the job training), developed training materials, implemented CBFM training for community leaders and implemented training for community-based authorized officers.

2-9. Presentation about the development and implementation of their scaling strategy (Mr Pita)

Presentation consists of 1. Brief on CBFM at the Region, 2. Brief on CBFM at the Sub Regional, 3. Brief on CBFM in Vanuatu, 4. CBFM Scaling strategy, 5. Challenges of implementing the CBFM Scaling strategy.

2-10. Discussion on development of Integrated CBCRM scale-up strategy and building a cooperative framework in the countries in the region, Presentation of the result of the discussion.

Each country's presentation is as follows,

Solomon Islands

The Solomon Islands presentation outlines strengths and challenges in the national resource management efforts. Notably, the Protected Areas Act and Fisheries Management Act support the conservation activities. Its scaling-up strategy emphasizes partnerships, requiring NGOs to align with the Ministry of Fisheries and Marine Resources. The primary challenge is enforcing legislation against turtle consumption. A key focus is Livelihood and Diversification, with JICA installing solar freezers



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and promoting data collection. However, the lack of connection measures in over 300 communities is a priority challenge. Learning from Vanuatu, the Solomon Islands aims to replicate successful practices like fingerlings production and reviving past successes in Giant clam production. In addressing economic and production concerns, the Solomon Islands emphasized climate-resilient facilities against climate change. With 6,000 coastal committees, its goal is to reach 25% of communities with information and improve resources in 40%. Disseminating Community-Based Resource Management (CBRM) information is a top priority for empowering communities to manage their resources effectively.

Fiji

Fiji's presentation emphasizes the importance of a focal point in the Ministry of Fisheries for effective collaboration with NGOs and streamlined reporting. The commitment to designate 30% of seas for protection, both inshore and offshore, aligns with government policies. In addressing resource and environmental challenges, Fiji aims to enhance deep-sea fishing capabilities, requiring capacity building, proper boat design, and financial literacy for fishers. Climate change impacts, such as soil intrusion, prompt shifts in agriculture to native water crops. In terms of production and economy, the rise in overseas labor and sports-related departures contributes to increased seafood exports, necessitating strengthened regulations, particularly regarding sea urchin size restrictions, for sustainable fisheries management.

Papua New Guinea

The Papua New Guinea presentation identifies key areas for improvement in the resource management efforts. In terms of Institution and Governance, the focus is on building human resource capacity at the provincial level within the National Fisheries Authority to enhance their understanding of resource management concepts. In Socio and Culture, the emphasis is on increasing awareness and ownership through training programs at the national, provincial, and community levels. This aims to ensure a unified understanding of community-based project management and education at the grassroots level. For Production and Economy, the need for an internal structure for communities is highlighted. The focus is on providing training in mariculture and aquaculture, showcasing ongoing projects like seaweed farming, Tilapia, and Trout farming. The goal is to extend these initiatives to other provinces and communities across Papua New Guinea, fostering sustainable economic development.

Samoa

Samoa's presentation underscores the strengths and challenges in resource management. Their Community-Based Resource Management (CBRM) program is robust, addressing various resources, yet climate change poses a significant hurdle. To counter this, they aim to integrate climate change activities into CBRM and expand to new communities. In terms of production and economy, while their multi-species approach is commendable, a weakness lies in limited capacity for mass production and exploring diverse commodities. They seek donor support to promote alternative farming and fishing technologies, introducing rotations to reduce fishing pressure. Socioculturally, traditional chiefs play a vital role in CBRM but require more awareness and training. Institutionally, Samoa boasts ample regulations, but effective implementation is lacking, urging a focus on capacity building and governance improvement at local levels, alongside advocating for reinforcing laws to support successful projects.



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Tonga

Tonga's presentation highlights strengths and challenges in resource management. The implementations of the Community-Based Fisheries Management (CBFM) and Special Management Area (SMA) programs are with a strength, but challenges remain, particularly in marine revitalization activities within SMAs. Due to obstacles to capacity building of stakeholders and material supplies, it has been prompting a call for donor assistance. The SMA areas, designated as aquaculture zones, showcase rapid growth in Mabe pearl farming, attracting interest from youth and women's groups. However, challenges include unexplored potential commodities, the lack of Mabe pearl markets, and the need for marketing strategies. Donors are sought to support research, explore marketing opportunities, and guide Mabe pearl farmers in product exportation, fostering alternative livelihoods for communities.

Vanuatu

Vanuatu team's presentation highlights four priority pillars: Resource and Environment, Production and Economy, Socio and Culture, and Institution and Governance. Under Resource and Environment, the focus is on addressing the lack of fingerlings production for aquaculture and mariculture. They emphasize community engagement for resource ownership and successful translocation of species. In Production and Economy, the challenge is poor fish quality and inconsistent supply in markets, leading to a preference for canned fish over fresh. Proposed solutions include establishing a cold chain system for quality fish supply and encouraging deeper water resource exploration. For Socio and Culture, the lack of coordination at the community level is identified, with the proposed response involving collaboration with national chiefs and the Ministry of Internal Affairs to strengthen resource management. At the Institution and Governance level, the need for increased skilled human resources and capacity is recognized. The proposed response involves investing in fisheries training, creating discussion platforms, and providing incentives for community officers. The overall goal is to address key challenges and promote sustainable development in Vanuatu.

Findings / Discussion point are as follows,

- Food sharing, capacity building, aquaculture development, fishing diversification is a strategy for scale up of CBCRM and CBFM for each country.
- It's better to make a page where we can put our reports from different countries about what is well as a source of information sharing.
- The suggestion of formulating and sharing a toolbox for knowledge exchange and organizing experiences into knowledge was considered valuable. Hosting knowledge-sharing seminars based on this toolbox was proposed as a way to facilitate communication and capacity building.

2-11. Closing remarks (Mr. Sompert Gereva, Acting Director, VFD)

Mr. Sompert expressed gratitude to participants for the productive two-day discussion on the Grace of the Sea Project. Acknowledging the uniqueness of the meeting for Vanuatu, the Director emphasized the ongoing commitment to improving policies and plans for coastal communities. Applauding JICA's continuous support, particularly in the three phases of the project, the Director thanked JICA colleagues for their dedication. Emphasizing the importance of collaboration in addressing challenges like climate change and food security, the Director highlighted the role of technicians in ensuring effective policies and management plans. The significance of data and information was reiterated, and the meeting was officially closed with appreciation for all participants.



Fisheries Department



2-12. Impression by the leader of GOS

Coastal resources in island countries are essential as a daily source of protein for coastal community people. It is also important as a means of livelihood. However, the promotion of the coastal resource management, especially in Small Islands Developing States is not easy due to following reasons:

- 1) it is required to keep adequate number of extension officers who motivate and sustain the coastal resource management on target communities by frequently visiting them.
- 2) it is necessary to provide the mobility of the extension staff due to the geographical characteristics of the islands spread across the ocean.

Promoting a community-by-community approach across thousands of communities would take decades, and the costs would be staggering. However, introducing posters and audiovisual materials alone may not be enough to motivate the community.

The main purpose of this seminar was to provide a place for discussions to obtain the mutual understandings on the specific issues and ways to improve them to some extent. It would be difficult to get concrete answers to completely improve the current situation, but we could exchange a variety of opinions and hints from various countries. Among these opinions, it would be especially agreeable that it is essential to build a communication among the participants in such seminar and to use it as a forum for discussion and capacity building. It was also suggested that the capacity building of local government officials, village leaders, and others to take on the extension role, rather than relying solely on the fisheries department extension officers is the only way to promote the coastal resource management in this seminar.

It would be valuable to share the experiences with other nations having difference experiences in fisheries resources, fishing ground, vessels and gear, markets, and community characteristics. In this regard, a suggestion by a JICA expert from Palau, who was one of the participants in this seminar, is the formulation and sharing of a toolbox that organizes experiences and knowledge-sharing seminars based on this toolbox, is worth considering. We hope to continue the communication with all of the participants in this seminar to organically work in the future.

At the end of his statement, he expressed his gratitude to the attendees for their active participation.



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From
the People of Japan

Inception Workshop
Small-Scale Tuna Fisheries Development Project
Nadi, Fiji
3 to 6 February 2020

Participants Agenda

The goal of the workshop is to ensure all stakeholders:

1. understand the goals of project
2. clarify activities at the national and regional level to tackle in the short term and over the course of the project
3. Develop partnerships and create synergies
4. have an overview of the full draft workplan across countries

Day 1 Purpose: Understand project goals and start to identify country priority activities

Timing	Agenda item
	Day 1
08:30-09:00	Registration
09:00-09:30	Opening prayer Welcome and opening of workshop
09:30-10:00	Group photo/ Morning tea
10:00-10:30	Meeting logistics Presentation on the project and purpose of the workshop Q&A in general about the project.
10:30-12:00	Country presentations covering the 4 areas of the Japan-SSTFDP (7 presentations 10-12 minutes each)
12:00-12:30	Discussion in plenary based on the presentations
12:30-13:30	Lunch break
13:30-14:30	Regional Presentation (40 mins + 20 mins discussion for clarification)
14:30-15:30	Partner presentations, with linkages to the Japan-SSTFDP. OFCF, JICA, USP, SPC (10 mins each, 20 mins questions and discussion at the end)
15:30-16:00	Afternoon tea
16:30-16:30	Group work: discuss regional activities - discussion on gaps, clarifications and priority ranking
16:30-17:00	Groups report back in plenary
	Close for the day.

Day 2 Purpose: To focus in on the FAD component of the workplan

Timing	Agenda item
	Day 2
08:30-08:40	Recap of day 1 Outline for day 2
08:40-09:00	Introduce the FAD session- setting the scene for FADs in the Pacific? What can FADs do? How do they work.
9:00 -9.30	FAD Design and deployment from the new SPC Pacific FAD Manual
9.30 -10.00	Experiences from the Pacific
10:00-10:30	Morning Tea
10.30 -11.30	Experiences from outside the Pacific Plenary discussion

11.30- 12.00	PART 1 Partnerships: identify partnership opportunities for the FAD work based on priority activities
12:00-12:30	Group work on country FAD Programmes to identify specific activities you would do under the project in Year 1.
12:30-13:30	Lunch
13.30 – 13.40	Introduction to tools for FAD monitoring session
13.40 – 14.00	Outcomes from the FAD think tank 2018
14.00 - 14:30	Presentation on TAILS+
14.30 -15.00	Partners experiences of relevant community monitoring
15:00-15:30	Group work on nearshore FAD monitoring and how the project can assist.
15:30-16:00	Afternoon tea
16:00-17:00	Report back from the groups in plenary and discussion
	Close for the day.

Day 3 Purpose: (1) Understand how Information, Communication and Technology can contribute to the project; and (2) identify activities and opportunities for the sea safety component of the project.

Timing	Agenda item
	Day 3
08:30-08:40	Recap of day 2 Outline for day 3
08:40-09:00	Presentation – what is ICT and what can it do for SS tuna fisheries under the four components of the project
09:00-10:00	Group work: To identify opportunities for use of ICT.
10:00-10:30	Morning Tea
10:30-11:00	Present back from Group Work
11:00-11:30	Setting the scene – what is safety at sea and overview of issues
11.30-12.30	A discussion session on safety – practical matters
12:30-13:30	Lunch
13.30-14.00	Safe FAD fishing – main challenges in the Pacific
14:00-14:30	Factors affecting the performance and longevity of engines. How to prevent breakdown of engines at sea. Small-scale oceanic fishing around FADs – what are the main factors that Yamaha considers when designing boats for this type of fishing in the Pacific.
14:30-15:30	Group work on the sea safety component of the workplans
15.30 -16.00	Afternoon tea
16:00-16:30	PART 2: Partnership session (group work)
	End of Day

Day 4 Purpose: Further developing draft workplans for project and identify next steps

Timing	Agenda item
	Day 4
08:30-08:40	Recap of day 3 Outline for day 4
08:40-9:40	Align activities with a timeline with focus on year 1 activities
09:40-10:30	Presentation of draft workplans, partnership summaries, outstanding issues to address.
10:30-11:00	Morning tea
11:00-12:00	Wrap up in Plenary Next steps - At national level - At regional level
12:00-13:00	Lunch
13:00-14:00	Workshop Closing and after action review



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Inception Workshop for GCP/SAP/002/JPN Nadi, Fiji 3-6 February 2020

Information Document

Meeting Venue

The Workshop will be held at the **Nalagi Hotel**, located at the following address:

Lot 20 Queens Road,

Nadi, Fiji

T: +679 6708888

www.nalagi-hotel.com

Workshop Sessions

The workshop sessions will be held on Monday 3, Tuesday 4, Wednesday 5, and Thursday 6 February. Please refer to the workshop agenda for further details on sessions.

Official registration and sign in begins on Monday from 8.30am in the Talei Room of the Nalagi Hotel. Event badges will be available for collection then, please wear your badge at all times during the whole duration of your stay to access the facilities, workshop and meals.

The entire workshop will be conducted in English.

Travel Arrangements

FAO will contact funded participants for travel and hotel bookings.

Visas

All travelers should hold passports, valid for at least **six months** prior to traveling to Fiji.

Nationals of Kiribati, Palau, Marshall Islands, Samoa, Tuvalu and Vanuatu are granted a visitor permit upon arrival to Fiji and do not need to apply for a visa. For other nationals, please ensure that you have an appropriate visa or entry permit to enter Fiji, if needed. It is the traveler's responsibility to arrange for his/her own visa.

Important note: Participants will enter as a VISITOR by showing your return ticket if asked at Immigration for a 3-month entry permit issued on arrival. Please have this document ready to show them for your hotel and local contact details.

Health Information

Despite some improvements on the measles epidemic in the region, workshop participants are requested to ensure that your measles vaccinations are up-to-date to ensure the health and safety of workshop participants and the region.

Accommodation and Meals in Nadi

For FAO-funded participants:

FAO will take care of your hotel accommodation, booking you a single room at the **Nalagi Hotel** for the duration of your stay. The room costs will be settled directly with the hotel by FAO and include a buffet breakfast. Additional costs incurred while staying, e.g. mini bar, telephone and internet costs, etc. will be charged to the individual participants who are advised to settle their personal bills directly with the hotel when checking out.

During check-in, please indicate that you are a part of the FAO booking.

For all participants:

Lunches will be served at the restaurant of the Nalagi Hotel each day of the workshop and well as dinner on 03 February.

Note: Inform us ahead of time if you have any dietary restrictions so that we can make arrangements with the hotel.

You will have complimentary access to Standard WiFi Internet Access in your accommodation as well as in the Talei Room during the workshop hours.

Transportation from and to the airport

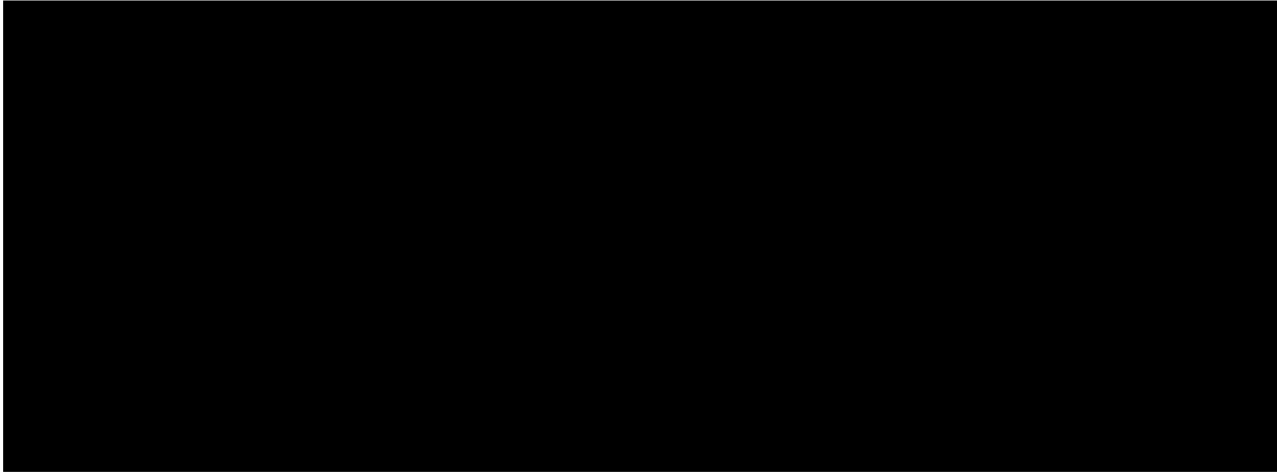
Upon your arrival in Nadi, Fiji, a shuttle service to and from the airport will be provided by the hotel according to your arrival/departure time, which has already been communicated to the hotel. This should also apply to non-funded participants who have also booked their accommodation at the workshop venue (Nalagi Hotel) and communicated their flight details to FAO.

Note: If you cannot locate the Nalagi Hotel shuttle, please contact the hotel Sales Manager of Nalagi Hotel, Ms Elenoa Daurewa through 

Daily Subsistence Allowance (DSA)

For FAO-funded participants, you will receive daily subsistence allowance (DSA) to cover meals (not included in the conference package/programme) and miscellaneous costs.

Contact information



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

Findings from the demonstration of resource management
and supporting tools

Evaluation of effectiveness and adaptability and
recommendations for future use
in the pilot project in Vanuatu

Nov 2023

I.C.Net Ltd.

INTEM Consulting Ltd.

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1. Purpose of this report

The project aimed to standardise the knowledge and experience gained in the process of strengthening the applicability and practicality of the CBCRM approach established in Phase 2 of the Project for Promotion of Grace of the Sea in the Coastal Villages (hereafter referred to as “GOS project”) into a national training programme and disseminate it to other regions within Vanuatu and to the surrounding Melanesian region. In the process, tools for resource management measures, supporting measures and connecting (linkage) measures to make CBCRM work were developed and a collection of tools was prepared as an annex to the Guidelines for the Implementation of Integrated CBCRM. This report was prepared with the aim of assessing the effectiveness and adaptability of the tools and making recommendations for their future use, mainly based on the experience of developing and demonstrating the tools in GOS project Phase 1 to Phase 3

1-1 Tools covered by the analysis

The above tool collection lists a total of 34 tools together with resource management measures, supporting measures and connecting measures, some of which are not demonstrated in this project, as some of the tools listed are also those that are assumed to be of general application. These were therefore excluded from the analysis in this report. The tools included in the analysis are shaded as shown in Table 1.

Table 1: Resource management tools analysed

	Tool name	Serial No.
Regulatory management tools		
1	Control by fish species	MT-1
2	Control by fishing gears and methods	MT-2
3	Control by fishing ground	MT-3
4	Control by fishing period	MT-4
5	Spatial Total Allowable Catch (TAC) setting	MT-5
6	Establishment of Fisheries Coordination Committee	MT-6
7	Fishing ground surveillance	MT-7
Resource propagation tools		
1	Translocation of broodstock of immobile or less-mobile species	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

Table 2: Supporting tools analysed

	Tool name	Serial No.
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
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
5	Community fish market	ST-10
6	Quality control and hygiene management	ST-11
Alternative income source development		
1	Tilapia culture	ST-12
2	Giant freshwater prawn culture	ST-13
3	Clam culture	ST-14
4	Eco-tourism development	ST-15
5	Road market development	ST-16

Table 3: Connecting (Linkage) tools analysed

	Tool name	Serial No.
1	Data collection on catch and fish distribution	CT-1
2	Activities on awareness raising and marine education programme	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 labour force to resource management activities	CT-7
8	Nutrition improvement	CT-8

2. Resource management measures

2-1 Regulatory measures

2-1-1 Control by species (MT-1), fishing gears and methods (MT-2), fishing grounds (MT-3) and fishing period (MT-4)

(1) Background to the development of the tool

In Vanuatu, resource management has traditionally been undertaken through the establishment of taboo areas, no take zone and/or MPA (restricted areas for fishing activities) based on community autonomy. As such, the focus at community and fisheries department officer level has often been only on community-based establishment of taboo areas. In addition to the establishment of taboo areas, management measures other than the establishment of taboo areas, such as control by fish species and fishing gear, were included in the resource management plans of GOS project Phase 2, but were applied only within the taboo areas.

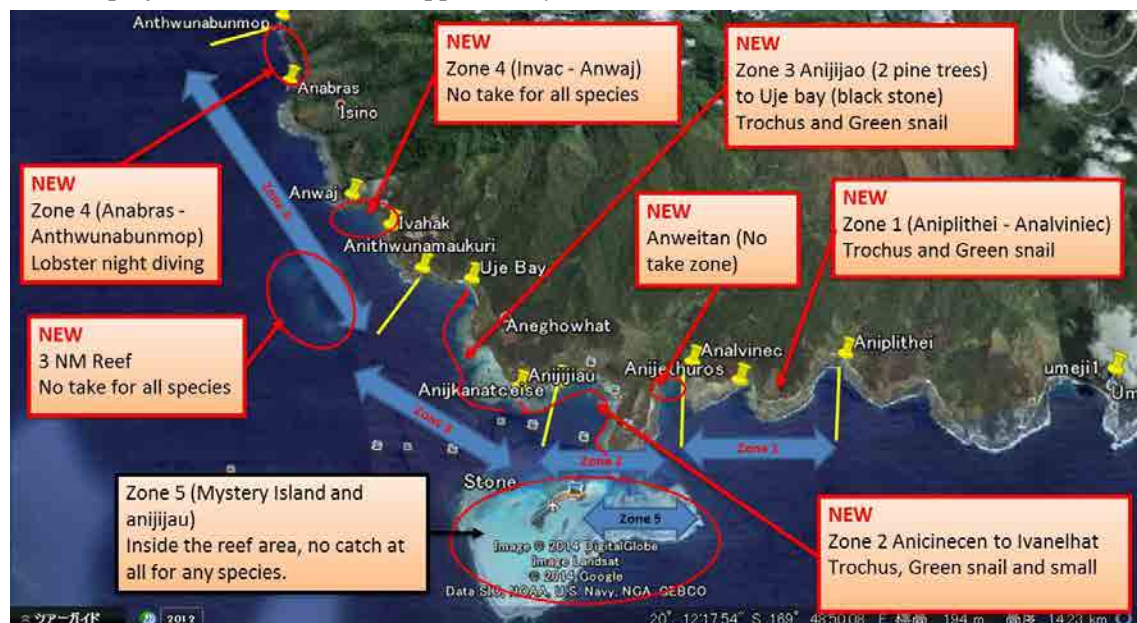


Figure 1 Location map of Taboo area in the pilot site, Aneityum Island, Tafea Province for GOS project Phase 2

Table 4 Resource management measures in each taboo area of Aneyityum Island, Tafea Province, pilot site of GOS project Phase 2

ZONE	BOUNDARY	Location	TABOO AREA (LANDMARK)	MANAGEMENT MEASURE (Gear or species)
ZONE 1	Aniplithei to Analvinec	S 020°14'15,97" E169°48'54.97"	Aniplithei (river mouth) to Anijethuros (Rocks)	Trochus and Green snail
		S 020°14'06,72" E169°47'36.62"		
ZONE 2	Analvinec to Anijijiau	S 020°14'06,72" E169°47'36.62"	Anijanumu (Reggea beach) to Blue water SDA (Tall coconut)	Small hooks and cast net, gill net (4') – Seagrass area
		S 020°14'04,05" E169°46'07.96"		
ZONE 3	Anijijiau (SDA tall coconut) to Anithwuna maukuri	S 020°14'04,05" E169°46'07.96"	Anijijao (2 pine trees) to Uje bay (black stone)	Green snail and trochus
		S 020°12'55,88" E169°45'28.55"		
ZONE 4	Anithwuna maukuri to Anthwunab unmop (Coconut)	S 020°12'55,88" E169°45'28.55"	Ivahak to Anwaj bay	No take for all species Lobster by night diving
		S 020°10'19,00" E169°44'31.04"	Anabras to Anthwunabunmop	Anabras to Anthwunabunmop
ZONE 5	Mystery Island	S 020°14'37,04" E169°45'49.07"	Mystery and stone	No take for all species
Special zone		S 020°12'58,98" E169°44'38.90"	3 mile reef	No take for all species

Source: Aneyityum's CBCRM plan (GOS project Phase 2).

In order to make communities and fisheries departments aware that community-based management of coastal resources involves not only regulation through the establishment of taboo areas as described above, but also several other tools depending on the status of local resources, such as control species, by fishing gears and methods, and by fishing season, were separated and introduced as new tools.

(2) Demonstration results

In GOS project Phase 3, CBCRM plans were developed at each pilot site with the above points in mind. The table below summarises the four control measures identified in the CBCRM plans for the three pilot sites.

Table 5: Regulatory measures identified in the CBCRM plan for the pilot site of GOS project
Phase 3

	South Santo (Wailapa, Tangoa Island, Araki Island, Nakere)	Emae Island	Waisisi
Control by fish species		- Prohibits the collection of trocus, sea cucumbers, green snail, coconut crabs and giant clam	- Lobster size regulations
Control on fishing gear and methods	- Control of mesh size - Control of fishing line size - Regulation of cast nets - Regulation of night diving	- Regulation of gill nets - Regulation of cast nets - Regulation of gill nets for catching Poulet and recommendation to use bottom longlines - Regulation of night diving - Limit lobster catches only by hand-collecting - Regulation of diving with tank - Encouraging fisheries using canoe	- Regulation of hook size - Regulation of bottom longlines
Control by fishing grounds	- Setting up a taboo area	- Setting up taboo areas in villages - Setting up a joint taboo area between several communities in Cooks Reef	- Setting up a taboo area.
Control by fishing season			- Establishing a fishing ban for shellfish

As an example, the CBCRM plan for the Waisisi community on Tanna Island, which has a thriving bottom fishery, including poulet, includes not only control by taboo areas, but also four measures, including hook size regulations throughout the fishing area, prohibited fishing gear regulations such as bottom longlines, lobster size limits and fishing ban period for shellfish. The CBCRM plan was developed with the idea that resource management is not just about taboo areas easily understood by the community, as the Vanuatu community had previously had the background to manage beyond the establishment of taboo areas, such as the community's own fishing ban period for shellfish in Waisisi.

(3) Evaluation of effectiveness and adaptability, and recommendations for future use of the tool

The monitoring results of CBCRM activities show that points have increased in all pilot communities, and given that the CBCRM monitoring sheet is structured so that points increase with the continuation of activities, resource management measures are seen to be generally

continuing. The reason for continued management is that communities have traditionally been predisposed to manage on their own initiative and have tended to comply with the decisions made during the multiple and painstaking community workshops held during the project.

Table 6: Point trends in the evaluation of the four management measure activities for each pilot site using the monitoring sheets developed by the project

		Control by fish species	Control by fishing gears and methods	Control by fishing grounds	Control by fishing season
Waisisi, Tanna Island	2019/10	3	3	3	3
	2023/7	7	6	7	7
Marae, Emae Island	2020/2	7	7	7	-
	2023/6	10	10	10	-
Sangaba, Emae Island	2020/2	5	5	5	-
	2023/6	8	8	8	-
Tongamea, Emae Island	2020/2	6	6	6	-
	2023/6	9	9	9	-
Araki Island	2020/3	-	5	5	-
	2023/8	-	8	8	-
Nakere, Espiritu Santo Island	2020/3	-	7	4	-
	2023/7	-	8	5	-
Tangoa Island	2020/3	-	6	6	-
	2023/7	-	8	8	-
Wailapa, Espiritu Santo Island	2020/3	-	2	2	-
	2023/7	-	5	5	-

In CBCRM projects in Vanuatu, other than GOS project, taboo areas or Marine Protected Area remain the focus of resource management activities. The Vanuatu Fisheries Department (VFD) and fisheries departments of other countries should be persistently educated on the point that resource management measures are not limited to regulation of fishing grounds through training and regional seminars, etc., and that resource management measures are not limited to taboo areas. If the VFD and other national fisheries departments are aware of the fact that resource management measures are not limited to taboo areas, it should be a tool that can be adapted in other regions.

The following are recommendations for the use of this tool.

- Resource management measures are sometimes set too strictly by communities themselves, as they do not know what level of regulation to set at the beginning of the CBCRM planning process. During the implementation of GOS project, several communities were found to regret the strict resource management regulations they set themselves. It is desirable to have a trial period of about one year for the resource management measures in this approach, so that communities have the opportunity to recognise the positive and negative aspects on their

own, and to decide on the final community resource management measures based on the results of this trial period.

- In the Vanuatu case, unlike the taboo areas that communities had set up on their own, in the case of CBCRMs involving the VFD and local authorities, communities wanted to open taboo areas at their discretion to secure food sources in the event of an emergency such as a cyclone or other natural disaster. However, in some cases, communities were unsure whether they should continue to manage the area based on their own decisions, such as the chief's decision. While the awareness to continue to adhere to management measures is commendable, the attitude of simply adhering to regulations may be counterproductive from the perspective of strengthening community resilience, i.e. the ability to make their own decisions when they need to utilise resources in the future, which is the original purpose of resource management. Therefore, when implementing CBCRM, it should be clearly stated that the community can use the resource at its own discretion in the event of an emergency.

2-1-2 Establishment of Fisheries Coordination Committee (MT-6)

(1) Background to the development of the tool

Up to Phase 2 of the project, the management of 'reef in coastal area' resources has been targeted, mainly through the establishment of taboo areas. In contrast, some pilot sites in Phase 3, such as Waisisi in Tanna Island and the Shepherd Islands including Emae Island, have also utilised bottom fish resources outside the reef. The handline bottom fishery was introduced to Vanuatu in the 1980s, but has now started to become established as one of the main fisheries in Vanuatu. According to local fishermen, there are many small seamounts around Vanuatu's islands that provide fishing grounds and in many cases the stock is considered to be in relatively good condition. However, with the growth of consumption demand in urban areas and the spread of outboard motor vessels, catches are likely to increase and fears of resource problems may arise in the future. Therefore, as a precautionary measure, it is desirable to start managing bottom fish resources from the present time, and the Fisheries Department has set guidelines for bottom fish resource management. Fishermen in Waisisi, Tanna Island also use fishing grounds around Aniwa Island, but there is no coordination on resource use with fishermen on Aniwa Island. In addition, Emae Island in Shefa shares fishing grounds with the neighbouring islands of Makira and Mataso, but competition with fishermen from Efate Island is a problem. Therefore, unlike the community-based resource management approach that has been implemented in the past, a new tool was developed to create a framework for fisheries coordination in which several communities jointly manage the fishery with the participation of the Provincial Government.

(2) Demonstration results

The project has worked to improve the distribution of catches and add value as supporting measures for the management of reef fish stocks in each project site. However, the target catch includes a large number of deep-sea bottom fish species, such as poulet etc., which are caught offshore and require corresponding resource management measures. In particular, as Emae Island is relatively dependent on deep-sea bottom fish resources, a pilot project was conducted to develop resource management measures.

<Activities in Emae and other Shepherd Islands>

(a) Fishing ground use issues

The bottom handline fishing grounds around Emae Island are used by fishermen from several settlements on Emae Island, Makila Island, Mataso Island and Efate Island. The geographical proximity of the three islands, Emae, Makila and Mataso, has traditionally led to a high level of human and material exchange, and in modern times they are under the same administrative division, making them a single cultural zone. This has led to a strong sense of 'three island membership fisheries' with the exception of Efate, with regard to bottom fish fisheries.¹ For this reason, it was considered necessary to first establish a resource management framework on the three islands of Emae, Makila and Mataso (Figure 2).



Figure 2: Extent of handline bottom fishing grounds on the three islands of Emae, Makila and Mataso

(b) Consultations by the three islands of Emae, Makira and Mataso

For these reasons, the project gathered representatives of fishermen from the three main fishing communities on Emae Island (Marae, Sangaba and Tongamea) and the islands of Makira and Mataso (about 20 people in total) in Sangaba, Emae Island, in March 2019 to hold a preliminary meeting (Consultation meeting). In this meeting, the representatives pointed out the following problems: (i) the overall resource status is generally good, but some problems have begun to emerge, such as the decreasing size of fish, and (ii) fishing boats from Efate operate more frequently than those from the three islands, which may be increasing fishing pressure. It was

¹ Interviews were conducted in June 2018 and February 2019 for Makira and Mataso islands, respectively, and a simplified interview for the three main fishing settlements on Emae Island (Marae, Sangaba and Tongamea) in February 2019.

agreed that a framework for resource management by the three islands is needed to resolve these problems and establish precautionary measures, and full-fledged discussions are to be held in the future.

After that, activities were temporarily suspended due to the global outbreak of COVID-19, but resumed in October 2023, and discussions were held with VFD and Shefa Provincial government officials on the basic policy and approach for the development of a bottom fish resource management framework. As a result, it was decided that the framework would be the Liaison Council for Deep-Bottom Fish Fishery Management (DBFFM), a less strict structure than the Fisheries Coordinating Committee originally envisaged. This was due to the lack of progress and understanding of the Vanuatu National Deep-Bottom Fish Fishery Management Plan, which is considered to be the basis for this framework, and the National Marine Spatial Plan, which establishes fisheries management zones, and lack of an implementation structure in the provincial government which is supposed to be the main actor in bottom fish resource management. Therefore, the decision was made to start with a preparatory framework.

A meeting was then held with representatives of bottom fishermen from the five fishing villages concerned in Emae, Makila and Mataso to establish a liaison council and was agreed this matters. The agreement was documented in minutes and signed by representatives from each fishing village, the Shefa Provincial Government representative (Acting Secretary General) and the VFD (Acting Director), thus establishing a formal management framework led by the Provincial Government.

(c) Potential resource management measures, etc.

The project supported the establishment of the above-mentioned liaison council. The objectives of the liaison council were (i) to exchange information necessary for bottom fisheries management, (ii) to discuss/build consensus on management rules, and (iii) to establish a framework for technical assistance from the Fisheries Department. The basic framework is that the Provincial Government, which has the authority to manage the sea area up to 12 nautical miles from the coastline, acts as the management entity and co-manages with the fishermen; the VFD, as an external support organisation, assists the activities by providing the necessary technical support. A conceptual framework is shown in



Figure 3: Framework of the Liaison Council for Bottom Fish Resource Management in Shefa Province

Figure 3. The National Marine Spatial Plan (MSP) project to define the areas to be covered by fisheries management is also added here as an external support organisation, which works in unison with the VFD. In addition, it is envisaged that the catch data mandated for bottom fishermen in the current Vanuatu National Deep-Bottom Fish Fishery Management Plan (Vanuatu National Deep-Bottom Fish Fishery Management Plan) will be shared with the Provincial government and the results of the analysis will be fed back to the fishermen with support from the VFD.

Phase 3 of GOS project only supported the establishment of the Liaison Council due to the impact of COVID-19. The future activities of the Liaison Council are envisaged to include (i) establishment of fisheries management areas, (ii) development of a province-led bottom fisheries management plan, (iii) establishment of monitoring methods for management activities, and (iv) information sharing, communication and problem solving after the start of management activities. Establishment of the management areas will be done based on the VFD and the Marine Special Plan from by MSP project. The bottom fisheries management plan will be developed by the provincial government in consultation with fishermen and with technical support from the VFD. In principle, the monitoring method is envisaged to be a catch survey, which could be carried out through surveyors appointed in each area using the TAILS method adopted by the VFD. This would monitor resource trends using changes in catch data and CPUE (catch per fishing effort) as indicators.

(3) Evaluation of effectiveness and adaptability, and recommendations for future use of the tool

As part of the Vanuatu Government's trend towards decentralisation, provincial governments have jurisdiction up to 12 nautical miles from the coastline. While this is advantageous for implementing fisheries management tailored to local characteristics, it challenges the implementation capacity of the provincial government, which has weak structures and insufficient capacity to deal with the fisheries sector. Therefore, this framework, which seeks to coordinate fisheries with the fishing communities concerned, rather than top-down management, even in offshore fishing areas, is considered to be an effective approach for Vanuatu and other island states. The VFD also has inadequate human resources, so providing technical support to activities led by the provincial government is a realistic response to disseminate bottom fisheries management.

On the other hand, in order to make provincial governments the main actors in fisheries management, VFDs need to take the initiative and provide sufficient technical input at the beginning of their activities. In particular, specific guidelines for the development of bottom fisheries management plans are required.

The followings are recommendations for the use of this tool.

- The establishment of liaison councils has been welcomed by both fishermen and provincial governments and appears to be a much-needed initiative. However, as the implementation capacity of the provincial government, which is the legislative management body, is limited, it is crucial to implement co-management with fishermen and establish a system to support by the VFD.
- Provincial governments need to develop a bottom fisheries management plan based on this framework, which will require strong support from the VFD. It is necessary for the VFD to develop a guideline to set out concrete items and contents to be included in the plan, such as the establishment of management zones, the content of entry restrictions, the design of monitoring methods based on catch data and the setting of entry fee.

2-1-3 Fishing ground surveillance (MT-7)

(1) Background to the development of the tool

Community-based coastal resource management involves a community-wide monitoring system for loose resource management. However, in order to ensure compliance with resource management rules, it is desirable to establish a monitoring system for fishing areas by dedicated personnel. To this end, this tool was demonstrated.

(2) Demonstration results

Two systems for fishing ground surveillance were observed at the pilot sites of GOS project Phase 3. One is the assignment of Community-based Authorised Officers (CBAOs) by the Fisheries Department and the other is community-based monitoring.

The CBAO embodies the monitoring part of the Community Development Officer (CDO) function, which was proposed in Phase 2 of the Project for Promotion of Grace of the Sea in the Coastal Villages and adopted by the Fisheries Department. The CDO considered the CBCRM as part of community development and as a leader to implement development, including resource management, at the community level. However, when it was replaced to the CBAO, the division overseeing it in the Fisheries Department was changed from the Fisheries Capture and Development Division to the Compliance Division, which was defined as a kind of police officer to ensure compliance with fisheries laws at the community level and to crack down on violators. While the assignment of CBAOs has yielded results in terms of compliance with fisheries laws, there have also been cases of difficulties in working with communities. On the other hand, community-based fisheries surveillance/monitoring at sites where no CBAOs have been assigned is a less strict monitoring system, with no clear definition of who will take the lead and how often it will be conducted. Monitoring results from the pilot sites also showed some challenges, such as

the fact that funds for fisheries monitoring activities were not adequately allocated by the CBCRM committee. Despite this, in the case of Vanuatu, the less strict community monitoring has resulted in offenders being brought to book and penalties applied in accordance with the rules set out in the resource management plan.

(3) Evaluation of effectiveness and adaptability, and recommendations for future use of the tool

As for CBAOs, in Vanuatu they are assigned separately from CBCRMs as a monitoring entity for fisheries legislation. In Phase 3 of GOS project, it has been tried to utilise CBAOs as a CDO as originally envisaged, and has been attempted to incorporate training on the CBCRM approach during CBAO training in collaboration with the Compliance Division of the VFD. However, due to interruptions caused by COVID-19 etc. it was not enough to achieved fully. The assignment of CBAOs requires funding for training and allowances, while at the same time there are limits to the monitoring activities that one person can undertake alone, and community cooperation is essential.

In Vanuatu, there is a predisposition to follow the rules set by the community, so even in communities without CBAOs, less strict fishing ground surveillance is functioning. It is essential to consider the social and cultural aspects of each country to determine whether such an approach is applicable to other countries in Melanesia.

The followings are recommendations for the use of this tool.

- It is advisable to incorporate the activities of CBAOs as part of the CBCRM programme and establish a fishing ground surveillance/monitoring system based on synergies between enforcement by CBAOs and community monitoring.
- In addition to fishing ground surveillance/monitoring, CBAOs need to be utilised as community development officers to support CBCRM and to use the funds generated by the implementation of supporting measures to establish a regular monitoring system.

2-2 Resource propagation tools

2-2-1 Transplantation of broodstock of immobile or less-mobile species (MT-8)

(1) Background to the development of the tool

In Vanuatu, when GOS project Phase 1 (2006-2009) was implemented, the resource of shellfish, which are highly persistent resources, in particular the green snail and giant clams, were in danger of extinction. As a solution to this problem, Phase 1 of the project was implemented with the aim of demonstrating a tool for transplanting green snails and giant clam transported from other regions into the sea area (taboo area), which was managed voluntarily by local residents (broodstock shellfish transplantation project), in order to try to propagate the same species, and this activity was continued in Phase 2.

This activity was continued in Phase 2.

(2) Demonstration results

The VFD and local residents collaborated in coastal fisheries resource management activities in the technical cooperation projects "GOS project Phase 1 (2006-2009)" and "GOS project Phase 2 (2011-2014)", which were implemented by JICA in Vanuatu from 2006. In these projects, the VFD has attempted to increase green snail which was one of endangered species in Vanuatu by transplanting broodstock into areas voluntarily managed by local residents (taboo areas). The table below shows the results of broodstock of green snail transplantations carried out to date.

Table 7: Records of broodstock green snail transplants

	Location of broodstock transplantation	Location name	Number of shells released	Year of transplantation
North Efate	Mangaliliu	Cotoa	205	Transplanted in 2007/2008
		Mangaliliu Village	262	
	Lelepa Island	Lakanthamas.	195	
	Moso Island	Sunae Village	150	
	Total		812	
Eastern part of Uripiv			299	Transplanted in 2012
			28	Transplanted in 2013

Source: Final report of GOS project Phase 2

In Phase 3 of GOS project, the transplantation of broodstock of green snail was planned to Emae Island, Shefa Province, which is one of the target sites of the pilot project and where the local community has a strong desire for green snail transplantation from the perspective of resource propagation and eco-tourism promotion. Though, the best way to transplant them is from Aneityum Island, Tafea province, which has a rich green snail population, but Aneityum Island is located at the southernmost tip of Vanuatu and has limited direct transportation methods to Emae Island, which would require a long time for transport. For this reason, it was decided that the transported individuals would be cured around the Mangaliliu Community Sea-farming Centre built by the project in Mangaliliu, and then transplanted to Emae Island.

In order to implement this plan, 35 adult shellfish were moved to Mangaliliu from Aneityum,



Figure 4 Marking on the green snail

where green snail population is abundant, in November 2018, and after marking each individual, they were cured for about three months in the taboo area of Mangaliliu, and were collected in Mangaliliu in March 2019, for a total of 48 Individual green snails were transported by boat and released at the selected release sites.

(3) Evaluation of effectiveness and adaptability, and recommendations for future use of the tool
In order to confirm the results of the transplantation on Efate Island, GOS project Phase 3 conducted a survey of the green snail resources in the vicinity of Efate Island. The results of the survey showed that the density of the shellfish population was high at the sites where broodstock of green snail had been transplanted through GOS project Phases 1 and 2. It is said that before the transplantation of adult green snails, local fishermen never found them on the seabed, a result that strongly supports the high effectiveness of broodstock shellfish transplantation.

On the other hand, most residents in the areas where broodstock of green snail transplantation were carried out had a positive view of the transplantation and management activities of the green snail resource, but some felt uncomfortable that fishing activities would be permanently restricted due to large-scale resource management activities. It was evident that they are seeking a balance between resource management activities and economic activities through fishing. This experience was the basis for the revision of the CBCRM model for this project, which is based on a balanced approach between management measures and support measures.

The study also revealed that not only the conservation of green snail resources, but also the propagation of green snail resources by human intervention, such as transplantation, can be very effective. The idea that Japanese-style resource management activities based on the Satoumi model, in which human intervention is used for propagation, is one of the options for resource management measures, rather than the conventional Western-style resource management activities that regulate the use of resources and wait for natural propagation, has provided a new perspective when compiling the resource management tools in the Tool Manual for Phase 3.

When the tool was explained at training and other opportunities, the participants showed a high level of interest and acceptance. This activity is considered to be a tool that can be adapted in other regions as well.

The followings are recommendations for the use of this tool.

- The common view, especially in projects by Western donors, is that resource management = restricting catches. However, the project has shown, based on the accumulation of projects from Phase 1 to Phase 3 to date, that increasing resources is also a part of resource management. This concept has been evaluated as a new way of thinking by the community based authorized officers who participated in the trainings conducted and supported by GOS project, as well as

by the participants of the regional seminars. In future similar community-based resource management projects, emphasising the perspective of propagation as well as regulation is considered important in fostering community motivation for resource management. On the other hand, depending on the policies of countries and other donors, it is essential to take a cautious approach, as there are still strong opinions that transplantation across islands and countries, even if the species is the same, will disturb the original ecosystem.

2-2-2 Establishment of artificial nursery for larval and juvenile lobster (MT-9)

(1) Background to the development of the tool

Lobsters are one of the most expensive fisheries products in the world and are a very important catch for the Vanuatu fishing industry. As a result, fishing pressure on the lobster stock is high and there is concern that the resource is declining. Against this background, the VFD has implemented fishing regulations, such as catch length limits, to ensure the sustainability of the lobster resource.

After hatching from lobster eggs, the larvae usually undergo a floating period of about one year, during which they metamorphose into very small lobsters and shift to a benthic lifestyle, using seagrass beds on the seabed of the surrounding seas as hiding places. As these young lobsters grow, they move to rocky areas and coral reefs to live. One of the measures to efficiently increase lobster stocks in the future will be to establish suitable habitats for juveniles and young individuals that have only just arrived at the bottom. However, in tropical areas such as Vanuatu, seagrass beds are usually very limited.

Meanwhile, artificial seaweed has been developed in Japan to attract and provide a habitat for fish and shellfish juveniles. This artificial seaweed is particularly effective when used as a nursery for sea cucumber and lobster juveniles. By installing this artificial seaweed and small blocks on sand or gravel seabeds, which are usually of little use as fishing grounds, etc., it is highly likely that habitats for juvenile lobster and sea cucumbers can be effectively developed. Furthermore, the installation of such artificial reefs has the potential to increase ownership of the resource at the community level and encourage active participation in resource management activities, so the project decided to experiment with the formation of a lobster juvenile nursery using this artificial seaweed.

(2) Demonstration results

In order to determine the effectiveness of artificial seaweed, artificial seaweed was installed for a certain period of time on the sand and gravel seabed area within the managed sea water area (no-take zone) of Waisisi, Tanna Island, Tafea Province, to check the effect of attracting juvenile lobsters and other useful marine products. After confirming this, it was decided to install and

monitor a structure combining artificial seaweed and small blocks on the same seabed to examine the possibility of a lobster juvenile nursery. First, as a preliminary test, two artificial seaweed units were installed in a sandy bottom area within the managed sea water of Waisisi. After approximately 1.5 months, the artificial seaweeds were recovered and four lobster juveniles hidden in the artificial seaweeds were collected. The approach of creating a new habitat for lobsters in a managed area where fishing is banned was presumed to be effective.

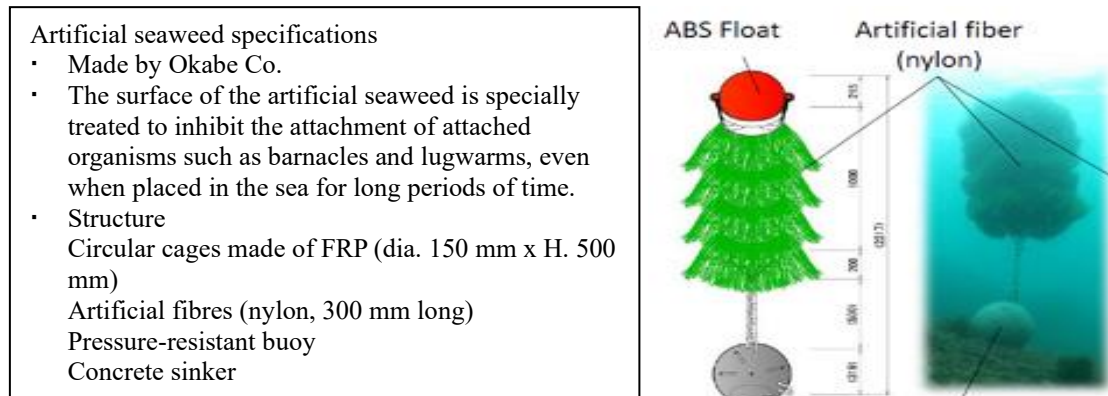


Figure 5: Specifications of the artificial seaweed



Figure 6 Individual lobsters collected from artificial seaweed

(3) Evaluation of effectiveness and adaptability, and recommendations for future use of the tool

The results of the demonstration confirmed that new juvenile nurseries can be created in sandy-bottom areas that have rarely been used. As lobsters are expensive and community interest is likely to be high, this activity could be well adapted in other regions.

The following is recommendation for the use of this tool.

- It is expected not only “resource management = regulation”, but also the option of increasing resource, and to be a new tool to increase communities' sense of ownership over their resources.

Therefore, it is desirable for the Fisheries Department to promote efforts to increase as well as regulate.

3. Supporting measures

3-1 Diversification of fishing

3-1-1 FAD development for large pelagic fishes (ST-1)

(1) Background to the development of the tool

In many Pacific archipelagic countries, fishing pressure is usually concentrated in shallow coastal waters, particularly around reefs. Reducing fishing pressure on reef resources is therefore essential. One possible means of reducing fishing pressure is to promote the catch of large migratory fish such as skipjack tuna. In order to promote the fishing of large migratory fish, it is common to deploy FADs, but the development of FADs has historically focused on durability and robustness, i.e. increased costs, and the need for large vessels to deploy them, which makes their deployment very expensive. In order to popularise FAD fishing, simple and inexpensive FAD units that can be deployed and maintained by local residents themselves are required. Therefore, this tool was developed with the aim of developing inexpensive FADs.

(2) Demonstration results

During Phase 2 of GOS project, based on experience from similar projects in the Caribbean, a method was trialled in which sandbag was used to replace the anchors, which account for a large proportion of the cost of deploying FADs. A very inexpensive one was developed, costing approximately USD 1,300 to manufacture one unit at the time of implementation. The system is being promoted in Vanuatu under the name 'VATUIKA FAD'.

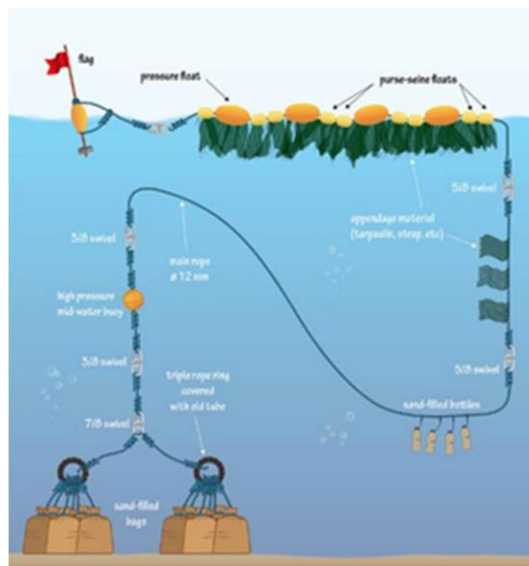


Figure 7 VATUIKA FAD.

Initially, in response to requests from coastal residents in the target areas, FADs were laid in coastal areas (1-3 miles from the shoreline) where they could operate using their own boats and existing fishing methods. However, some management problems were observed with FADs laid in the coastal zone, such as unstable fish aggregation, a long period of time before the fish aggregation effect appeared, and disconnection by vessels navigating in the coastal zone, so it was decided to lay them further offshore at greater depths, and at each site, additional FADs were laid in waters deeper than 600m offshore (4-8 miles from the shoreline) at each site.²

Table 8 Floating fish reefs (FADs) laid down in GOS project Phase 2 (as of February 2014)

sight	laying (a road, a railroad, water pipes, etc.)	depth	date of laying (a road, a railroad, water pipes, etc.)
North Efate	3 miles north off Moso	314 m	21 November 2012
	3 miles north of Mangaliliu	189 m	21 November 2012
	4.5 miles north-north-west of Lelepa	730 m	23 May 2013
	4.5 miles northwest off the coast of Lelepa	600 m	10 October 2013
Malekula	From Uripiv Island		
	1 mile north-north-west	200 m	5 December 2012
	1.2 miles north-east	550 m	5 December 2012
	2.2 miles east	660 m	14 July 2013
	2 miles north (mid-level)	300 m	16 December 2013
	1.5 miles east (mid-level)	300 m	16 December 2013
Aneityum	From Crab Bay		
	3 miles north-east	300 m	18 Dec 2013
	From the village of Anarkhat		
	3.7 miles south-west	350 m	14 December 2012
	4.7 miles north-west	270 m	15 December 2012
	7.5 miles south-west	805 m	25 June 2013

Source: Progress report of GOS project phase 2

In North Efate and Aneityum, it was confirmed that the FADs set up in the offshore area had a significant effect on attracting offshore pelagic fish such as skipjack and rainbow runner. This has led to the establishment of a fishing pattern whereby skipjack and other pelagic fish are caught by trolling around the FADs, and the skipjack are used as bait to catch offshore bottom fish such as poulet by vertical longline fishing.

In Vanuatu, offshore bottom fish such as poulet are traded at a high price and are in great demand. In the bottom fishery (vertical longline), securing stable bait has been a problem, but the deployment of offshore FADs and guidance on improved fishing methods has enabled stable catches of offshore pelagic fish.

² Unfortunately, all of these FADs were lost after the project ended and no more remain.

(3) Evaluation of effectiveness and adaptability, and recommendations for future use of the tool

The FADs have already become standard and widespread in Vanuatu through a process of recognition and establishment by fishermen of their cost, durability, ease of installation and effectiveness in attracting fish. The fact that it was adopted by other donors in a timely manner after the project introduced is considered to be a particularly important factor in its spread throughout the country. In addition, the low cost of the fisheries has inevitably led to drawbacks in terms of durability. In addition, even though the production costs are low, they have not reached the point where fishermen are investing in their own expense. In the future, it is desirable to establish a dissemination strategy with a view to organising and demonstrating initiative among fishermen, for example by adopting measures such as sharing even part of the cost among fishermen, and to promote dissemination in the Pacific region.

3-1-2 Deep sea bottom fishing development (ST-3)

(1) Background to the development of the tool

In many Pacific archipelagic countries, fishing pressure is usually concentrated in shallow coastal waters, particularly around reefs. Reducing fishing pressure on reef resources is therefore essential. One possible means of reducing fishing pressure is to promote offshore bottom fisheries. To this end, this tool has been developed.

(2) Demonstration results

In Phase 2 of GOS project, training was provided on trolling and drift vertical long line (drop line) as well as drift bottom long line methods to utilise offshore FADs.

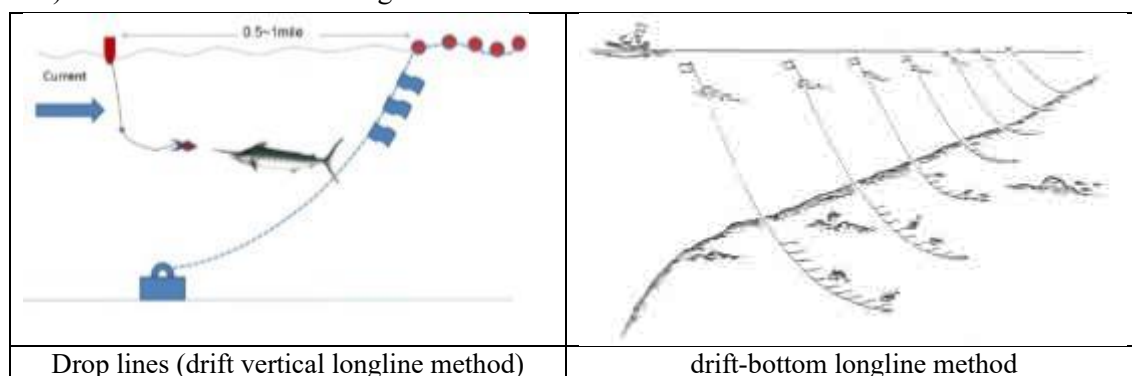


Figure 8 Schematic diagram of the drop line and drift bottom longline method

The vertical long line introduced by the project were actively utilised, with an increase in the number of pioneering fishermen making their own improvements to the introduced fishing gear.

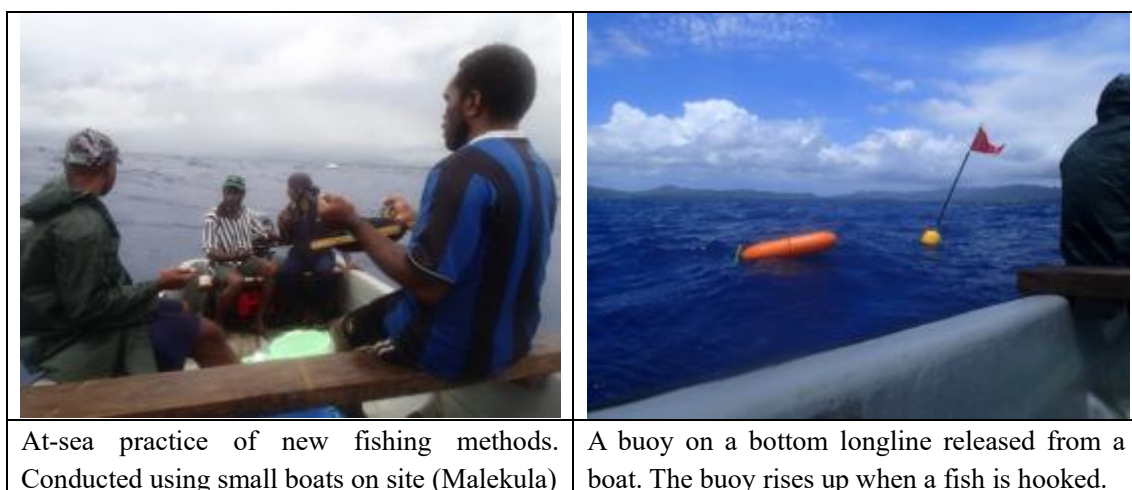


Figure 9: Photographs of activities related to bottom fishery development

(3) Evaluation of effectiveness and adaptability, and recommendations for future use of the tool

The tool is highly effective in terms of alleviating fishing pressure on coastal resources, and as bottom fish is in high market demand and expensive, it is an effective supporting measure. However, it is not a tool that can be adapted to all areas, as the rate of motorized fishing boats is not high in Vanuatu's coastal communities, which are predominantly paddled canoes. In order to promote this tool, boats with engines should also be provided.

The following is recommendation for the use of this tool.

- There is concern that the resource status of bottom fisheries may rapidly deteriorate as they become more widespread, and promotion should be carried out through careful management measures such as limiting the number of hooks and rotation of fishing grounds. In particular, in fishing communities with active bottom fisheries, it is advisable to include management measures related to bottom fisheries in the CBCRM plan in advance in a precautionary manner.

3-1-3 Diamondback squid (DBS) fishing development (ST-4)

(1) Background to the development of the tool

In many Pacific archipelagic countries, fishing pressure is usually concentrated in shallow coastal waters, particularly around reefs. Reducing fishing pressure on reef resources is therefore essential. One means of reducing fishing pressure is to utilise underutilised resources offshore. Therefore, it was decided to develop and demonstrate the tool of promoting the **DBS** fishery, which was an underutilised resource, although its inhabitation had been confirmed.

(2) Demonstration results

In Phase 2 of GOS project, a pilot **DBS** fishery was conducted during an at-sea exercise on Aneityum Island, Tafea Province, and **DBS** was successfully caught. This was the first case of **DBS** being caught in Vanuatu (at the time). Subsequently, a test operation was also conducted off the coast of Lelepa, Efate, which resulted in a catch of seven **DBS** in one day. In the South Pacific region, SPC has conducted test operations for **DBS** using tuna longline vessels in New Caledonia and the Cook Islands, but there have been rare cases of ordinary small boats catching **DBS** .



Figure 10: DBS fishing gear



Figure 11: DBS fishery development activities

(3) Evaluation of effectiveness and adaptability, and recommendations for future use of the tool

DBS has high edible value and is a promising commercial product for tourists. **DBS** does not require live bait and can therefore be combined with offshore bottom fishing, as long as the fishermen bring their own fishing gear. In addition, it has been found that **DBS** can be caught in Vanuatu waters in offshore areas that can be accessed by small boats, and it is hoped that **DBS** can be caught stably in the future if suitable fishing grounds and fishing seasons are identified. Unfortunately, no progress has been made in this activity in Vanuatu since then, but future development is expected, such as activities combined with market development targeting tourist hotels.

3-1-4 Hybrid canoe development (ST-5)

(1) Background to the development of the tool

In remote island areas, fresh fish is important as a source of protein. One possible measure to reduce fishing pressure in coastal areas is to promote offshore fishing, but only a limited number of residents actually go fishing regularly. One reason for this is the high cost of petrol in remote island areas. Therefore, in order to reduce fuel costs for fishing, a tool called an improved canoe (hybrid canoe), which can use both a small outboard motor and sails as a power source, has been developed.

(2) Demonstration results

In Phase 2 of GOS project, hybrid canoes were introduced in Aneityum Island, Tafea Province and Mangaliliu Village, Efate Island, Shefa Province, and were used by the residents for their usual fishing activities, especially in Mangaliliu Village and Lelepa Island, Shefa Province. The introduction of the improved canoes stimulated the communities of Mangaliliu village and Lelepa Island to jointly build a large canoe with a sailing and engine, using the profits from the FAD Committee's catch sales as a source of funds, among other impacts. Furthermore, in Mangaliliu village, tourism activities using improved canoes and trolling fishing around the FAD by youth groups were being considered in conjunction with a community-run tourism bungalow project being promoted by the UNESCO World Heritage Centre and the Vanuatu Tourism Department.



Large canoe under construction in Mangaliliu village.
Use for tourism and fisheries (Oct 2013).



Completed large improved canoe (December 2013).



Figure 12: Hybrid canoe development activities

In Phase 3 of GOS Project, locally-made FRP canoes purchased in Efate, Shefa Province were transported to the VFD shipyard in Santo for the project site communities of Wailapa and Tangoa Island, Espiritu Santo, Sanma Province, and were equipped with outriggers and modified as fishing boats, and two FRP sailing canoes with outboard motors were constructed. One of the canoes was outfitted with a mast and sails, and after conducting training for potential users, one of the canoes was introduced to the Tangoa community.

In order to familiarise them with the operation of such canoes, in addition to the project experts, members of the Resource Management Committee of the Mangaliliu community on Efate Island, Shefa Province, which was the target community in Phases 1 and 2 of the project, and who are also sailing canoe experts, the following training was conducted over a period of two days for representatives of the Tangoa and Wailapa community.

- Hull rigging: mast and sails and associated ropes
- Handling of outboard motors: position of fuel cock, engine emergency stop method, engine oil change timing, etc.
- Sailing: downwind sailing, handling the paddle as rudder, etc.
- Operational records: how to fill in the catch volume (amount) and operating expenditure lists

An FRP canoe with a two-cycle outboard motor was subsequently delivered to the fishing cooperative on Tangoa Island in November 2020 and operations commenced in December 2020. However, prior to this, the solar freezer installed in the fishing cooperative under the project had developed a fault and was unable to produce ice. This caused problems with the preservation of the catch, and as the failure coincided with the end of the year, replacement parts and technicians were not available as expected, and the final repairs took until March 2020, during which time ice was imported from Luganville, the provincial capital, to maintain operations, but unfortunately the

number of days of operation fell far short of the original plan. In addition, the same type of vessel introduced by Wailapa was damaged by Cyclone Harold, which submerged the outboard motor and unusable.

(3) Evaluation of effectiveness and adaptability, and recommendations for future use of the tool
The usefulness of this activity was confirmed in the pilot activities of Phase 2, although its effectiveness was not fully verified in the pilot activities of Phase 3 of GOS project, due to various factors, including damage from natural disasters. Adaptation in other areas seems feasible, but there are challenges regarding the cost of implementation.³

The following is recommendation for the use of this tool.

- As a project, it needs to be granted to groups rather than individuals, but there is a need to clarify how hybrid canoes will be operated and managed within coastal communities.

3-2 Value addition of fish products

3-2-1 Improvement of fish distribution system (ST-6)

(1) Background to the development of the tool

In Vanuatu, distribution channels and means of distribution for fish products are not yet fully developed. Distribution system problems such as 'high distribution costs' and 'infrequent and irregular distribution' have also arisen. In other words, fish products are sold under an inefficient distribution system. This has a negative impact on the livelihoods of the families of fishermen who are involved in the entire process from fishing to distribution and marketing. At the same time, inefficient distribution makes it difficult for the general public to access fish products, especially in remote areas. From a resource management perspective, weak distribution systems lead to inefficient use of fisheries resources, including post-harvest losses. Therefore, tools have been developed to improve fish distribution systems.

(2) Demonstration results

1) Trial distribution improvement in remote island areas using solar freezers

Phase 3 of GOS project decided to install solar freezers in Tongamea and Sangaba, Emae Island, Shefa Province, to contribute to improved distribution. The plan was as follows.

- (i) Three fisheries production centres in Sangaba, Tongamea and Marae (where a community-led market is under construction) on Emae Island, with fisheries products that cannot be consumed within each community being collected and sold in Finonge.

³ In GOS project, an outboard motor was kindly provided free of charge by a private Japanese company, but in practice, it had to be purchased.

- (ii) Primary processed products will be manufactured in Marae and transported to Port Vila, and the development of distribution to Tongoa, where there is a high demand for fish products, will be considered.
- (iii) As a means of distribution to Port Vila, the project will consider air transport in addition to the regular ferries that call at Emae Island once a week.
- (iv) Planning the development of distribution between Makila and Emae, where there has been no distribution route, and examining whether Emae can function as a fisheries catchment area.

Of these, Sangaba had started market activities in January 2019, and the income and expenditure records for approximately one month showed that the income was 138,000 vatu, and the expenditure 93,100 vatu, recording an income of about 44,900 vatu. It was explained that the community must be responsible for saving and managing a portion of these revenues from the project for the repair of the solar freezers.

The Sangaba Community FA, where the solar freezer was installed in the project, has been able to preserve the freshness of large quantities of catch for longer periods than previously possible. This has enabled them to coordinate shipments without being subject to the use of ferries with fewer services and sudden changes in flight schedules. As a result, distribution to Port Vila has become more efficient and more profitable.

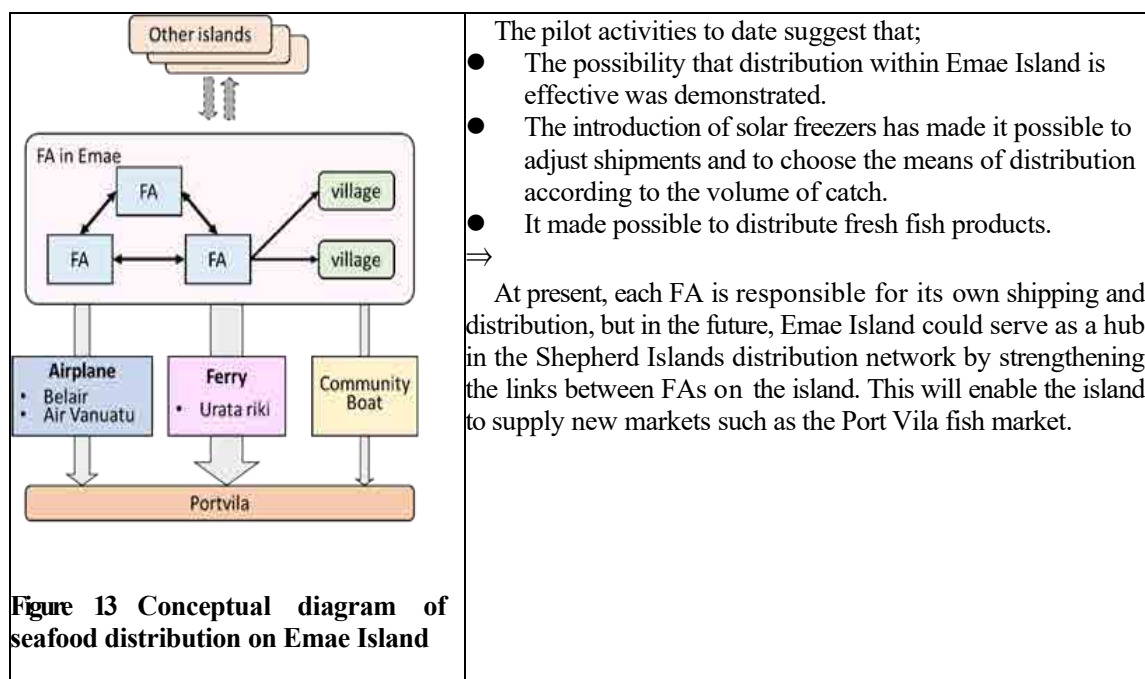


Figure 13 Conceptual diagram of seafood distribution on Emae Island

On the other hand, challenges have been observed in the maintenance and management system of the solar freezers. In some cases, the profits from the solar freezers were not fully utilised, such as

when the solar panels broke down or were blown off by the large cyclones that frequently hit Vanuatu, and the parts could not be procured, and in some cases, the solar panels were not fully utilised.

2) Development of fish distribution from one island to another

For the aim of examining the feasibility of developing distribution from Aniwa Island, Tafea Province, to Waisisi, Tanna Island, Tafea Province, one of the pilot sites of GOS project, a workshop was held targeting the member of Ikoukau Fishermen's Association. The current distribution route from Aniwa to Lenakel is through White Grass, Tanna Island to Western Tanna and through Waisisi to Lenakel. In both cases, fishermen or fishermen's associations transport the fish to Lenakel for sale, but the choice between these two routes depends on the amount of fuel held in Aniwa. The workshop compared (i) the case of Aniwa Island fishermen transporting and selling to Tafea fish market via Waisisi and (ii) the case of selling to the Waisisi Fishermen's Association. The results showed that the Aniwa fishermen would make more profit if they sold to the Waisisi Fishermen's Association when the amount transported per trip was less than 120 kg (for the selling price at the time of the workshop implementation).

The workshop led to five purchases of catch by the Waisisi Fishermen's association from the Aniwa fishermen's association. In addition, Fisheries Development Officer in VFD and Department of Cooperative staff conducted an awareness-raising campaign for distribution development in Aniwa in July 2019. The workshops and awareness-raising activities were considered a major step towards expanding the distribution network, as previously there was no distribution channel between the Ikoukau and Waisisi Fishermen's Associations.

This activity has been functioning for some time, but has remained inactive due to the breakdown of the project vehicle used for transport and the weakening of the management of the Waisisi Fishermen's Association.

(3) Evaluation of effectiveness and adaptability, and recommendations for future use of the tool

The results of previous demonstrations have verified that the introduction of solar freezers is highly effective in villages without electricity. Solar freezers are also widespread in Vanuatu due to support from other donors and are considered to be highly adaptable. On the other hand, challenges have been observed in their maintenance and management. GOS project has understood that there are maintenance and management issues and has been working to improve operations through regular monitoring, but during the monitoring gap of the temporary suspension of project activities in COVID-19, many solar freezers ceased to operate.

The following are recommendations for the use of this tool.

- In carrying out this activity, it is essential that efforts are made to build operational and

maintenance management, including bookkeeping and profit savings, updating plans with depreciation in mind and regular monitoring, which requires regular awareness-raising activities by Fisheries Development Officer in Fisheries Department.

- In order to generate a source of income other than fish distribution, it is necessary to consider ways to utilise solar power. In particular, demand for mobile phone recharging is considered to be high, so methods such as charging for mobile phone recharging could be considered.

3-2-2 Fish processing (ST-7)

(1) Background to the development of the tool

In tropical countries such as the Pacific Islands, the lack of appropriate facilities and technology for handling and processing fish results in poor sanitary conditions and post-harvest losses. In particular, pelagic species that migrate seasonally are caught in large quantities over short periods of time, and the challenge is how to utilise these resources efficiently and effectively.

To solve these problems, it is important to introduce appropriate technology, including fish handling, preservation and processing. The development and demonstration of this tool was also undertaken because it is expected to add value to fish products, thereby generating more profit and expanding the sales channels of fishing communities.

(2) Demonstration results

In Espiritu Santo Island, Sanma Province, one of the pilot sites of GOS project Phase 3, fresh whole fish, not filleted, is the main source of distribution, and primary and secondary processed fish products are generally not distributed. Therefore, the following activities were carried out with the aim of learning lessons for the future development and dissemination of secondary processed products in the pilot sites through training and test marketing.

(a) Implementation of training on fish processing and marketing

Training on fish processing and marketing was conducted. The theoretical lectures helped pilot site representatives to understand value addition, while the practical training helped them learn processing techniques. The training included post-harvest processing methods for fresh fish, filleting, salting, smoking, bottled fish and making fish balls.

(b) Sales of processed fish products

A pilot sale of processed fish products was conducted in Kava bar. The purpose of the test sales was to confirm the general public's willingness to buy processed fish products and to collect basic information for marketing. Sales were generally sluggish, but purchasing of smoked products of fish species such as skipjack and squid, which are familiar to the general public, was

comparatively high. On the other hand, purchases of smoked tilapia did not progress. Ni-Vanuatu are generally conservative when it comes to food, and unfamiliar processed products are shunned, and it is possible that smoked tilapia was avoided due to its poor appearance and high bone content. However, further analysis is needed, including at the place and time of sale, as fried tilapia sold well in the market's side dish shops during lunchtime, which was conducted as a supplement. In terms of taste, the fact that a number of people commented that the product was well received at the tasting confirmed that it was acceptable to Ni-Vanuatu.

In order to develop secondary fish products, a smoked fish production and marketing trial was conducted with residents in Mangaliliu, Efate, Shefa Province, where it is relatively convenient. The resulting smoked fish was sold at the village kava bar and sold out within 30 minutes.



Figure 14: Activities in the development of processed fish products (i)

In addition, a prototype hamburger steak made from taro, yellowfin tuna and wahoo was also made.



Figure 15: Activity of the development of processed fish products (ii)

These secondary products can be stored for longer periods by adjusting the amount of salt. This could be useful for disaster food security, e.g. during cyclones. Long-term preservation also enables distribution not only to coastal residence but also to mountainous areas, thereby expanding markets

and contributing to improved nutrition by enabling the distribution of marine products that are normally inaccessible. Secondary processing is considered to be a new source of income for processors and a means of improving the lives of consumers.

(3) Evaluation of effectiveness and adaptability, and recommendations for future use of the tool

The project has reached the stage of developing processed fish products, training and tasting, which were generally well received by the training participants, but have not yet been disseminated after the training. The effectiveness and adaptability of this tool should continue to be examined.

The following is recommendation for the use of this tool.

- As a future development to promote unfamiliar smoked products and processed tilapia products, the Fisheries Department should take the lead in implementing the following activities: (i) continuous promotion to make the general public less cautious, (ii) sales promotion after tasting the products along with sales, (iii) holding tasting events for cafeteria owners and other food and beverage businesses.

3-2-3 Local handicraft development for shell craft (ST-8)

(1) Background to the development of the tool

Shells of trocus and green snail are highly valued and prized as materials for handicrafts. These species are subject to bans in many countries and regions due to overfishing. On the other hand, these shellfish have long been an important source of food and income for coastal communities. These shellfish are easily collected by women on rocky shores at low tide. Fishing restrictions therefore tend to have a greater impact on women. In other words, both shellfish resources and women's sources of income are simultaneously reduced.

Shell craft has the effect of reducing fishing pressure on in-reef resources and improving income sources by adding value through the processing of shells and making them a source of income. It was therefore decided to develop and demonstrate this as a tool.

(2) Demonstration results

In Phase 2 of GOS project, residents from Mangaliliu Village, Efate Island, Shefa Province, who are good at shell crafting, were sent to Aneityum Island, Tafea Province, to organise a 'shell crafting workshop' for local women. Subsequently, shell crafting committees were organised in the target communities and shell crafting production activities were initiated. In November 2013, residents in the target communities also started selling their products to cruise ship's tourists at a shop on Mystery Island, which is adjacent to Aneityum Island and frequently visited by cruise ships. On Aneityum

Island, the shell crafting was further developed and a solar power generation system for shell crafting was installed using unused solar panels previously installed on Aneityum Island by the VFD and additional equipment such as batteries and regulators were installed.

	
Shell crafting workshop (Anarkhat Village, Aneityum Island: May 2013)	Shell crafting youth groups (August 2013)
	
Beganing selling shell crafting at the Mystery Island shop during visits to tourist cruise ships (Nov 2013)	Pilot distribution and use of eco-labels as promotional pop-ups for local shellfish products (November 2013).
	
Shell crafting workshop, well-equipped with a new solar power system (February 2014)	Shell crafting items under production at the shell crafting workshop (February 2014)

Figure 16: Activities related to shellwork on Aneityum Island

In addition, a shell crafting expert from Mangaliliu Village, Efate, already mentioned above, was sent to organise a shell crafting workshop in 2014 for women's group representatives from Crab Bay Village, Malekula Island, Malampa Province, one of the pilot sites, who then organised a shell crafting committee with the women who participated in the workshop and started making shell crafting.

Initially, the plan was to manage the shell crafting machine tools (grinders, drills, etc.) at the Fisheries Office in Lakatolo, the capital of Malekula, as the villages in Crab Bay are not served by public electricity, and the women's group would use the power supply at the Fisheries Office to produce shell crafting. However, as many of the beneficiaries are housewives, it is difficult for them to take time to travel to Lakatolo to work, and in response to their request to manage the machine tools and hardware in their communities, two women's groups in Crab Bay and Uripiv Island were provided with machine tools and generators and the project carried out guidance to start making samples of shell crafting.

As only a limited number of women who were able to travel to Lakatolo were able to participate in the first shell crafting workshop, a second shellfish-making workshop was organised for other women.

The challenge was to sell shell crafting, but it was expected that local shell crafting would be sold at the crafts centre attached to Lakatolo Market and at Lakatolo Fish Market. Sales were also expected to take place on Walla Island, where tourist cruise ships call.

	
Shell crafting workshop (Malekula Island), attended by representatives of women's groups from Crab Bay village. (Lakatolo, July 2013)	The workshop participants were to teach the women how to make shell craft in their own villages.
	
Shell crafting workshops in Uripiv Island. Basic skills in shell crafting were taught from local instructor Mr Lapsal (November 2013).	Shell crafting workshops in the village of Crab Bay Louni village The event had to be held outdoors as no venue could be arranged. (Nov 2013)

	
Shell craft made by the women's group were displayed as samples at the Club Bay MPA legislation ceremony. (Lakatlo, Dec 2013)	The eco-labels provided by the project were used as advertising pop-ups for shell craft

Figure 17 Shell crafting activities on Malekula Island

In Aneityum, a representative of a community has been selling shell crafts made from dead shellfish to cruise ship tourists by having schoolchildren in the community collect only dead shellfish instead of live ones. Later, this activity was taken over by TIVET (Vocational Training Department) and developed to the point where women from Lelepa who improved their production skills through this activity are now training in various places as instructors.

(3) Evaluation of effectiveness and adaptability, and recommendations for future use of the tool

For shell crafting activities, shellfish as a material is easily available in coastal areas. It is also possible to train people with skills from Mangaliliu, Efate Island, where shell crafting is already practised, as instructors, and it is seen as highly adaptable. Tourism is an industry that supports Vanuatu's economy, but much of the souvenirs are imported and there is significant room for development in this activity.

The following is recommendations for the use of this tool.

- Department of Tourism and the Women's Department have also shown interest in this activity, and it is hoped that in the future this activity will be promoted in collaboration with other ministries to simultaneously establish resource management and livelihood improvement through the promotion of eco-tagging.

3-2-4 Fish Café (ST-9)

(1) Background to the development of the tool

Mystery Island, adjacent to Aneityum Island in Tafea Province, which was one of the target sites of GOS project Phase 2, received many tourists from over 70 cruise ships per year. However, the only local cuisine for tourists was limited to lobster. Although the Fisheries Act prohibits the catch of lobster with a tail of less than 20 cm, the island's residents have voluntarily measured the tail of all catches under an agreement with the Mystery Island Resource Management Committee,

which establishes a stricter ban than the Fisheries Act on the taking of lobster with a tail of 25 cm or less. Nevertheless, excessive fishing pressure was being exerted on this species. Therefore, a major challenge was to maintain the lobster resource by diversifying the local cuisine offered to tourists to include fish dishes. Against this background, the project introduced and guided the management of a fish café with the aim of promoting the effective use of the currently under-utilised fish resource and at the same time reducing fishing pressure on lobster.

(2) Demonstration results

From July to August 2013, through the introduction of a JICA Senior Volunteer, two lecturers in charge of cooking from the Hospitality Tourism and Leisure Training Centre, to which they were assigned, were sent to Aneityum Island, Tafea Province, and a training workshop on cooking with locally caught fish was held. The training was attended by 15 participants selected from the residents of Anarkahat village, Aneityum Island. The main focus of the training was on four different fish menus, including fish skewers, fried sticks with tartar sauce, and cocktails using coconut juice, utilising pelagic fish such as skipjack and wahoo, and bottom fish such as snappers and poulet. Instructors also instructed on purchasing methods and costing. In addition, trial sales of the prototype dishes to cruise ship tourists were conducted for three days during this training course. Incidentally, the trainees were awarded a certificate of completion of the training by the Centre. The total cost of the culinary training course, including the cost of dispatching lecturers, was approximately VAT 500,000, which was borne entirely by the Tourism Committee of the village of Anarkahat.

	
Trainees preparing local fish dishes in the Fish Café kitchen	The cooking of barbecue food



Figure 18: Activities related to fish cafés

The tourist fish café on Mystery Island was considered to be operationally viable, with average sales of approximately 60 thousand vatu per visit (gross profit of 20 thousand vatu per visit) from five (5-day) sales of fish dishes to cruise ship tourists, including sales of approximately 270 thousand vatu during the three-day trial sales during the training.

However, since October 2013, the Fish Café has been closed due to the Café Committee's inability to secure pelagic fish such as wahoo, and also due to the Café's inability to find a suitable location to open. Therefore, the committee discussed and guided the fish café committee on how to secure the fish needed for the café, including purchasing fish several days in advance to coincide with the cruise ship visit schedule, providing fuel money to residents who go out fishing to prepare suitable fish, and utilising bottom fish such as poulet as well as offshore pelagic fish. They also met with executives of the Mystery Island Tourism Committee to request their understanding and cooperation with the Fish Café programme, including fixing the location of the fish café to be opened. As a result of these projects and the VFD's efforts, the Fish Café was able to resume operations, but the problems of procuring suitable fish and securing a place to open the café remained unresolved, and the café returned to a state of closed operations. Despite this recurring situation, the project reported that the fish café is still continuing to serve fish dishes.

(3) Evaluation of effectiveness and adaptability, and recommendations for future use of the tool

Although there were periods during the demonstration phase when things went extremely well, the operation of the Fish Café cannot be said to be stable, with various factors preventing it from going ahead as planned and then restarting. However, the Fish Café's work on Mystery Island has shown good potential for making effective use of under-utilised marine resources and reducing fishing pressure on lobsters. It is desirable that approaches such as the Fish Café are promoted in terms of effective utilisation of underutilised resources.

The case of Mystery Island, where more than 70 cruise ships call at the port every year, was very specific and it would have been difficult to adapt it directly to any community. However, the opportunities for interaction between the residents involved in the project made a small positive impact. The community counterparts who were selected to manage the Japanese-supported fish market on Malekula Island applied the concept and establish a cafeteria in the fish market using this concept. The success of the project was based on the project's proposed activities, the cooperation of the Tourism and Leisure Industry Training Centre and the presence of the Mystery Island Tourism Committee, which was able to provide funds for this activity, against a background of growing expectations among residents for increased income from increased cruise ship visits and concerns about the sustainability of the lobster resources. In some coastal settlement areas, tourism is thriving , so the adaptation of this tool can be considered in such areas.

3-2-5 Community fish markets (ST-10)

(1) Background to the development of the tool

In islands and villages, a stable supply of fish is an essential element for increasing fish consumption by local residents as well as tourists visiting from outside the target area. Developing markets for fish products in local communities is also important for fishers. Fishermen may understand the importance of resource management, but if they do not see the benefits, they will lose the incentive to implement it. Establishing local refrigeration facilities and developing markets will enable fishers, middlemen and cooperatives to handle fish products in a stable manner. It is from this perspective that the tool of community fish markets was developed and demonstrated.

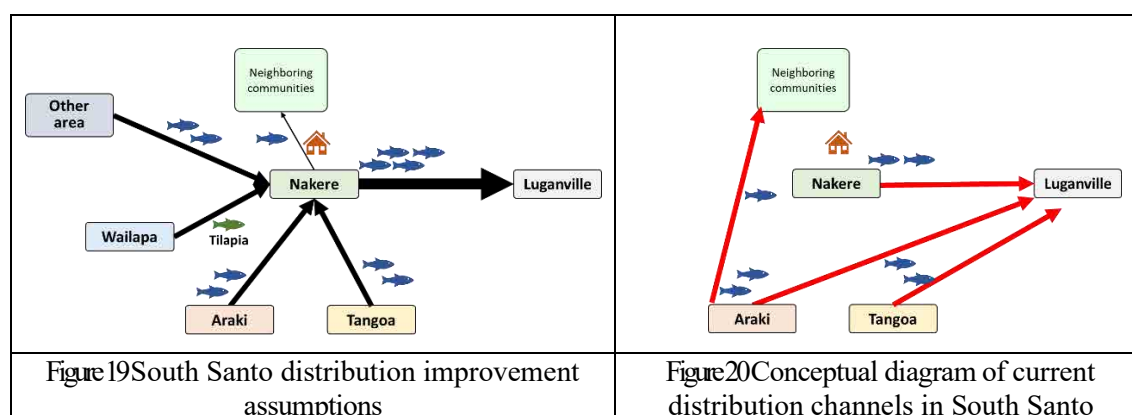


Figure 21 Community fish market built in Nakere

(2) Demonstration results

In Phase 3 of GOS project, an attempt was made to construct a community fish market in Nakere, South Santo, Espíritu Santo, Sanma Province, one of the pilot sites. Initially, in South Santo, the following methods were considered to improve and streamline the distribution of fish products.

- Fish products caught on Araki and Tangoa islands will be collected at the community fish market to be built in Nakere.
- The market is then used as a base for joint shipments, thereby reducing distribution costs and effort.



In implementing this activity, it was agreed that VCAP project, which was being implemented by the United Nations Development Programme (UNDP), also with a pilot site in South Santo, would purchase the solar freezers, and GOS project supported their operation and maintenance. However, the construction of the community fish market in Nakere stalled after the VCAP project stopped its activities due to budget shortfalls and the procurement of the solar freezers that were originally planned to be installed fell through.

Other factors contributing to stagnation include delays in construction. In order to foster ownership of the community fish market by the residents themselves, it was agreed with the community that the project would only provide construction materials and the community would provide the labour for the construction, without any more input than necessary from the project side, such as labour charges or hiring a construction contractor was decided. However, as volunteers, if there were paid jobs in the community, they were given priority, and the project activities were halted due to COVID-19 in 2020 and Cyclone Harold, which hit the island of Santo on 6 April 2020, and the building was not finally completed until July 2023.

(3) Evaluation of effectiveness and adaptability, and recommendations for future use of the tool

Unfortunately, as the completion of the community fish market was in the final year of GOS project Phase 3, no monitoring results are available on how effective it has been. Therefore, it is difficult to assess the effectiveness and adaptability of this tool.

However, it is desirable that such an approach is promoted by the Fisheries Department itself in the future, as the development of places with refrigeration facilities, such as community fish markets, is very important in improving the distribution of fish products.

3-2-6 Quality control and hygiene (ST-11)

(1) Background to the development of the tool

In terms of hygiene management, the floors and tables of the buildings where fish products are handled were generally cleaned, but the freezers and ice boxes where fish are stored were often not

cleaned. However, in the rural fish markets, despite the fact that it is an hour's drive from the fishing village to the centre, ice was not used for quality control.

In view of the above situation and the importance of maintaining hygiene in terms of quality control of catches, not only to avoid food poisoning, etc., but also to minimise discarded fish and utilise resources without waste, quality and hygiene management tools were developed.

(2) Demonstration results

With regard to hygiene management, a simple one-page instruction sheet was prepared on how to clean the freezers and other equipment for the purpose of hygiene management and prevention of food poisoning. As 15 solar freezer units were planned to be distributed to different sites through equipment provision, the above one-page paper was also enclosed. The project sites with existing freezers were distributed with the help of other corps members and extension workers. The final handover was made to the extension workers in the respective communities.

In terms of quality control, materials on how to clean freezers and other equipment and the dangers of food poisoning from spoiled fish were added to the VFD's existing materials as training materials for fish quality control and prevention of fish spoilage. The training was conducted for fishermen. After the training was conducted, the training material was updated to take into account the actual situation in the local area. The existing training material basically introduces quality control using ice, which is difficult to put into practice in areas that do not have freezer/solar freezers. Therefore, it was decided to recommend the handling of catches on board in areas where ice supply is not possible in the future and handed over to the staff in charge of the VFD.

(3) Evaluation of effectiveness and adaptability, and recommendations for future use of the tool

The quality and hygiene management described in this paper is understood as an option of one of the 'supporting measures', i.e. a lateral means of making integrated CBCRM work effectively, either as one of several support measures or as a combination of several supporting measures depending on local conditions.

Effectiveness and impact on PDM.

Output 1: The applicability and practicality of the integrated CB-CRM approach is enhanced.

Both hygiene and quality management contribute to the achievement of Output 1 in terms of adding value to the catch through the achievement of the following direct objectives

Hygiene: the use of uncleaned freezers and cooler boxes is common in some Oceania countries. One of the bacteria present in seawater becomes active at temperatures above 15°C and multiplies very quickly at 25-37°C, reaching levels that can cause food poisoning. Even if they do not multiply in the freezer, they can multiply while consumers are buying and taking it home at room temperature. As the

toxin is heat-resistant, heating contaminated food can also cause poisoning symptoms. To prevent these points, it is essential to keep areas where seafood is handled clean. The proposed freezer cleaning method consists of six major steps, but in practice it is not very time-consuming and is considered to be highly practical.

Quality control: in some Oceania countries, there are instances where the market will not buy seafood that has not been properly treated for quality. In addition, quality-controlled seafood is usually sold at a higher price than non-quality-controlled seafood. However, many regions do not have freezers or solar freezers, so the introduction of 'quality control of seafood in ice-free areas' included in this activity is a practical proposal that can be applied in other regions.

- Practicable suggestions: both freezer cleaning and quality control of seafood products in ice-free areas suggest low but effective hurdles to practice, thus contributing to strengthening applicability and practicality.

Project goal: The integrated CB-CRM approach developed in the project will be implemented nationally and within Melanesia.

The above is not a situation unique to Vanuatu, but one that is widely found within Melanesia, and is therefore likely to be introduced not only in Vanuatu but also within Melanesia.

	
Solomon Fishery products on sale (not good example).	PNG Fisheries products on sale

Top targets:

- ① The integrated CBCRM approach is formally adopted and disseminated as the standard approach for promoting coastal resource management in Vanuatu.
- ② A population-driven integrated coastal resource management approach is promoted in the Pacific region.

Quality and hygiene management is also an area of focus for the Seafood Verification Agency division of the Fisheries Department, and fishermen understand its importance, so it will be formally promoted as a standard approach for promoting coastal resource management in Vanuatu in the future.

Application issues

In many countries, it is common for fisheries departments to have departments responsible for sanitation and quality control within their organisation. To improve the effectiveness of these activities, it is important to check whether other ministries have similar departments, and if so, what their functions and action plans are and whether they can work together. The next issue is how they can work together, whether they can be linked in terms of their objectives, whether training for the general public and fishing communities is possible, the timing of training and the allocation of budgets. A second challenge is whether training content that promotes integrated CBCRM as a development of these original objectives can be organised by the Fisheries Department on its own or in conjunction with relevant ministries. One way to deal with this is to strengthen the capacity of the fisheries department extension departments in each country that are directly involved in integrated CBCRM training through regional seminars, etc., but also to strengthen the capacity of quality control departments and other personnel to position hygiene and quality management within an integrated CBCRM approach through their participation in seminars.

3-3 Alternative income source development

3-3-1 Tilapia culture (ST-12)

(1) Background to the development of the tool

Pacific archipelagic countries such as Vanuatu have abundant coastal fisheries resources, but in recent years, inland aquaculture has attracted attention as a source of animal protein and cash income in inland areas. Inland aquaculture has also attracted attention from the perspective of food security, as farmed fish can be used as emergency food in the event of natural disasters such as cyclones. Although the history of inland aquaculture in archipelagic countries is not long and the accumulation of technology is limited. However, tilapia is a suitable target species for inland aquaculture in island countries because it is easy to produce seedlings and can withstand extensive culture. Furthermore, in the case of community-based aquaculture, it is possible to actively participate in resource management activities by, for example, contributing part of the proceeds from sales to resource management

activities. From this perspective, tilapia culture was developed and demonstrated as a tool.

(2) Demonstration results

Tilapia culture in Vanuatu, as shown in the diagram on the left, is a hybrid approach that combines livestock, agriculture and aquaculture in a trinity of combined farming and feeding, with products coming not only from aquaculture but also from livestock and vegetable farming.

1) Tilapia culture at the Wailapa Community Pond

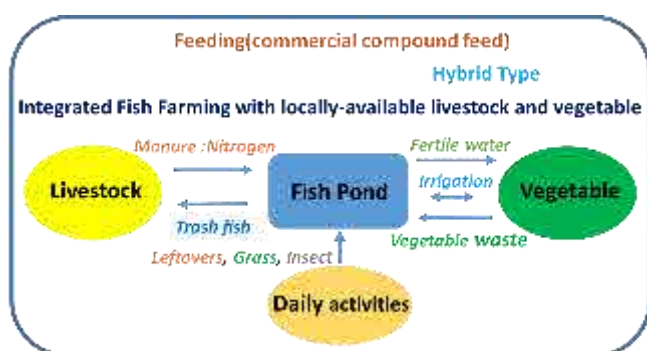


Figure 22 Schematic diagram of hybrid tilapia culture

At the community tilapia culture pond in Wailapa, Espiritu Santo Island, Sanma Province, a site of GOS project Phase 3, 1,300 fish were raised in the community tilapia pond with the cooperation of the VFD, by laying HDPE (High Density Polyethylene) sheets imported from China as a water leakage control measure. The fry (5g size) were stocked and started to be cultured in January 2019. The culture period was four months and feed were Fijian tilapia pellets (1bag/25kg, available for import at approximately 3,400 vatu) provided by the VFD. The Fijian feed was used to see how efficient it was as a food source and whether the fishery could actually make a profit from using



Wailapa Community Aquaculture Pond on Santo Island. Because HDPE aquaculture sheets are used, there is no water leakage and the pond remains green and in a very stable condition.

expensive imported feed. Additional island cabbage grown around the ponds was fed and 10 chicks of duck were purchased and reared for fertiliser application. The results of the take-up in the first four months after the start of the aquaculture are shown below: 225 kg of Fijian pellets were fed in the four months and the tilapia taken up were sold at 500 vatu/kg and sold out.

Table 9 Changes in tilapia at the beginning and end of culture (4 months) and increase in feed conversion rate

At the beginning			Time of termination (e.g. of a contract)			Feed conversion rate
Number of fish	Average body weight	Gross weight	Number of fish	Average body weight	Gross weight	Amount of food eaten (dry) / weight gained (wet)
1,300	5g	6.5 kg	780	190g	146 kg	1.54



Within 4 months of starting farming, 146 kg were

The results show that the increase in feed conversion rate was 1.54, which does not indicate that the efficiency of the Fijian feed is good. However, considering that the actual increase feed conversion rate is lower than this because the calculations were based on the amount of feed fed rather than the amount of feed consumed by the farmed fish, it is considered that the efficiency of the feed is good. Other factors contributing to the increase in the feed conversion rate of 1.54 were the use of HDPE sheets, which eliminated water leakage and increased the effectiveness of fertiliser application, and the additional feeding of island cabbage, which is highly palatable and highly effective. A simple look at the amount of food fed and sales shows that the cost of food was 30,600 vatu and sales were 72,500 vatu.

The aquaculture demonstration also started in August 2019 with 1,300 fry (5 g size), as before, using inexpensive poultry pellets (2 kg = 2,200 vatu, protein content 17-20%) available locally (Santo). The period of cultivation was set to be approximately five to six months, and the target average weight was set at 250 g (as four fry per kg was the most preferred size according to interviews with local residents). As before, island cabbage grown around the ponds was additionally fed, as well as ducks for fertiliser.

2) Wailapa community backyard aquaculture

After seeing the good example of tilapia culture at the Wailapa community aquaculture pond mentioned above, many residents wanted to implement small-scale tilapia culture in their own households, and some households voluntarily excavated ponds of 20-30 m² and asked the VFD and the project for assistance. In response, the VFD was consulted and it was decided to provide joint support. However, as it is difficult to provide assistance to individuals from the point of view of fairness, it was decided that the project would mainly provide technical assistance and part of the materials and food for

the backyard aquaculture demonstration as a community, while the VFD would provide assistance in laying sheets to prevent water leakage, and part of the materials and food.

As a result, 15 backyard ponds were created at the end of October 2019, with a further increase to 26 backyard ponds as of March 2020, which is highly appreciated by the VFD. From the ponds, 75 kg of tilapia were harvested from the backyard ponds at the end of March 2020.

	
Wailapa backyard aquaculture ponds (15 m ²)	Wailapa backyard aquaculture ponds (20 m ²)

Figure 23 Backyard aquaculture activities in Wailapa

Subsequently, there was a major turning point in this activities: a Category 5 tropical cyclone hit Vanuatu on 4-5 April 2020. Named Harold, this cyclone caused severe damage, mainly in northern Vanuatu. Although the death toll was not high (five), more than 159,000 people were affected and houses were heavily damaged (more than 17,000). Recovery was unprecedented. This was due to the fact that foreign assistance was not available due to COVID-19 and domestic resources had to be utilised. The Vanuatu Government purchased food from less affected areas.

Lessons learned from the Category 5 Cyclone Pam that hit Vanuatu in 2015 led to the formation of eight clusters in Vanuatu as a coordinating forum for climate change and disaster risk reduction (CCDRR). The function of the clusters was to fulfil a coordination function in the event of natural disasters caused by climate change and other factors. The Food Security and Agriculture Cluster (FSAC) was one of the clusters and had established a coordination structure with the support of the Ministry of Agriculture and the National Disaster Management Office (NDMO).

In Wailapa, Espiritu Santo Island, Sanma, emergency supplies arrived two weeks after Harold had passed. Emergency supplies from the government included rice, eggs and canned fish, while FSAC provided local foodstuffs and canned tuna. Another NGO operation, World Vision, provided tents.

In the two weeks following the cyclone until emergency and relief supplies arrived, the community harvested 156 kg of tilapia from the tilapia ponds, which were being implemented as a pilot activity of GOS project, and shared them with themselves and other affected communities. Subsequently, FSAC considered the 156 kg of tilapia to be equivalent to the distribution of emergency food and paid VT156,000, equivalent to the purchase price, as relief money to the villagers. The cash received was

distributed in VT3,000 each to the people with fish ponds.

Community interviews indicated that it was helpful to have tilapia as a food source for two weeks until emergency relief supplies arrived. Tilapia culture is considered to be extremely effective as an emergency food source during natural disasters.



Figure 24 Damaged community ponds



Figure 25 Backyard ponds that are no longer usable due to damage

(3) Evaluation of effectiveness and adaptability, and recommendations for future use of the tool

GOS project was able to verify that tilapia culture can function as an animal protein source supply and a source of cash income. It can also contribute to strengthening resilience against natural disasters, as it can serve as an emergency food source in the event of cyclones and other natural disasters.

On the other hand, many donors provided assistance to promote tilapia culture in response to the Cyclone Pam that hit Vanuatu in 2015, but not all have worked well. The main reasons for this are that there are few places where water is available, the quality of the HDPE sheets used to prevent water leakage in the ponds was poor, causing water leakage to occur quickly, the seed supply system was not in place, and activities such as promoting tilapia eating to residents who are not used to eating inland waterways fish were not carried out in conjunction with other activities. Therefore, it can be said that although the tool is highly effective, adaptability remains a challenge. On the other hand, it is hoped that its effectiveness will be demonstrated by ensuring high quality sheets and the ongoing construction of community hatcheries currently underway on the islands of Santo, Malekula and Tanna.

The followings are recommendations for the use of this tool.

- In promoting tilapia culture, it is necessary to solve the above-mentioned problems while expanding the culture area and simultaneously carrying out multifaceted activities such as promoting appropriate tilapia cooking methods.
- While using compound feed, it is necessary to promote combined aquaculture by using locally available ingredients, conducting tests to increase yield, and combining it with duck rearing and agriculture using nutritious water from the ponds, not only to increase profitability but also to

provide nutritionally balanced emergency food in times of disaster.

3-3-2 Clam culture (ST-14)

(1) Background to the development of the tool

Smaller clams have been traded in markets around the world because of their popularity as an ornamental species, particularly in Europe and the USA, due to the beauty of their mantle. Currently, many countries, including Vanuatu, restrict the import and export of natural products of the clam, as overfishing has led to a severe depletion of their resources and some species are listed as endangered. For this reason, clam culture has been attempted in many countries. To this end, tools for clam culture have been developed and demonstrated.

(2) Demonstration results

A maxima clam (*Tridacna maxima*) culture trial was conducted from July 2012 to January 2013 in Sunae and Tasiliki villages on Moso Island, which were pilot sites of GOS project Phase 2. Of the 10 sampled households, only two households in Sunae village were able to manage the cages properly. The maxima clam of five households in Tasiliki village were completely wiped out. This was largely due to the awareness of the inhabitants who wished to culture.

Full-scale aquaculture activities began in June 2013, with the distribution of seedlings of the fluted giant clam (*Tridacna squamosa*) to two households in Sunae village, which had performed well this time, and one household on Lelepa Island and one household on the main island side of Lelema, which had experience in aquaculture in Phase 1. The resource of maxima clam, which is difficult to sell on the ornamental fish market, was also switched to edible purposes (to be processed and sold as local food) and seedlings were distributed to those who wanted them. The purpose of this project was to organise the VFD's stock and to improve the aquaculture techniques of the target population, but if in the future, maxima clam and fluted giant clam are also cultured, then clam culture could become an alternative source of income for coastal residents who are not allowed to fish.



Figure 26: Activities in the clam culture

(3) Evaluation of effectiveness and adaptability, and recommendations for future use of the tool

Cage culture of maxima clam (*Tridacna maxima*) was tested in Phase 1 and Phase 2 of the project in Vanuatu. Although there is a demand for the species as a food source and it may be sold for food depending on price, the project assumes ornamental aquaculture production. Ornamental clam has the advantage of a high unit price and low costs because they do not require artificial food for growth due to their feeding habits. If they can be produced stably, profits are also high. On the other hand, it is not easy to succeed in sea cage culture, as it requires daily care and takes more than a year before shipment. Another major challenge is the availability of seed supplies and the need for ornamental fish suppliers to buy the shellfish produced locally.

The cash income generated by shellfish aquaculture in coastal areas or by fishermen can reduce fishing pressure on coastal resources. Although the potential for large income is great if production can be done on a relatively large scale, there are also significant risks, such as the time and effort required to manage cages and the impact of other conditions such as seed supply and sales. However, it is also possible to actively participate in resource management activities by contributing part of the proceeds to resource management activities, using aquaculture facilities as teaching materials for environmental education, or transplanting some of the shellfish produced.

The followings are recommendations for the use of this tool.

- Aquaculture activities require some ongoing, detailed technical support, which is a major barrier to extension for fisheries departments with limited staff. The availability of core human resources in the villages is seen as the key to the future.
- Cultured clam were sold to ornamental fish exporters in Port Vila through the intermediary of the Fisheries Department, but this is not the original mandate of the Fisheries Department, so a mechanism needs to be established to act as an intermediary between community aquaculture practitioners and the ornamental marine fish exporters.

3-3-3 Road market development (ST-16)

(1) Background to the development of the tool

Road markets are simple shops along relatively busy roads whose main purpose is to sell food and souvenirs to tourists and holidaymakers. In Vanuatu, local products and foodstuffs are sold at road markets, with the proceeds going to community activities. Usually, locally produced seafood and agricultural products are brought to the larger town or community markets. The main purpose of community-run road markets is to reduce distribution costs and increase sales. Road markets were developed and demonstrated as a tool because of their potential to generate a source of income for local communities by utilising their broad utility.

(2) Demonstration results

In this activity, there are examples of implementation, such as the construction of a road market by community along the main road in Mangaliliu, Efate Island, Shefa Province, one of the pilot sites in Phase 2 of GOS project. To promote its effective use, the project side provided coffee makers and other equipment to run the café. At one time, souvenirs and food products were sold, but the market is no longer in operation due to a combination of negative factors, including the relatively long distance between the community and the main road, which was not paved at the time as it is now, the fact that the market did not sell as much as expected, and the sharp decline in tourists due to COVID-19.



Figure 27 Roadside markets built by communities

(3) Evaluation of effectiveness and adaptability, and recommendations for future use of the tool

It is clear that the location of this facility is very good for business as there are no similar facilities nearby in a key location towards the northern part of Efate and parking spaces are available. In the future, the conditions for the revitalisation of this facility will be met in that the area is a World Heritage Site, there is tourist accommodation, the presence of a tourist-oriented giant clam farm and a community hatchery, and now that cruise ship visits are being realised. Thus, it is essential to motivate communities to scrutinise, in collaboration with them, the external conditions for setting up road markets, both those that are inherent and those that can be set with the help of outsiders and external agencies, and to find a person who can facilitate the organisation of such a market by the Department of Business and Cooperatives.

4. Connecting measures

4-1 Data collection on catch and fish distribution (CT-1)

(1) Background to the development of the tool

In Vanuatu, at the time of GOS project Phase 2, catch data on coastal fisheries had not been collected and it was difficult to use data to understand the situation of the coastal resources. Although catch data is useful for management by the Fisheries Department, it was expected that the communities themselves would record the data and visualise the data as one of the tools to promote coastal resource management by the communities. Therefore, after recording catch data, a tool was developed and demonstrated to show trends in the catch data in a simple and easy-to-understand manner.

(2) Demonstration results

During the implementation of Phase 2 of GOS project, a fishing activity record sheet was introduced in the target area at the same time as the FAD was established and the FAD Management Committee was set up. This fisheries record sheet was structured to record the catch of pelagic and bottom fish in the coastal and offshore areas as well as in the vicinity of the FAD, and also the income from fishing activities and expenses incurred from fishing activities.

The project created an MS Excel programme to input this fishing activity data into a computer and automatically analyse averages and trends. In order to enable target communities to use this programme to input and analyse fishing activity data themselves, workshops were held in each target area in June 2013 to teach them how to input and analyse fishing activity data. The workshops targeted 5-10 representatives involved in coastal resource management, such as MPA

(Marine Protected Area) committees, FAD management committees and fishermen's associations in each target area. Using actual recorded data, the workshop explained how to input data and how to read the automatically analysed charts.



Figure 28: Activities to recording fish catch and distribution data (i)

After the workshop, one personal computer was provided to the MPA committees in each area, and each committee proceeded to input and analyse data on fisheries activities, and Japanese experts and VFD staff checked the progress of fishing recording activities when they visited the sites. However, it was not easy to continue the recording work on an individual basis and only a small number of interested residents in each target area continued to keep fisheries records. However, this was a valuable initiative in understanding trends in fisheries activities, as no routine fisheries recording had been carried out in the past.

On Aneityum Island, Tafea Province, the FAD management committee chairperson used the solar freezer installation provided by the project as a communal collection point to record catch data and input catch data into the tallying programme introduced by the project. The Mystery Island MPA Committee, which has been collecting catch data on lobster for sale to cruise ship tourists for many years, also began to enter and manage catch data into the tallying programme. This has enabled catch data to be viewed by community stakeholders as required.

On Uripiv Island, Malampa Province, the FAD Management Committee Chairman understood the importance of collecting data on fishing activities and built a 'Fisherman House' in the island community, which serves as a communal collection point and fishing gear storage. A solar freezer (166 L) was installed in the Fisherman House with the help of JOCV members currently assigned to the Malampa Provincial Fisheries Office. In addition, in Crab Bay on the main island of Malekula, several residents who fish in the village of Louni started to record their fishing activities. These results were reported to the Malampa Provincial Fisheries Office and analysed and organised by a tallying programme with the help of the above-mentioned JOCV.

The land crab harvest data previously collected by the Crab Bay MPA Committee at the Lakatolo market was also improved to record not only the amount of crab shipped, but also the district where the crab was harvested. This land crab harvest data was also entered into the tallying programme introduced by the project, and community stakeholders managed the data on their computers.

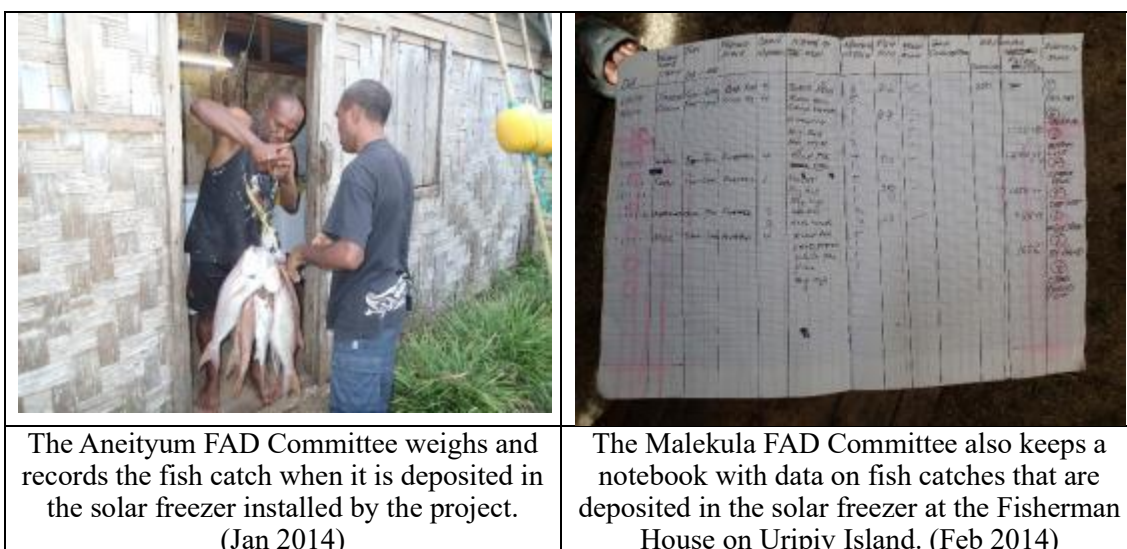


Figure 29: Activities for recording fish catch and distribution data (ii)

(3) Evaluation of effectiveness and adaptability, and recommendations for future use of the tool

The data collection activities initiated by GOS project were subsequently evaluated by the VFD for their effectiveness and evolved into data collection activities using the TAILS system by The Pacific Community (SPC). The current system is that data collectors in the communities deployed by the VFD in different regions input catch data on tablets and send the compiled data via the internet. The recognition of the importance of data collection is an important point to be evaluated, but the TAILS activities do not have the function of recording and inputting catch data in their own foreshore and recognising the importance of resource management after analysing the data, which was the aim of GOS project, and the TAILS activities are not effective in terms of functioning as a connecting measure for resource management.

The followings are recommendations for the use of this tool.

- It is recommended that in the future, the statistical department of the Fisheries Department should take the lead in establishing a mechanism for communities to access their own TAILS data, so that they can view the current status of their own coastal resources, and in doing so, a mechanism should be established by Fisheries Department staff to teach residents how to view the data. Being able to refer to their own data will motivate them to collect the data and make them aware of the importance of resource management through the data.
- Establishing a mechanism whereby data can act as a tool to facilitate obtaining loans from banks would also enhance its role as a connecting measure. This could include a system whereby the fisheries department recommends data providers to lending institutions.

4-2 Activities on awareness-raising and marine education programmes (CT-2)

(1) Background to the development of the tool

The findings and experiences gained from the resource management activities implemented so far in the project can be shared not only with local stakeholders, but also with primary school teachers and other education stakeholders, so that they can be used to educate and enlighten the next generation of children in Vanuatu, and thereby disseminate integrated CBCRM. Therefore, this tool was developed.

(2) Demonstration results

Discussions were initiated with relevant VFD's Research and Aquaculture Division officials on the feasibility of implementing an awareness programme on marine resources (henceforth 'marine education') using the Mangaliliu Community Sea-farming Centre. In particular, it was confirmed that the use of the facility would also lead to its sustainable utilisation. Subsequently, together with VFD officials, the objectives of the marine resource management was explained awareness-raising activities to Mangaliliu residents and their willingness was confirmed to participate in the promotion of the use of the Mangaliliu Community Sea-farming Centre. In addition, opinions were exchanged with VFD staff and residents on specific marine education dissemination programmes, and discussions were held on how and what could be provided, including the establishment of a mechanism and the implementation system of the community and VFD, to foster ownership by the local residents.

(3) Evaluation of effectiveness and adaptability, and recommendations for future use of the tool

The marine education described in this paper is understood as an option of 'connecting measures', i.e. a lateral means of making integrated CBCRM work effectively through one of several connecting measures or a combination of several connecting measures depending on local conditions.

This activity could be recognised as extremely important in terms of promoting integrated CBCRM in the future.

Effectiveness and impact on PDM.

Output 1: The applicability and practicality of the integrated CB-CRM approach is enhanced.

As an objective of marine education, the UN environment programme recognises marine education as the primary 'catalyst' for social transformation towards 'sustainable development'⁴ and its vision for the next decade is that it will be holistic approach including an action to protect the environment, improving people's quality of life and encouraging an initiative toward the activities looking to future generations. It stresses the importance of not stopping learning and continuing to accumulate by experience, consistently from early childhood to adulthood in order to develop marine education to support such social change.⁵

As already mentioned, the activities in this area in the project were carried out in a community that had restored the green snail and giant clam resources at the project site from Phase 1 on the capital island, and using the only facility in the country, the Mangaliliu Community Sea-farming Centre established by the project. Because of these advantages, the project was considered highly effective as one of the connecting measures for integrated CBCRM in terms of the following

Involvement of the whole community (men and women, all generations): it was an opportunity to recognise that both resource management measures and supporting measures can lead to sustainable development of resources for the whole community, not just primary school teachers and pupils, but also adults.

Linkages with tourism development: the giant clam and Mangaliliu Community Sea-farming Centre, which were transplanted in Phase 1 and have become increasingly important as species conservation and tourism resources, were positioned as tourism resources, and an environment was created in which they can be managed and maintained by community actors and directly contribute to improving the livelihoods of community members as a whole.

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Project Purpose: The integrated CB-CRM approach developed in the project will be implemented nationally and within Melanesia.

Potential for implementation in other communities through marine education: a factor in the success of this activity, as already mentioned, the Ministry of Education has set aside a budget for extra-curricular projects, which can be executed by schools at the discretion of their headmasters; the Ministry of Education does not have a concrete plan for extra-curricular projects, and the significance of marine education using the Mangaliliu Community Sea-farming Centre for an

⁴ UN environment strategy for environmental education and training

⁵ Nakamura, M. (2022) Transition and future prospects for marine education - towards a contribution to social change

extra-curricular project for teachers and students from another school on Efate Island. Furthermore, the school that used the facility approached us about the possibility of implementing an extra-curricular project on coral rehabilitation by students from their own community school, and experts and the Fisheries Department investigated the possibilities in the waters of the community concerned. Through this activity, practical marine education was made possible even in ordinary communities that do not have facilities such as Mangaliliu Community Sea-farming Centre, suggesting the possibility of implementing and sustaining the use of this approach in communities other than those where the project and the Fisheries Department have implemented the CBCRM approach.

Overall goal: A population-driven integrated coastal resource management approach is promoted in the Pacific region.

Marine education is highly applicable as a tool to induce community residents, regardless of region, to participate in integrated CBCRM activities.

The project team believes that the practice of marine education in the Pacific region suggests that it has the potential to contribute to building a platform for the promotion of an integrated CBCRM approach. Specifically, the fact that marine education is implemented with 'sustainable development of resources' and 'maximisation of benefits' in mind, and that such mind-setting is targeted mainly at primary school children but also includes adults in the community, has the potential to induce motivation and organisation for the community as a whole. From this perspective, it can be safely assumed that this tool is not limited to Vanuatu, but can be widely applied, as it can indirectly contribute to the construction of the main parts of the Blue Economy, namely resource management measures and livelihood enhancement (economic development) measures, which are the structure of the Integrated CBCRM Plan.

Application and dissemination challenges

Need for collaboration with relevant ministries: the key to the promotion of an integrated CBCRM approach lies in strengthening the social culture and institutional governance in the four perspectives. Specifically, there should be active participation of all generations as far as possible at the community level in an organised manner, and a concrete and timely infusion of funds and activities in collaboration with relevant ministries and agencies that encourage community organisation and participation of all generations. From this perspective, marine education was a tool for encouraging participation of all generations, i.e. real community-level participation, in that there was also active participation of adults, mainly community schoolchildren. In addition, it was possible to concretise the linkage between the Ministry of Education and the Fisheries Department in particular as a generational approach in the connecting measures. In addition to

this linkage with the Ministry of Education, the conservation of the marine environment by students based on coral rehabilitation activities in the future will not be limited to the Ministry of Education and the Fisheries Department, but will also have significant shared benefits for the Department of Tourism and the Department of Environment, which want to maintain healthy corals that are extremely important as a tourism resource.

Issue: dissemination of marine education on remote islands

Beach cleaning has been carried out in many parts of Vanuatu by community school teachers and students. Coral rehabilitation, which was the main activity of this project, is a practical activity for improving the marine environment beyond this activity. Coral rehabilitation is not an easy task due to the unpredictable nature of changes in the marine environment, but if deterioration is detected in the waters surrounding the community, it is desirable to actively engage in regeneration activities rather than just sit on the sidelines and watch the situation deteriorate. Even if the growth of transplanted corals is not observed, it is expected that the community will learn a lot during the monitoring process and become more aware of the importance of environmental conservation and sustainable development. In addition, if growth is observed in transplanted corals, and if such activities are gradually disseminated at the national level, this will not only lead to sustainable development by improving the environment of coastal resources, but also to halting and maintaining the deterioration of the marine environment, which is valuable as a tourism resource, in a way that the Fisheries Department cannot do alone, as the CBCRM. It is undeniable that the CBCRM approach has the potential to become a pillar of national economic development through the Blue Economy, which is a collaboration of stakeholders throughout the country, using the approach as a tool for environmental conservation, sustainable development of resources and tourism development. One of the challenges for the country-wide dissemination is whether teachers can become leaders in coral rehabilitation activities through the implementation of extra-curricular projects.

The first factor that must be mentioned as a success factor of this activity is the so-called aquarium effect of the use of the community livestock facilities, i.e. the fact that some marine organisms living in the community reef can be observed up close without going into the sea; secondly, the Ministry of Education had a scheme and even a budget for extracurricular lessons. Secondly, the Ministry of Education had an extra-curricular scheme and even budgeted for it, but nevertheless did not have any concrete ideas on the content of the extra-curricular lessons, a condition that was proposed by the project side.

Measures: Capacity development (CD) and implementation of marine education methods for teachers and Mangaliliu community

Teachers involved in primary education throughout the country receive regular training at teacher training facilities on Efate island. Therefore, the Research and Aquaculture Division of the Fisheries Department will take the lead in conducting a marine education CD for teachers using the Mangaliliu Community Sea-farming Centre. It can also be envisaged that the Mangaliliu community personnel trained through this activity could be used to conduct on-site classes in other communities. Specific activities that are not limited to knowledge transfer but have potential as field activities include coral rehabilitation, dense propagation of clam, and transplantation of the green snail.

4-3 Sports events (CT-3)

(1) Background to the development of the tool

When participatory workshops are held in communities for community-based coastal resource management, 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, new tools were developed and demonstrated to hold popular Vanuatu football (mainly popular with men) and volleyball (mainly popular with women) tournaments, and to use the occasion to raise awareness of the importance of resource management activities among the general population and school children.

(2) Demonstration results

Resource management awareness-raising activities through sports events were conducted three times during Phase 3 of GOS project. 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 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 residents to develop a common understanding of the current situation and challenges faced by coastal residents.

In this CBCRM Cup, the community-based workshops conducted in each community were able to gather young people with low levels of participation at an island-wide level, as shown in the table, enabling the resource management plans set up in each community to be disseminated as an all-island resource management plan. In doing so, it was not only a means of 'recruiting' people to carry out awareness-raising activities, but also a means of promoting the concept of fisheries resource management by applying the 'field', 'rules', 'division of roles' and 'discipline' of group-type sports to the target areas of fisheries resource management, management rules, roles of resource management committee members and compliance with the rules. plan, rather than a one-

way explanation of the plan, and enabled active discussion of the plan amongst the population.

Table 10: Average age of athletes and the number of people whose occupation is fishing

Team name	Poloa	Sakamao	Iwoka	Matakina
average age	24.75	27.41	23.24	29.37
Number of players	20	17	21	19
Number of fishermen (%)	10 (50%)	7 (41%)	11 (52%)	14 (74%)

A similar trial was carried out on Santo Island with the participation of all 10 communities in the project site, SPC project site and neighbouring communities, with similar results as on Emae Island.

(3) Evaluation of effectiveness and adaptability, and recommendations for future use of the tool

The use of sports events to raise awareness of resource management was very well received by the country's Fisheries Department and residents. Such sporting events are considered to be highly effective as a tool for fostering awareness and encouraging behavioural change among residents, in that they became a tool to help young people who observe and respect the rules of football understand the importance of treating coastal resource management rules in the same way. However, due to the reputation of the CBCRM Cup, which was implemented by GOS project, the scale of the CBCRM Cup increased with each round, and the budget for its implementation gradually became larger. It is considered practically difficult for the Fisheries Department alone to implement this activity in the future on the scale implemented by the project.

The followings are recommendations for the use of this tool.

- An important aspect of this tool is to increase participation in community-based coastal resource management through sport, especially among young people. Therefore, it could be continued in a way and on a scale that does not require a lot of funding, such as awareness-raising activities through sports events by two neighbouring communities. Other activities should be carried out in cooperation with the Ministry of Youth and Sport and football associations that organise and implement these sporting events.
- The United States Agency for International Development (USAID), which is currently working on the project, is also likely to support this activity and implement the CBCRM Cup on Tanna Island. It is desirable to continue this activity by making other donors aware of the effectiveness of this tool.

4-4 Research and study (CT-4)

(1) Background to the development of the tool

Research and study are generally carried out by fisheries departments. In most cases, the results are not shared with communities. On the other hand, the implementation of research and study activities by the community, and the analysis and sharing of the results, enables the community to understand the current status of the resource and can serve as a motivation to continue resource management activities. For this reason, this tool was developed and demonstrated.

(2) Demonstration results

On Emae Island, Shefa Province, one of the pilot sites of GOS project Phase 3, a reef check (under water monitoring) of the managed area was planned by the Resource Management Committee, and reef check training was conducted by the project. The training included theoretical lectures on visual observation of the seabed using line transects and setting of fish and shellfish to be monitored, practical training on the reefs of Marae as part of the field survey, and practical training on creating graphs in Excel based on the data obtained in the practical training. Figure 30 shows the practical training and the graphs produced by the Resource Management Committee during the practical training.

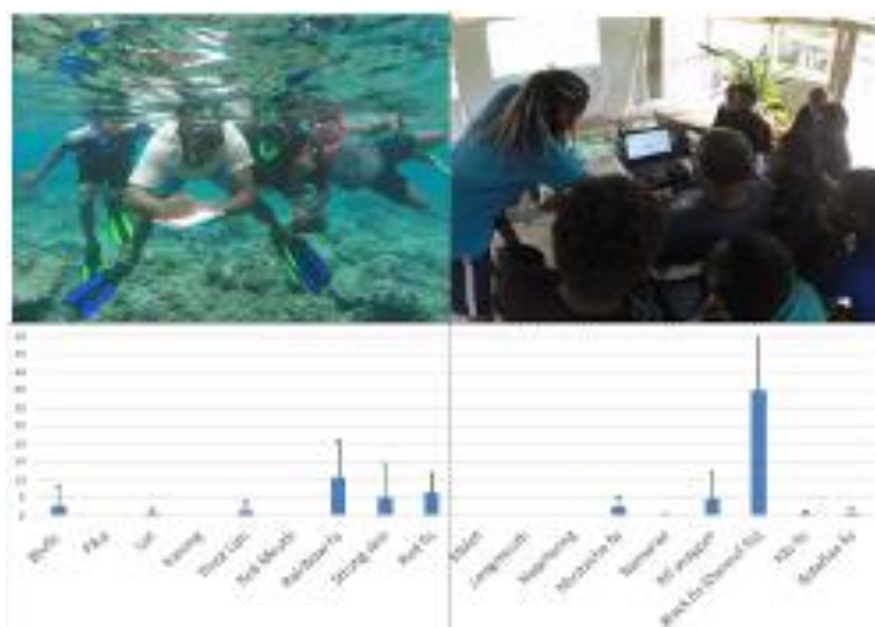


Figure 30: Practical training and graphs produced by the Resource Management Committee through the practical training

(3) Evaluation of effectiveness and adaptability, and recommendations for future use of the tool

The limited staffing of the VFD makes it difficult to conduct research and survey activities in all villages throughout Vanuatu. As such community-based activities can expand the scope of activities with less effort, which itself can be a motivation for resource management. Pilot activities will be carried out on Futuna Island as a model, succeeded by the Food and Agriculture Organisation of the United Nations (FAO) and with the cooperation of the VFD's Research and Aquaculture Division. The plan is to then propose implementation on other islands in Tafea Province, depending on the results, and it is desirable to promote such activities.

4-5 Eco-tag (CT-5)

(1) Background to the development of the tool

In promoting activities such as shell crafting, if resources are overexploited to secure materials, it cannot be said that the activity supports resource management. As a way to raise awareness of the use of dead shellfish as a material for shell crafting, a tool was developed and demonstrated by applying an eco-tag (eco-labelling) and appealing to tourists with high awareness of environmental protection.

(2) Demonstration results

In Phase 2 of GOS project, the Mystery Island MPA Committee on Aneityum Island, Tafea Province, planned to distribute eco-labels to be attached to shell crafts made on the island to help fund community-based resource management activities, in order to promote links between shell crafting and sales and resource management activities. The project printed 300 eco-labels and provided to MPA Committee. Originally, MPA Committee supposed to appropriately select, distribute and utilise shell craft producers and sellers to cooperate with the eco-labelling activities. However, as the eco-labels were not widely known amongst those involved, the MPA Committee distributed the labels to shell craft sellers on a trial basis free of charge, with the aim of encouraging them to use the labels to promote local shell crafting. This activity has since been passed on to some shell craft producers with inexpensive eco-labels designed by JOCV members dispatched to the VFD.



Figure 31 Eco-tags attached to shell crafts

(3) Evaluation of effectiveness and adaptability, and recommendations for future use of the tool

The reason why this activity, despite its significance, has not disseminate and taken root since

the time of the plan is largely due to the stove-piped administrative structure of the relevant ministries. VFD has not made efforts to cooperate with these ministries, taking the stance that it should be the Ministry of Industry and Department of Tourism that promotes such a system. However, as already mentioned, shell crafting training has been conducted in various regions, mainly by TIVET (Vocational Training Department) and Department of Women, and there is a strong possibility that high quality shell crafting will be introduced to the market in the future. On the other hand, there is concern that if the eco-labelling does not become widespread, it could lead to overfishing of the resource. With these considerations in mind, it is essential that the Fisheries Department promotes cooperation with relevant organisations.

4-6 Providing labour force to resource management activities (CT-7)

(1) Background to the development of the tool

CBCRM activities require labour in various situations. For example, it is possible to outsource the construction of a community fish market to a construction company, but providing only the materials and carrying out part of the CBCRM activities by providing their own labour could motivate them to carry out resource management activities, and a tool called 'community labour for resource management activities' was developed and demonstrated. This tool was developed and demonstrated.

(2) Demonstration results

The tool is being used in Phase 3 of GOS project in the construction of a building to house a solar freezer and a community fish market.

(3) Evaluation of effectiveness and adaptability, and recommendations for future use of the tool

While this activity is considered to have fostered motivation to manage resources, what needs to be taken into account is the delay in construction and other activities. The fact that the project was free of charge meant that if the community had paid activities or other high priority activities, the project activities were sometimes put on the back burner and completion was delayed. Therefore, it is difficult to utilise this tool for activities that have limited deadlines.

4-7 Nutrition improvement (CT-8)

(1) Background to the development of the tool

The Vanuatu National Fisheries Sector Strategy stated that the risk of non-communicable diseases would be reduced by promoting fish diets. Information gathering also confirmed that the nutritional situation in Vanuatu is partly poor, with intake of foods high in calcium, which is essential for good health, being below recommended levels.

Fish contains high-quality protein, fat, essential amino acids and other nutrients, and tools for improving nutrition were developed with the aim of utilising fish without wasting it and at the same time improving nutrition.

(2) Demonstration results

The activities largely involved (i) preparation of fish bone meal, (ii) testing of the nutrients contained in the fish bone meal, and (iii) introduction of the fish bone meal to relevant institutions (Ministry of Commerce and Industry, three schools in Port Vila, Ministry of Health and Port Vila Central Hospital) and trial cooking. Some schools in Port Vila were targeted for the activity as they have a programme called Farm to Table, which aims at local production for local consumption of school lunch ingredients, in collaboration with the Vanuatu Government and the schools from 2021 onwards.

Fish bone meal was prepared by (i) drying in an oven or frying in oil and (ii) grinding with a household mixer or similar.

Tests for nutrients in bone meal were conducted in Japan by the Food Environment Health Research Institute Inc. and in Vanuatu by the Vanuatu Bureau of Standards. The test results showed that the nutrients such as calcium, iron, magnesium and phosphorus were abundant in the bone meal.

The above procedures and test results were introduced to relevant organisations involved in improving nutrition, and trial cooking was conducted to give them hands-on experience. The stakeholders agreed that the activities based in schools and hospitals would improve calcium intake, which is essential for young people and undernourished patients, and promote the health of the whole community. They also said that there were no hurdles to introducing the system.

(3) Evaluation of effectiveness and adaptability, and recommendations for future use of the tool

The nutritional improvements described in this paper are understood as an option of one of the 'connecting measures', i.e. a lateral means of making integrated CBCRM work effectively through one of several connecting measures or a combination of several connecting measures depending on local conditions.

This activity was recognised as extremely important if the dissemination of integrated CBCRM in the future is to be placed at the centre of the vision, Effectiveness and impact on PDM.

Output 1: The applicability and practicality of the integrated CB-CRM approach is enhanced.

The importance of the fisheries sector in the Oceania region is also mentioned in JICA's 'Global Agenda (Issue-Specific Project Strategy) 7. Improving Nutrition - Promoting the 'JICA Nutrition

Declaration" as an objective for improving nutrition. Specifically, in the fisheries sector, which is highly important as a source of protein in Oceania, it is stated that the project will work on the proactive management of fisheries resources by fishing village residents' organisations, the coexistence of people and nature based on the principle of 'Satoumi' and the construction of fisheries FVC, as 'Blue Economy in Fisheries on the Islands'. The fisheries resource management and nutrition improvement activities in this project are in line with the global agenda.

As there are many factors contributing to malnutrition and a wide range of initiatives, interventions in multiple areas (health, agriculture, fisheries and food, water and sanitation, education, etc.) are needed, as follows.

Food (quality food)	Nutritious food (agriculture, fisheries) Food security within the household
Eating behaviour (how to eat and feed)	Nutritional practices from infancy. Creating a healthy eating environment
Services (our food environment).	Appropriate health services

The activities in this project are one idea in improving nutrition, where multi-sectoral efforts are needed.

The activities described here, while focusing on the contribution to resource management, may also contribute to improved nutrition, thus strengthening the applicability and practicality of the integrated CBCRM approach in the following ways.

- Involving schools: in developing countries, young people are often socially vulnerable in terms of nutrition, so this activity, which improves the intake of essential nutrients such as calcium for young people, could contribute to promoting the health of the whole community.

Apart from the above-mentioned recognition of the need for improved nutrition and health promotion through the consumption of seafood in schools serving school lunches and hospitals serving hospital meals, the following points indirectly contributed to the applicability and practicality of integrated CBCRM.

- Contribution to strengthening the fisheries value chain through increased potential to stimulate demand for seafood products.
- Reduction of fishing pressure on in-reef stocks by promoting the development of low-use stocks outside the reef through the above

Project Purpose: The integrated CB-CRM approach developed in the project will be implemented nationally and within Melanesia.

From the following perspectives, improved nutrition is likely to be sought within the country, as well as within Melanesia, and is likely to contribute as one activity in the implementation of integrated CBCRM.

- Potential for implementation in other communities to improve nutrition: some schools receive about 200 kg of tuna and other offshore fish once a week and serve them as school meals, with the bones being discarded. In the case of similar situations (e.g. hospitals), not only in schools but also in other communities, bone meal can be produced in a simple way and can therefore be used in school and hospital lunches on other islands.
- Potential approaches in households and aquaculture farms: only a suggestion, but two options are being considered: first, in households, where fried reef fish bones could be consumed to make better use of resources and increase the intake of nutrients such as calcium; and second, in aquaculture farms, where, when thinning out poorly growing individuals, they could be fried and consumed to promote the growth of better-growing individuals and increase the intake of nutrients such as calcium. The second is in aquaculture where, when thinning out poorly growing individuals, they can be fried and consumed to promote the growth of the better growing individuals and increase the intake of calcium and other nutrients.

Overall Goals:

- ① Integrated Community-based Coastal Resource Management (CB-CRM) approaches are widely extended in Vanuatu as official standard approach for promoting coastal resource management.
- ② Integrated CB-CRM approach is widely promoted in the Pacific region.
- Improved nutrition is highly applicable as a tool to induce community residents to participate in integrated CBCRM activities, regardless of region.

The project team believes that the practice of nutritional improvement in the Pacific region suggests that it may indirectly contribute to building a platform for the promotion of an integrated CBCRM approach. Specifically, this is because nutritional improvement can approach both the effective use of resources and nutritional improvement by utilising bones that are normally discarded, as in this case, and by actively communicating these points to school students, it can raise awareness about the 'sustainable use of resources' and 'effective use of resources'.

Application challenges and measures to address them

Issue: need for cooperation with relevant ministries, etc.: In small-scale fisheries, the days and quantities of fish caught are often not consistent. This situation can make it difficult for fishermen to find a place to sell their products, and for consumers, who want a bulk quantity, making fisheries products less attractive. Through this activity, the Fisheries Department provided the Ministry of Commerce and Industry with information on local fishermen (fishing season, landing sites, fish species, quantity, etc.), suggesting that the Ministry of Commerce and Industry, which promotes local production for local consumption, may cooperate in cold chain development with a view to providing a bulk quantity and stable supply of fisheries products, and therefore, through inter-ministerial collaboration, it is possible to through the development and stabilisation of sales channels, the potential for the spread of fish diets will also increase. Therefore, cooperation with relevant agencies should be promoted.

Measures: Promote information gathering (also essential for resource management)

It is desirable for the Fisheries Department, the Ministry of Education, the Ministry of Commerce and Industry and the Ministry of Health to unite in a campaign to stimulate the consumption of fisheries products, as improved nutrition of the population will lead to reduced costs for healthcare and a stable labour force from a medium- to long-term perspective. On the part of the Fisheries Department, as part of the catch data collection system that it has been promoting in order to develop strategies for the development of resources outside of reef in particular through the establishment of a cold chain network, activities that show the benefits to the fishermen, such as feedback of information, stabilisation of sales channels, provision of fishery statistics information and integration of financing, are possible.

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