

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.

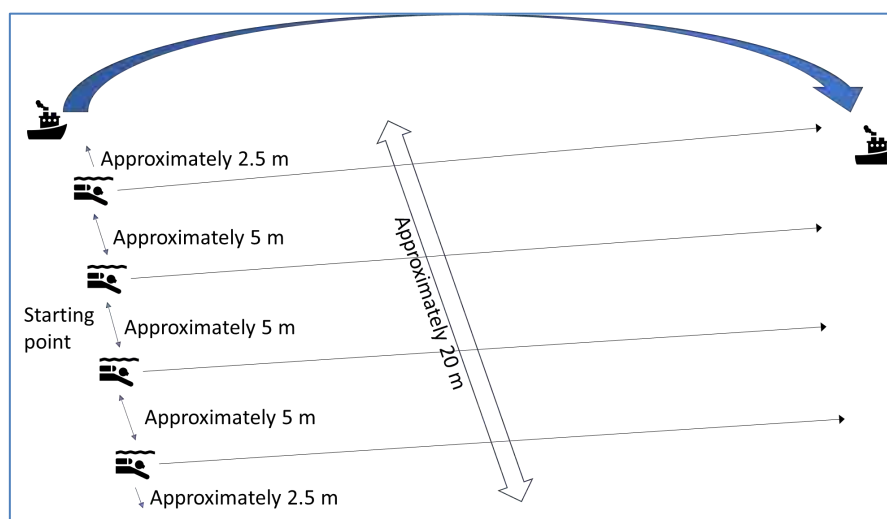
Status survey of green snail transplanted to Emae Island

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.

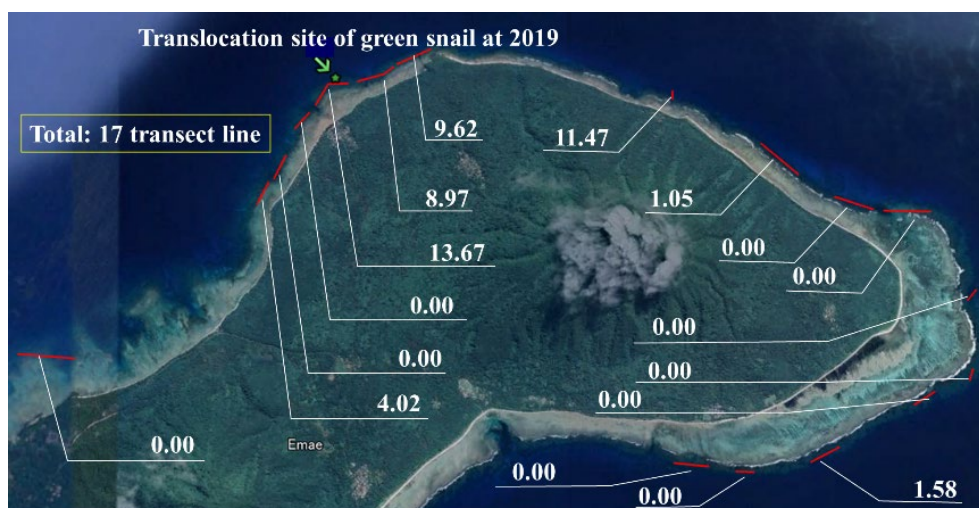
6. The range observed by the snorkeler is calculated and estimated from the recorded GPS coordinates as follows, and the amount of mussels inhabited per unit area is recorded. The calculation method: distance between start and end points x width observed by snorkeler (20 m = 5 m x 3 + 2.5 m + 2.5 m).

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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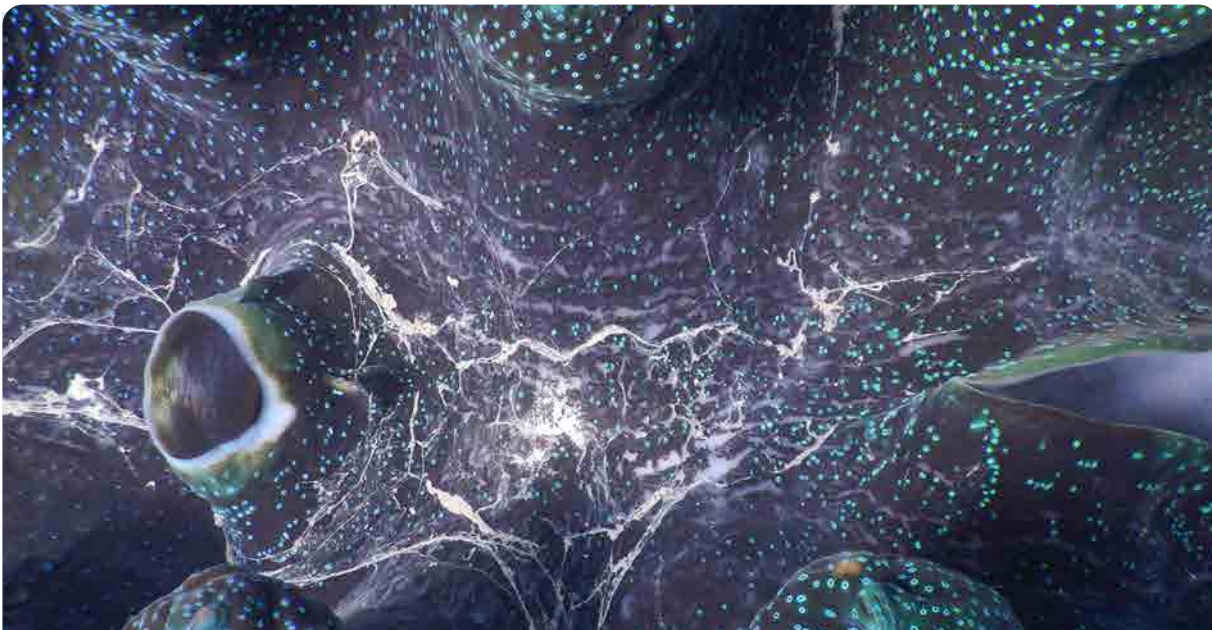
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Acknowledgment



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

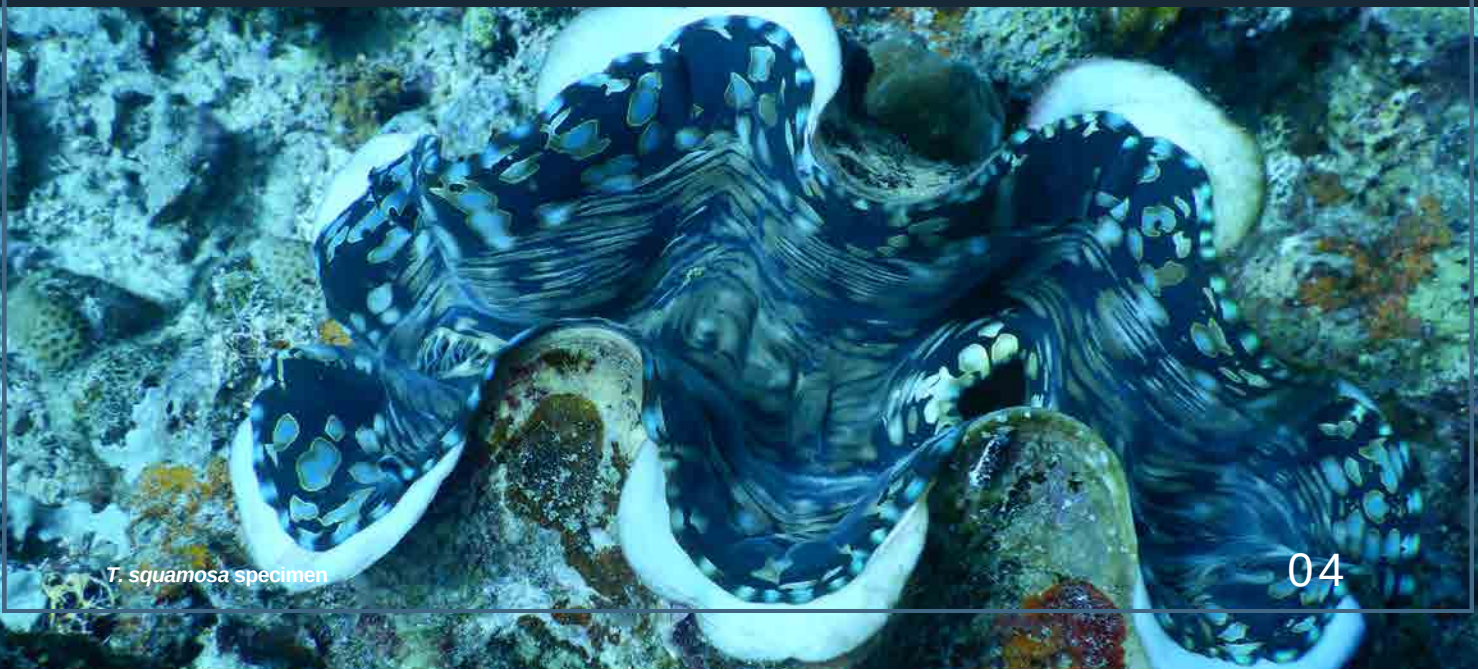
Giant clams are bivalve mollusks that inhabit shallow tropical and sub-tropical waters, mainly in the Indo-Pacific region (Hean and Cacho, 2003). They are unique to other bivalves as they share a symbiotic relationship with an algae (symbiodinium) that resides within the upper layer of their mantle. 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).

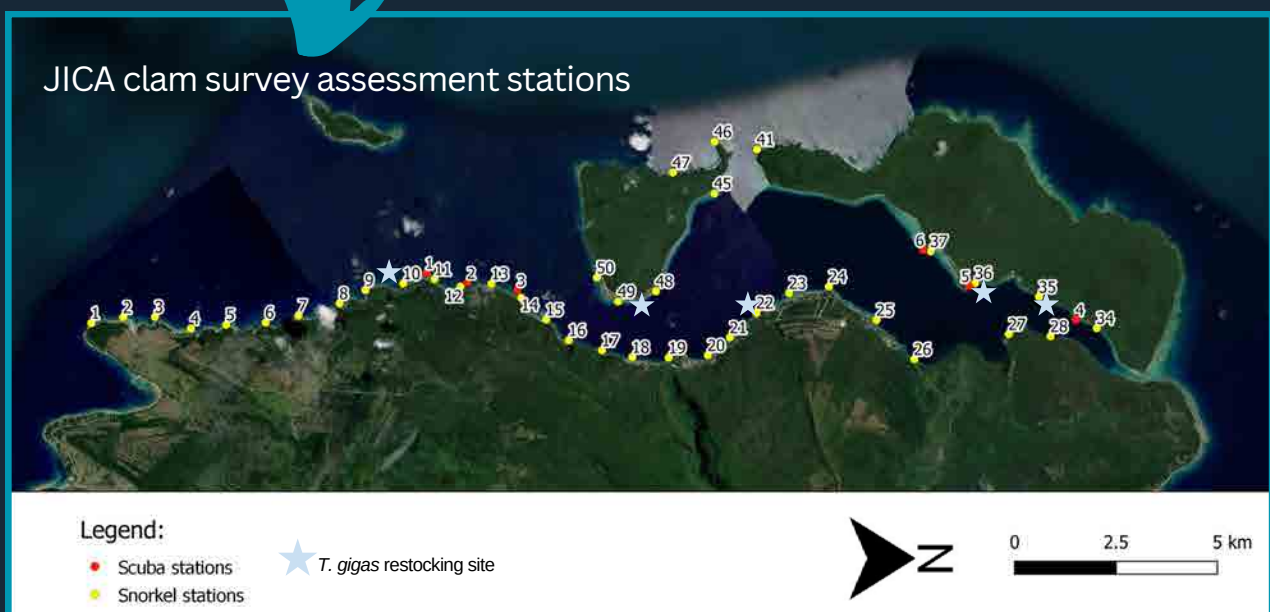


Figure 1. Map of survey stations from Tuktuk point to Moso Landing

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.

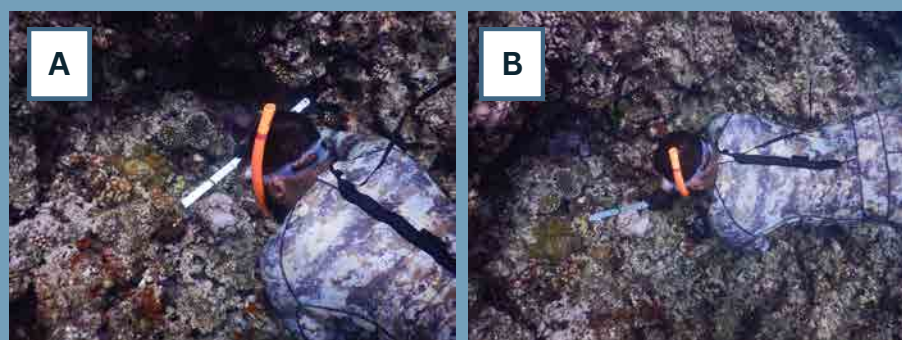


Figure 2. a) Snorkeler measuring the length and b) width of a boring giant clam (*T. crocea*).

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.

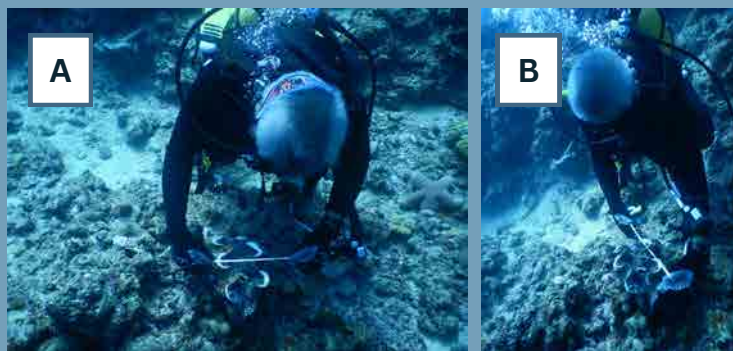


Figure 3. a) Scuba diver measuring the length and b) width of a Fluted giant clam (*T. squamosa*).

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*.

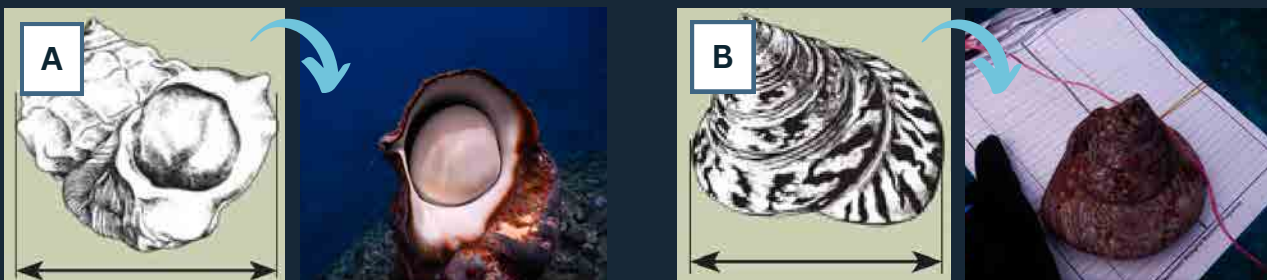


Figure 4. a) Measuring the long width in *T. marmoratus* and b) measuring the longest shell base length in *R. niloticus* (Pakoa, 2013).

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).

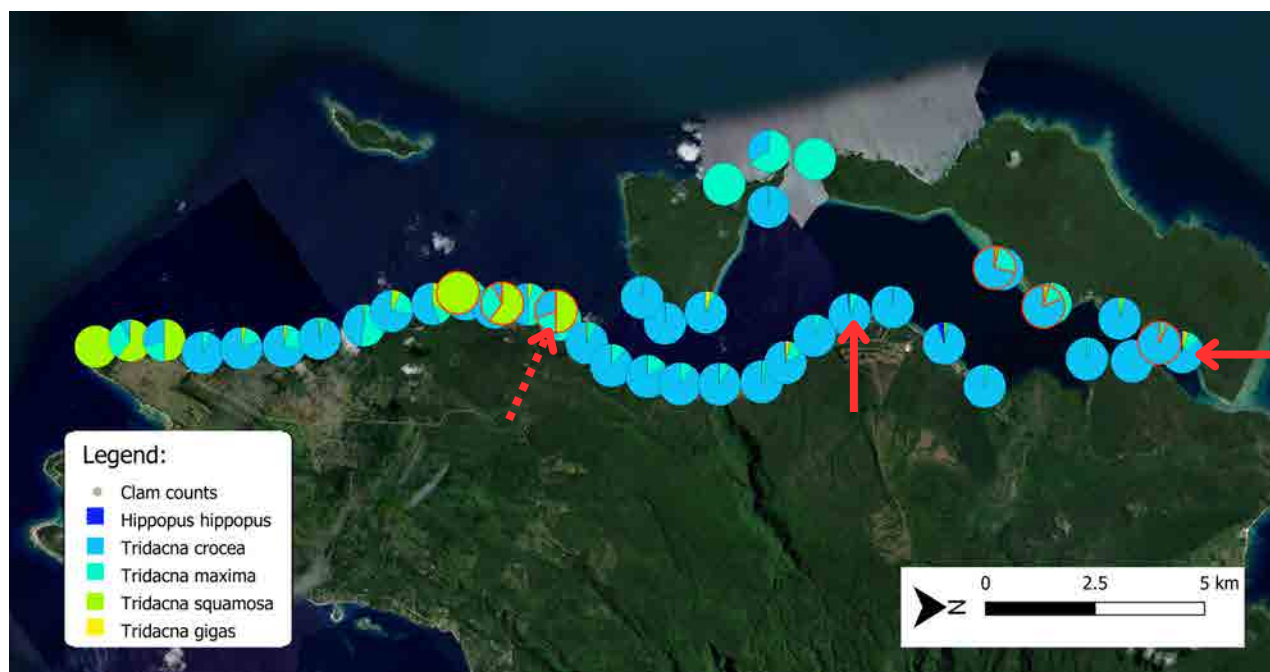


Figure 6. Proportion of abundance per species per station. Red outlined pie charts are scuba stations whilst black outlined pie charts are snorkel stations. Solid arrows show clam gardens that were put together by local communities that happen to be in vicinity of the station while dotted arrow shows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

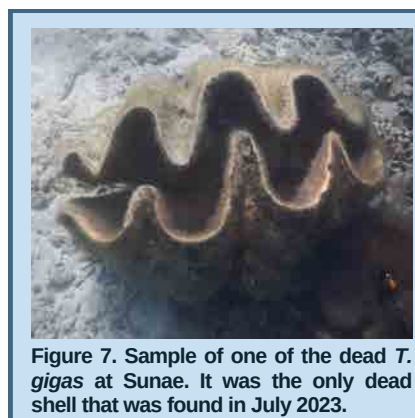


Figure 7. Sample of one of the dead *T. gigas* at Sunae. It was the only dead shell that was found in July 2023.

Density

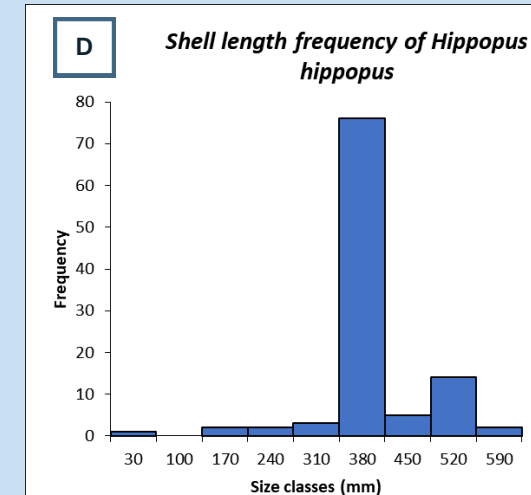
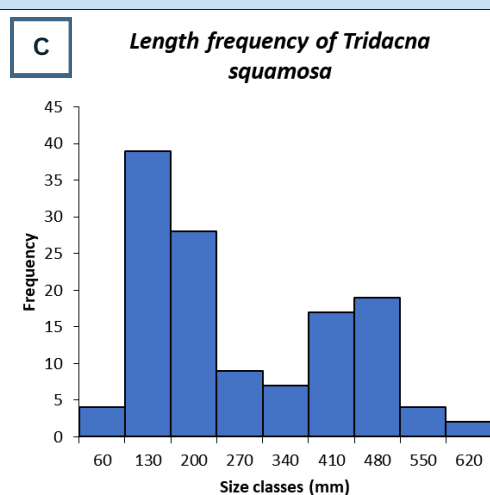
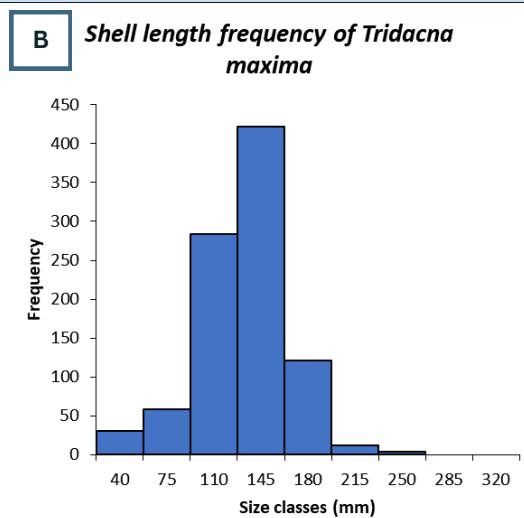
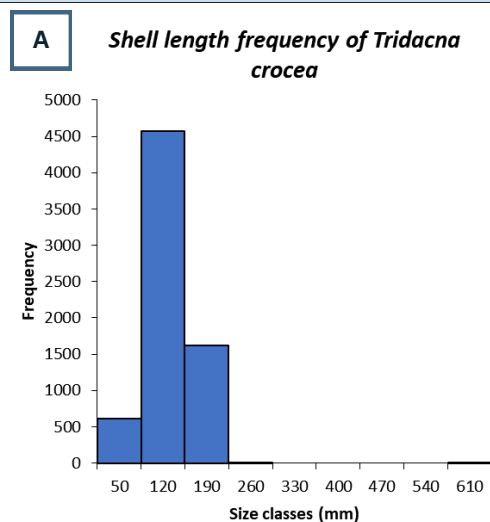
T. crocea had the highest calculated density of all clam species that were observed with 322 individuals per hectare followed by *T. maxima* with 44 individuals per hectare. Much like the trends in abundance, the trends in density, also, follow a similar pattern.

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.



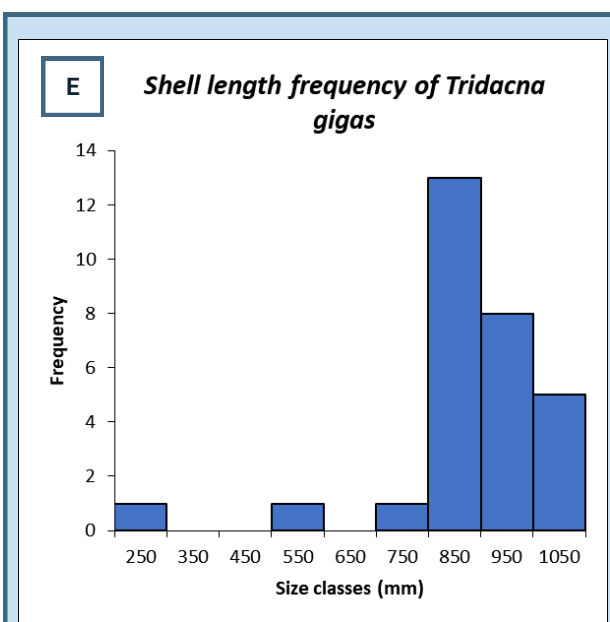


Figure 8. Length frequency histogram for a) *T. crocea*, b) *T. maxima*, c) *T. squamosa*, d) *H. hippopus* and e) *T. gigas*

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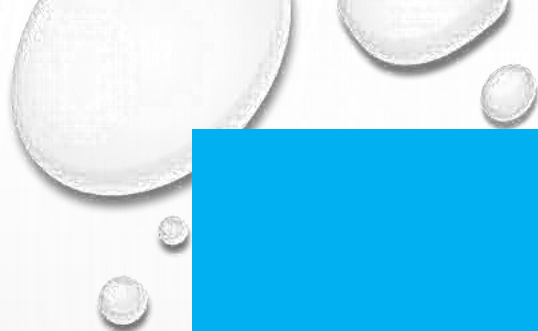
TRAINING FOR INTEGRATED COMMUNITY BASED- COASTAL RESOURCE MANAGEMENT (CB-CRM) FOR FISHERIES DEVELOPMENT OFFICERS

VANUATU FISHERIES DEPARTMENT (VFD)

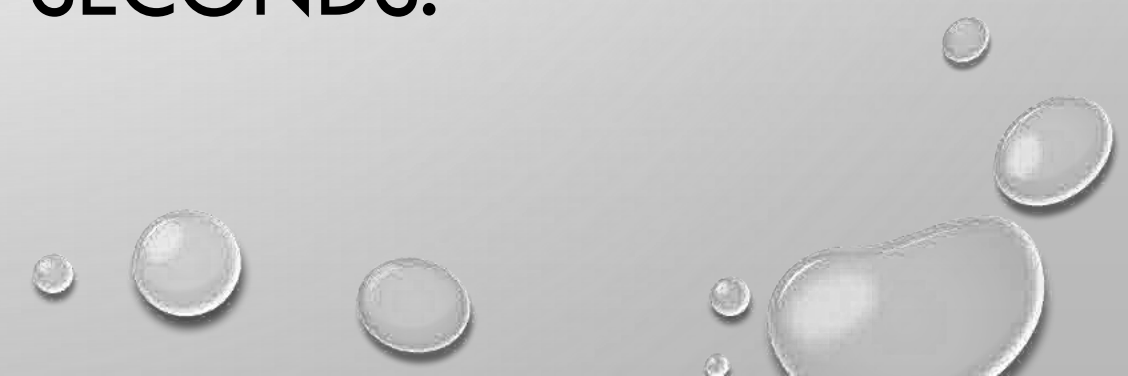
THE PROJECT FOR PROMOTION OF GRACE OF THE SEA

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.
- 

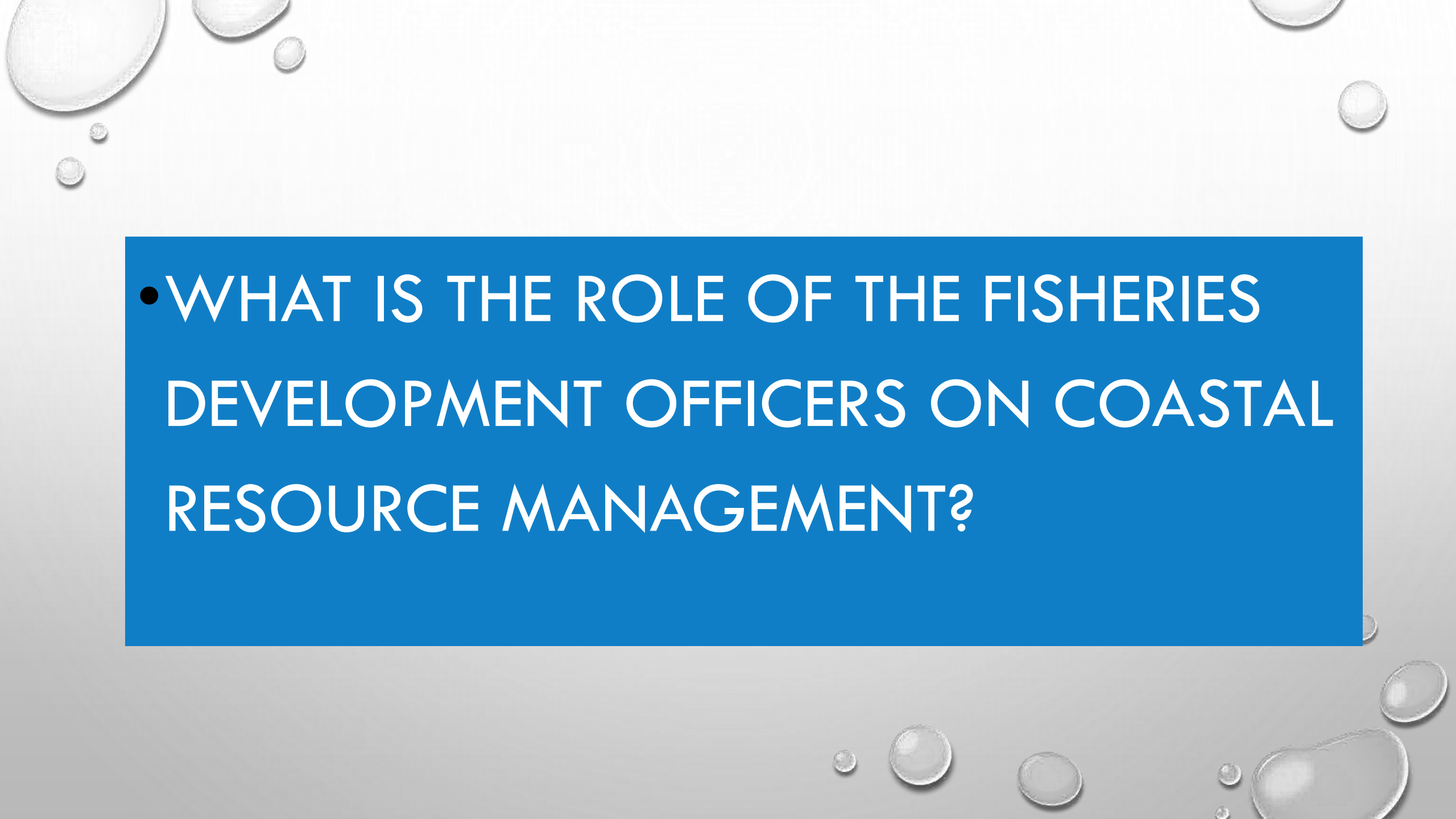


WHAT IS INTEGRATED CB-CRM?

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	✓ Leaning 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

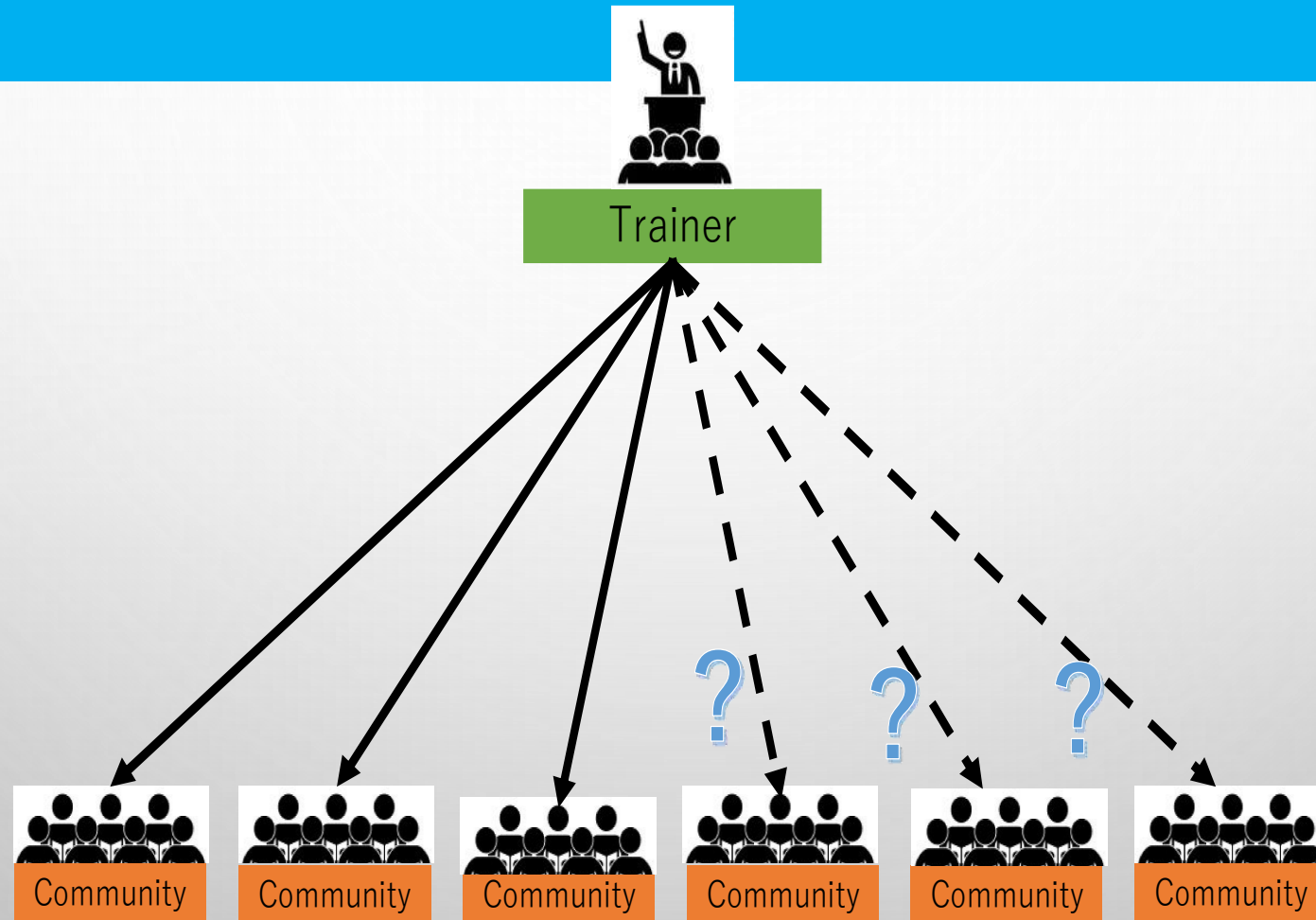


Figure: Structure of ordinary trainings

WHAT IS TRAINING OF TRAINERS (TOT)?②

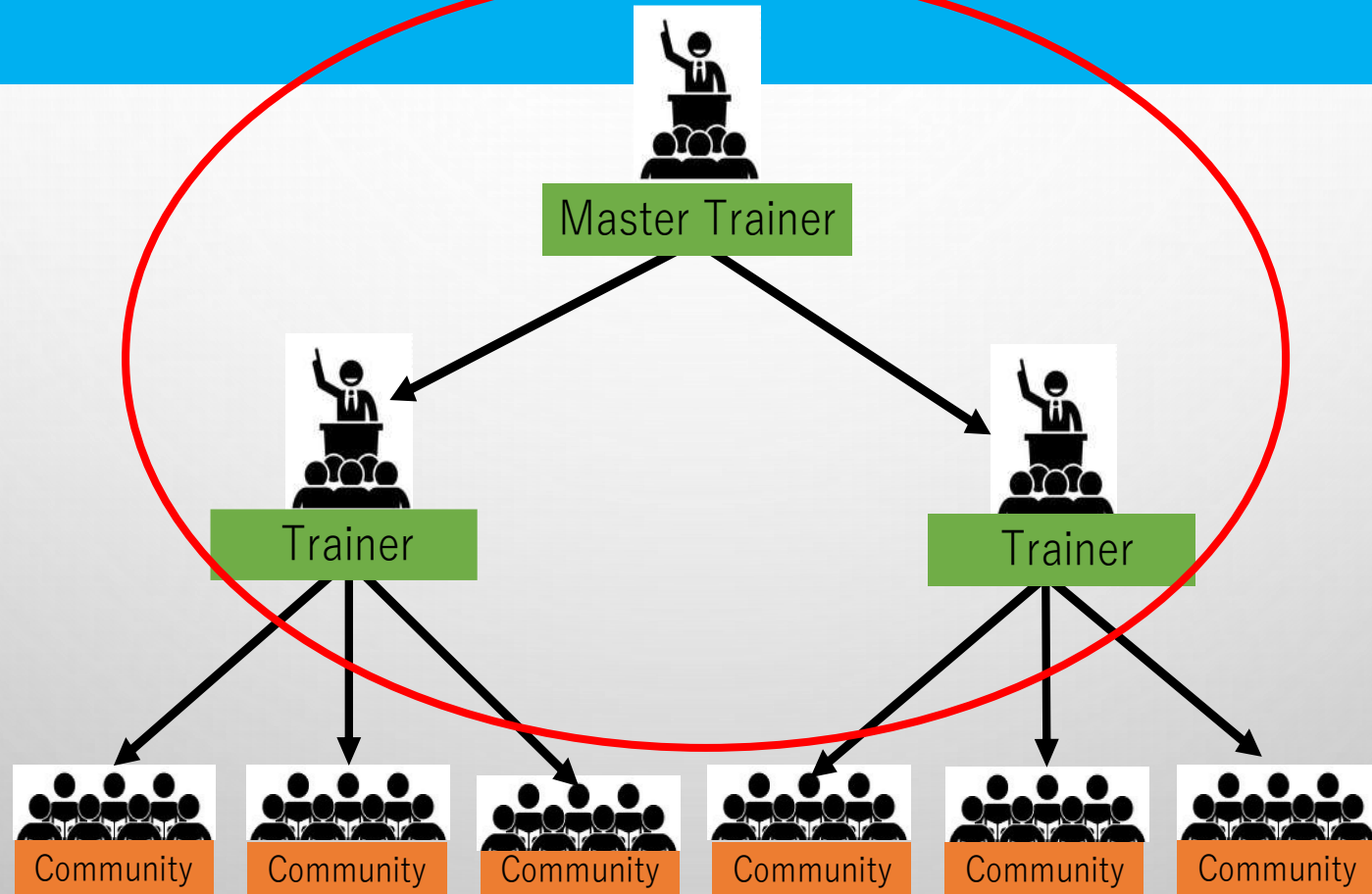


Figure: Structure of TOT

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)

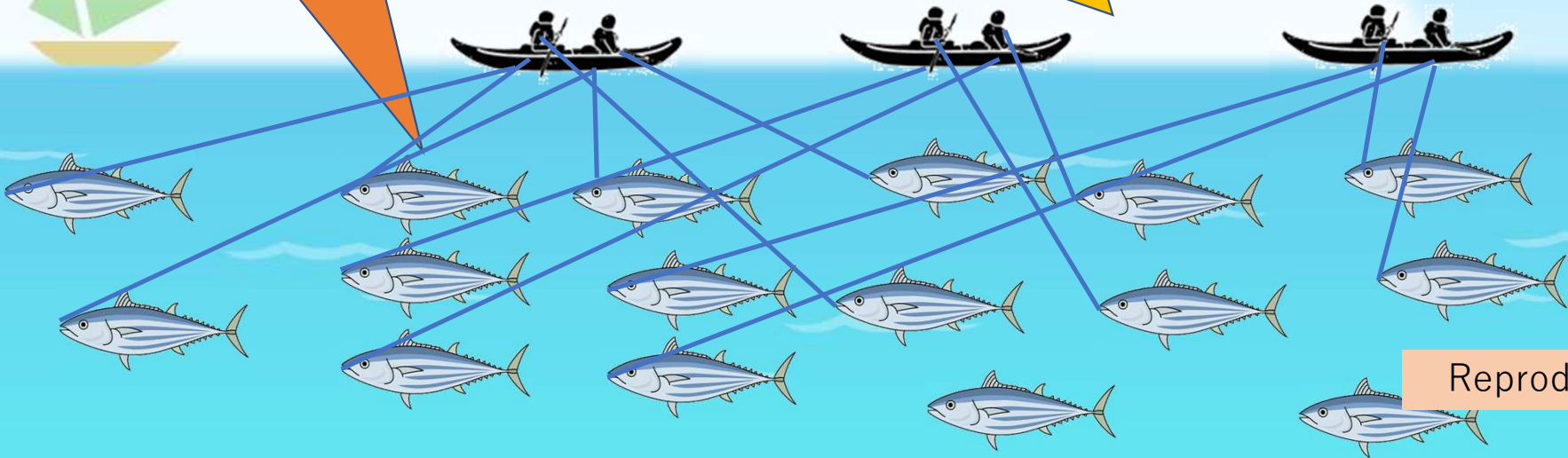


1. Necessiti blong kostel risos manejmen

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?

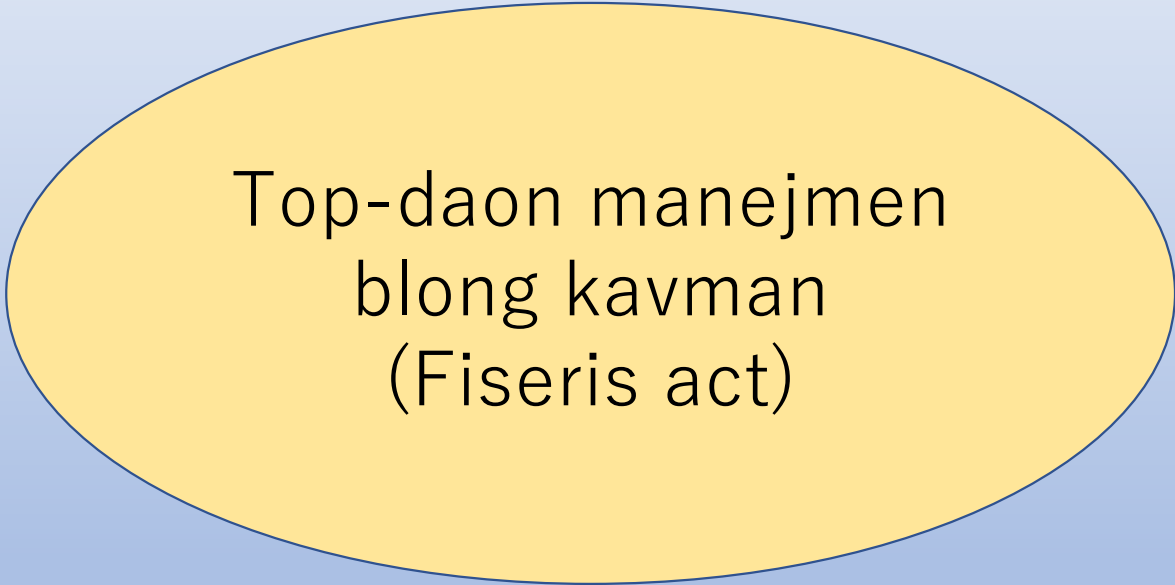
- Ol wanem kaen mesa nao bambae yumi konsidarem blong kontrolem blong i stopem risos we i sta go daon?

- 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)

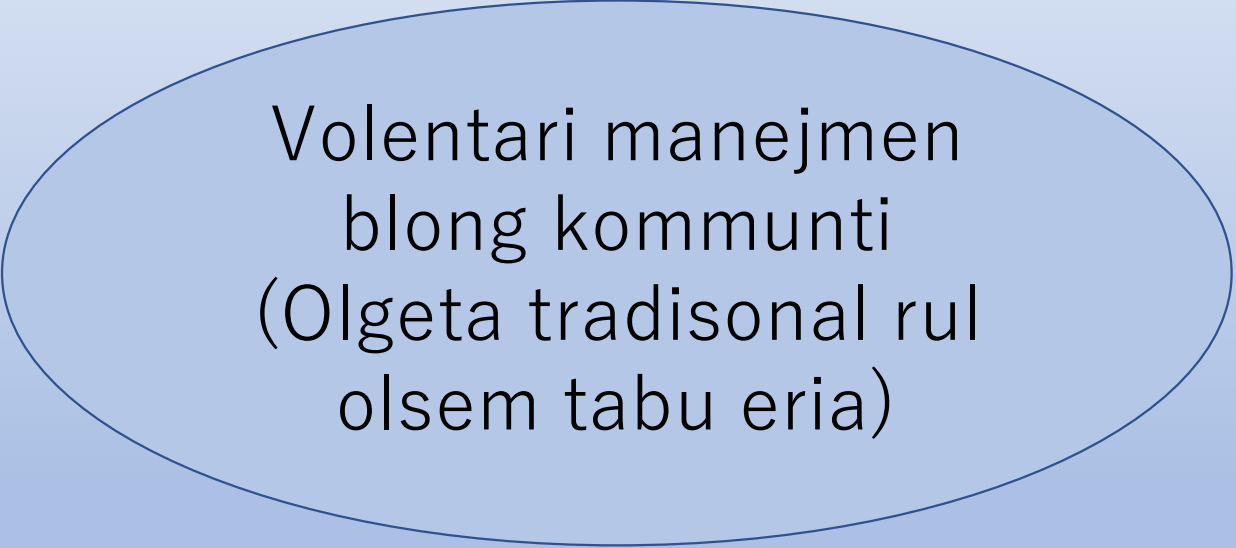
Ol rabis saed

- 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)

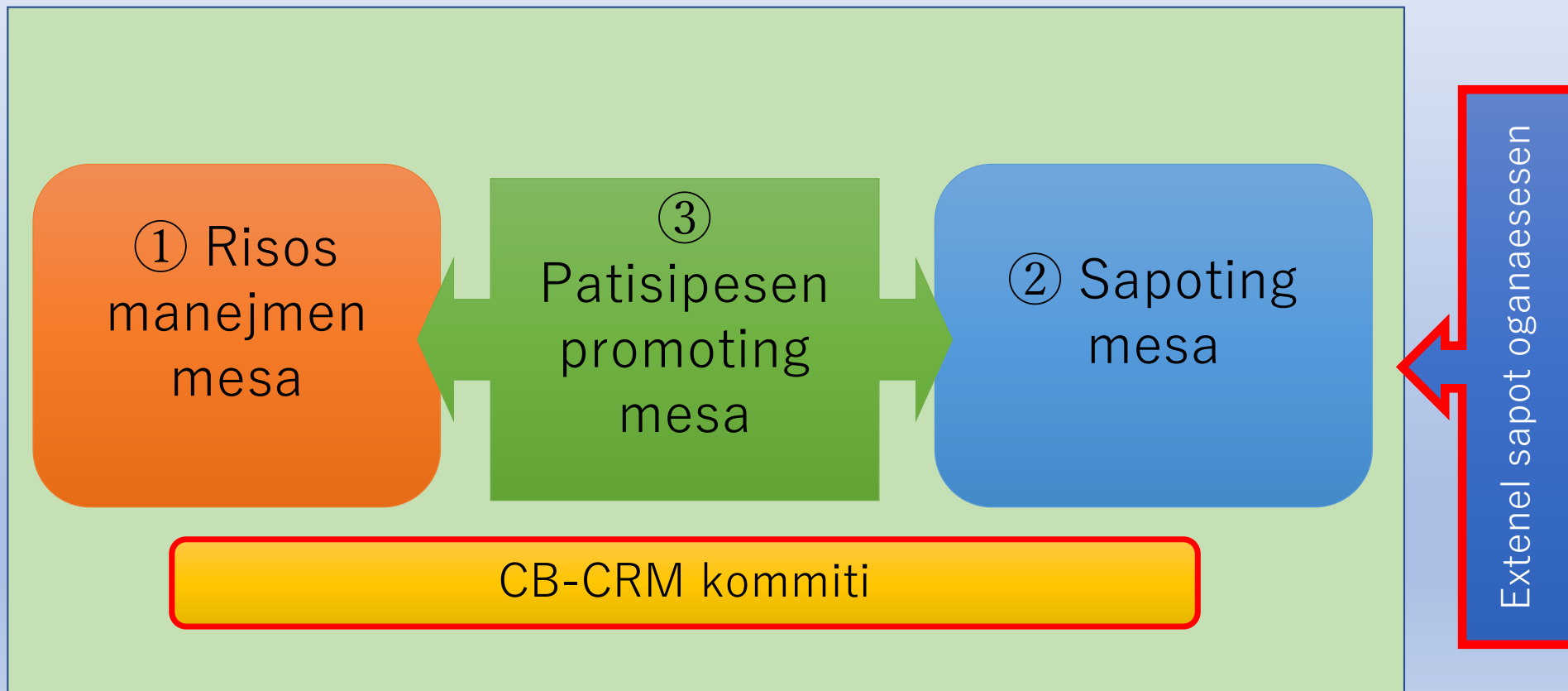


Volentari
manejen blong
kommunti
(Olgeta
tradisional rul
olsem tabu eria)

Government authorizes their
rules and supports to
implement it

Community discusses and
decides own rules on their
coastal resources

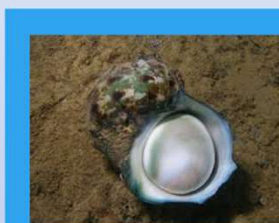
3. Components of the CB-CRM plan



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.

Kontrollem
fising graon



Kontrollem
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**



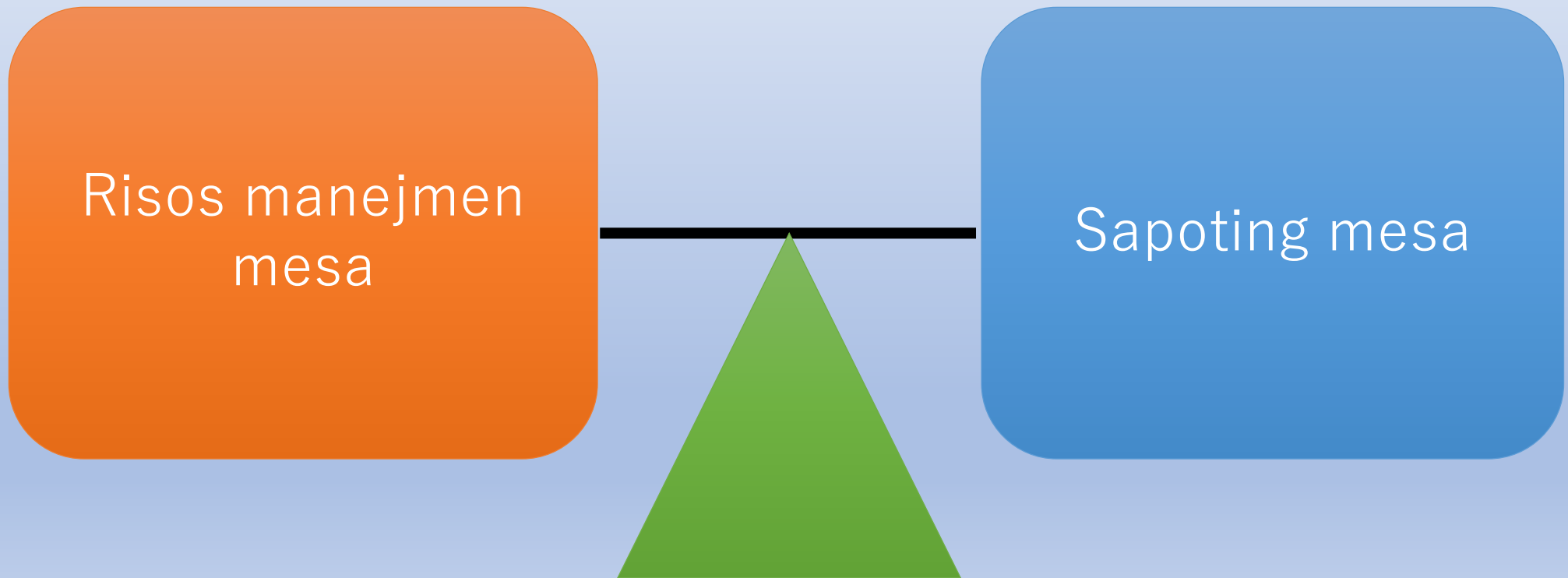
5. Sapoting mesa

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.

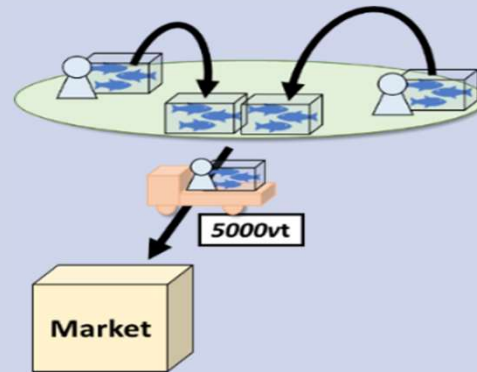
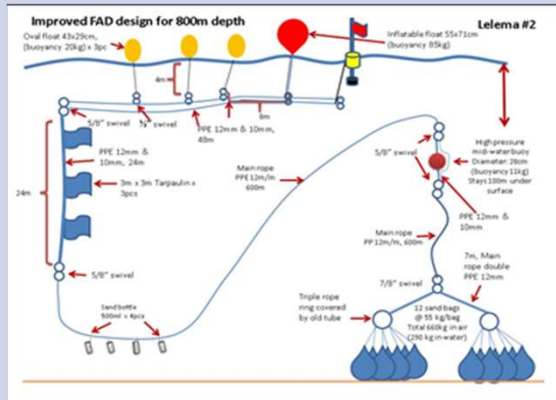
Hemia olgeta exampol:

6. Approach blong sapoting mesa

Daevesifikesen blong olgeta fising aktiviti

Valiu addisen

Olgeta narafala wei blong inkam sos divelopmen



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)**

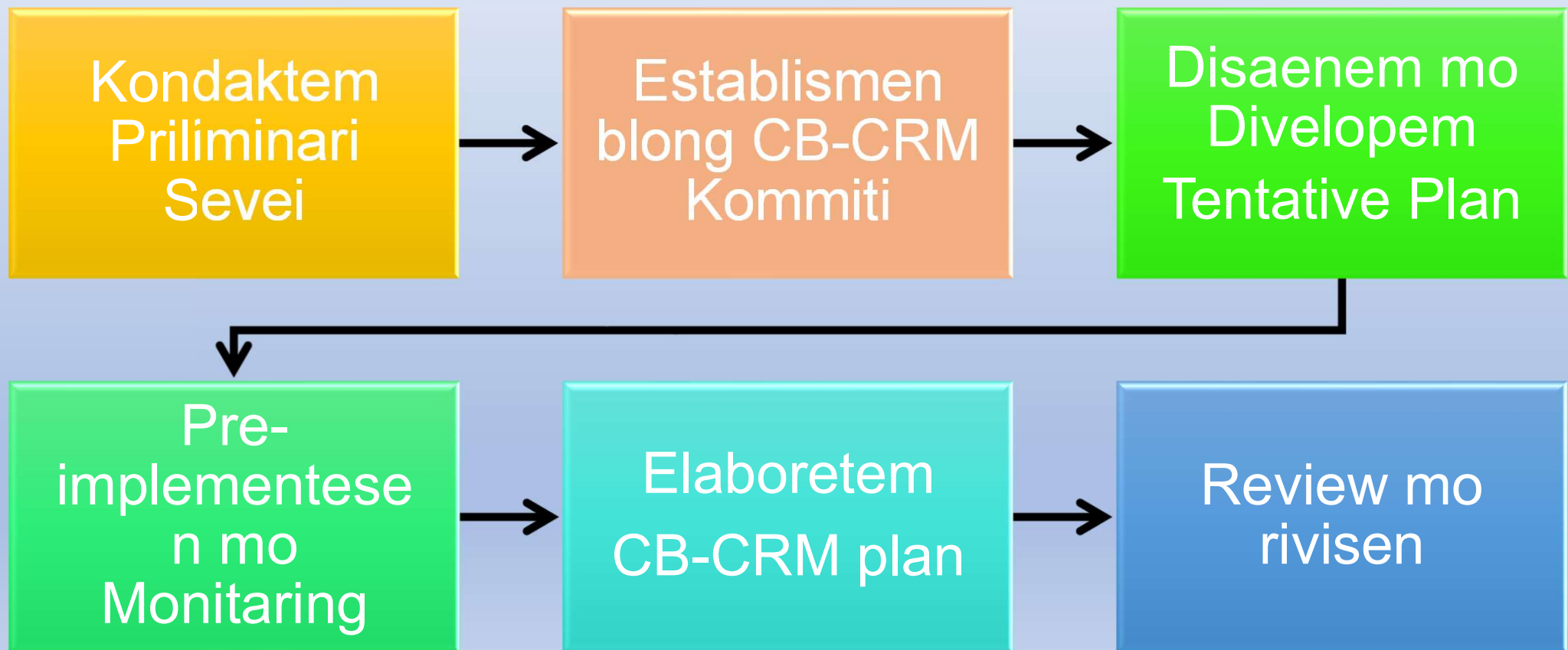


Eco-tag

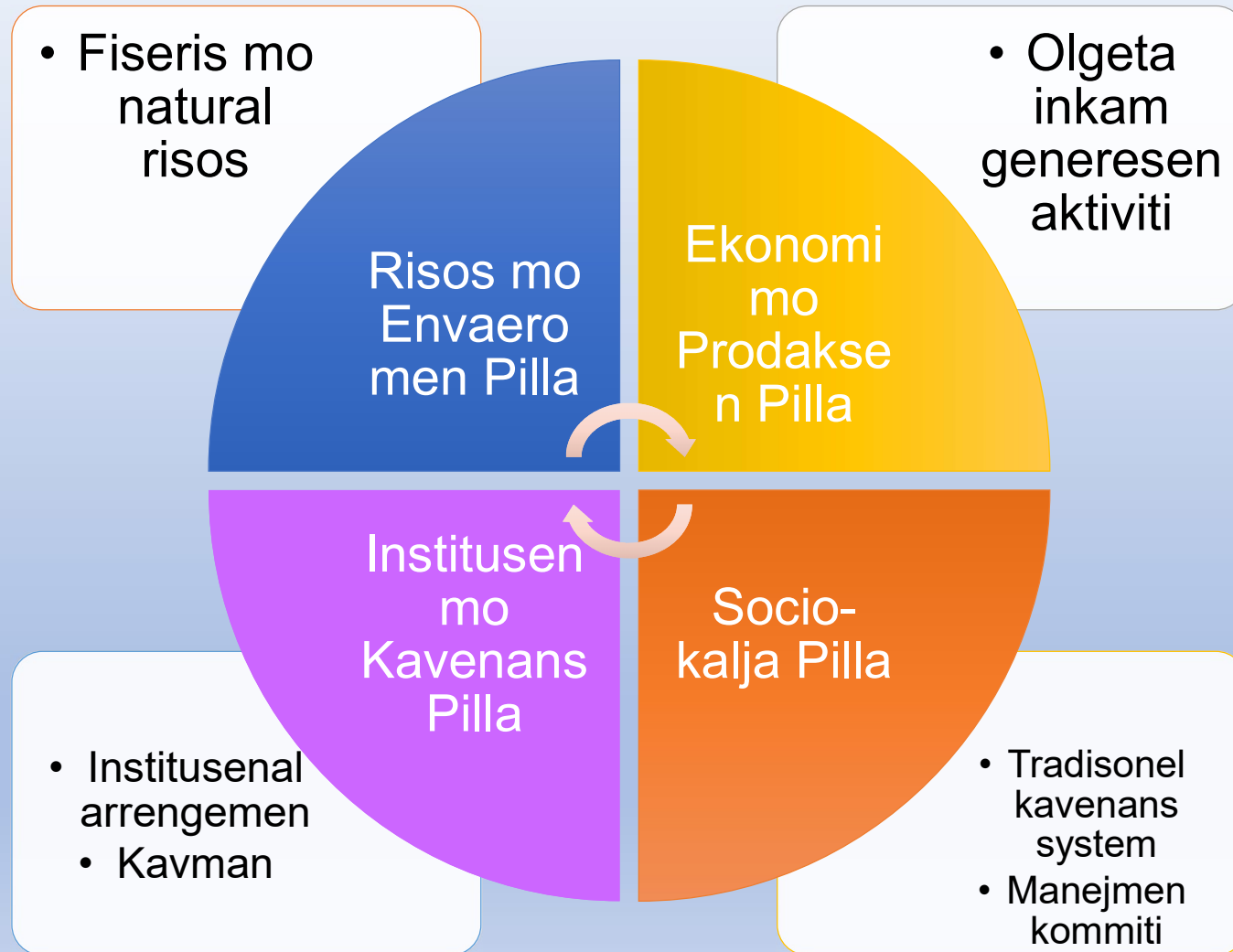


9. Hao blong prioerem CB-CRM plan

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.

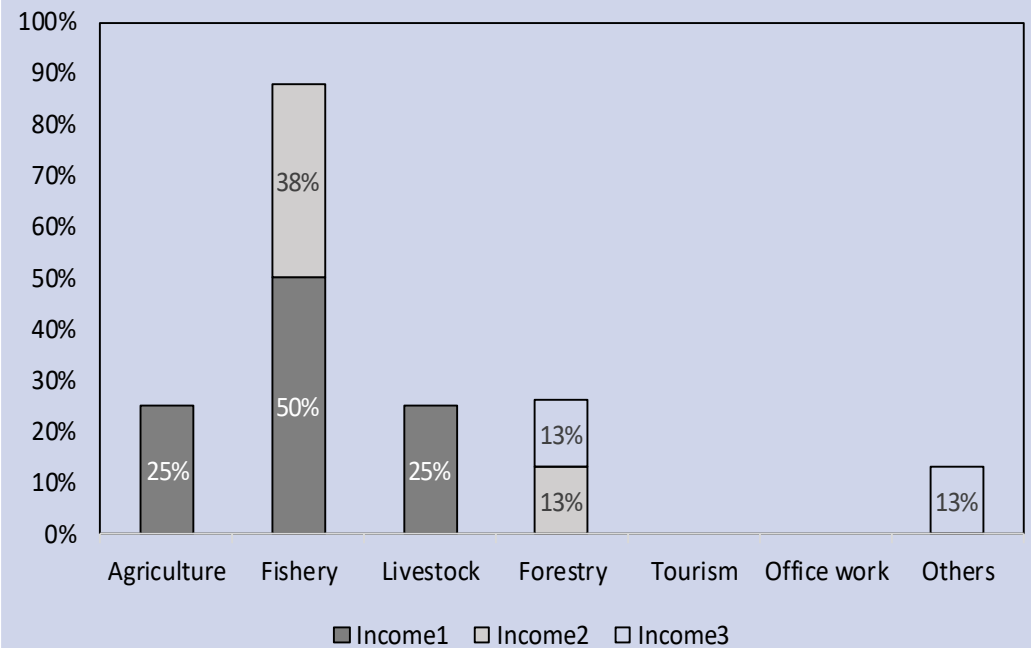
11. Kondaktem priliminari sevei

I kat samfala simpol method blong socio-ekonomik sevei.

Intaviu sevei yusum pepa



Intaviu sevei yusum simpol kwestenea



11. Kondaktem priliminari sevei

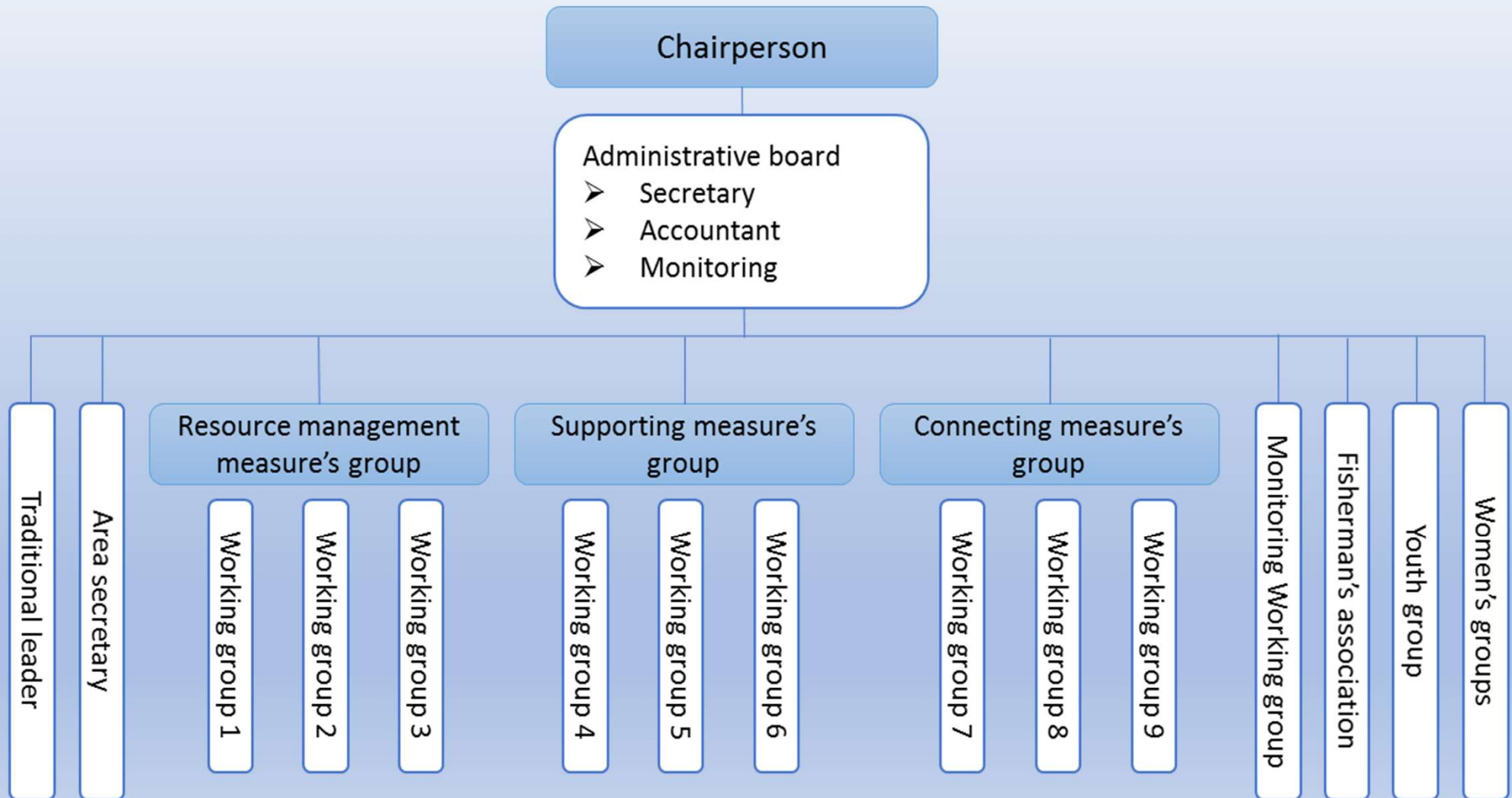
Purpose blong karemaot priliminari sevei hemi blong;

(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 manejmen mesa

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



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

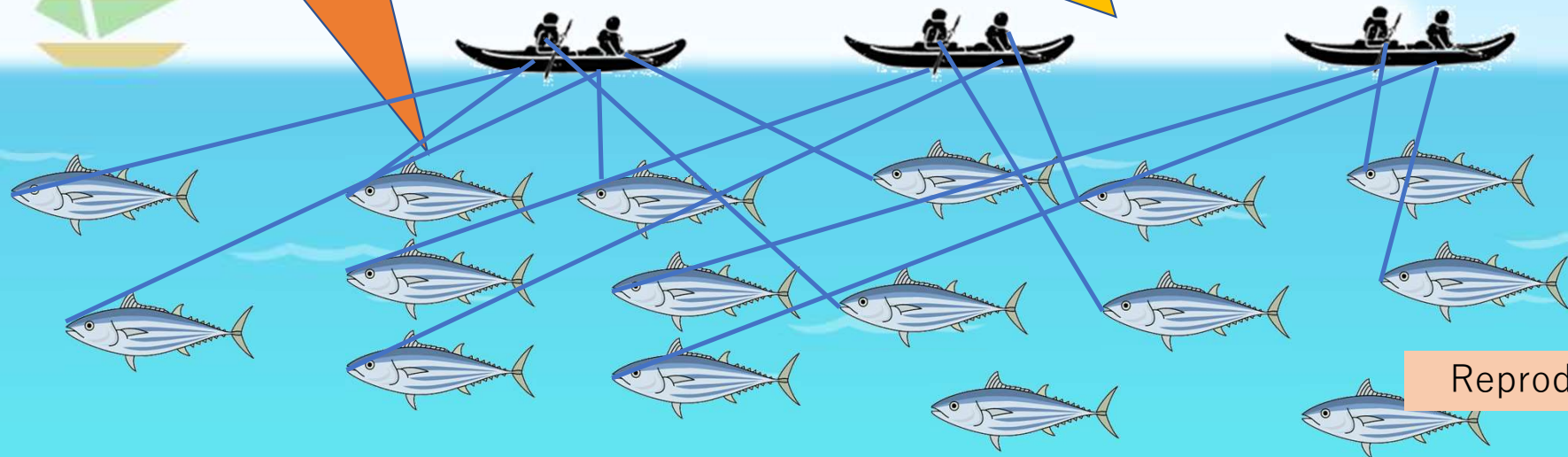


Necesiti blong kostel risos manejmen

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



Reprodaksen

Costal resos manajmen i necesari lo komuniti

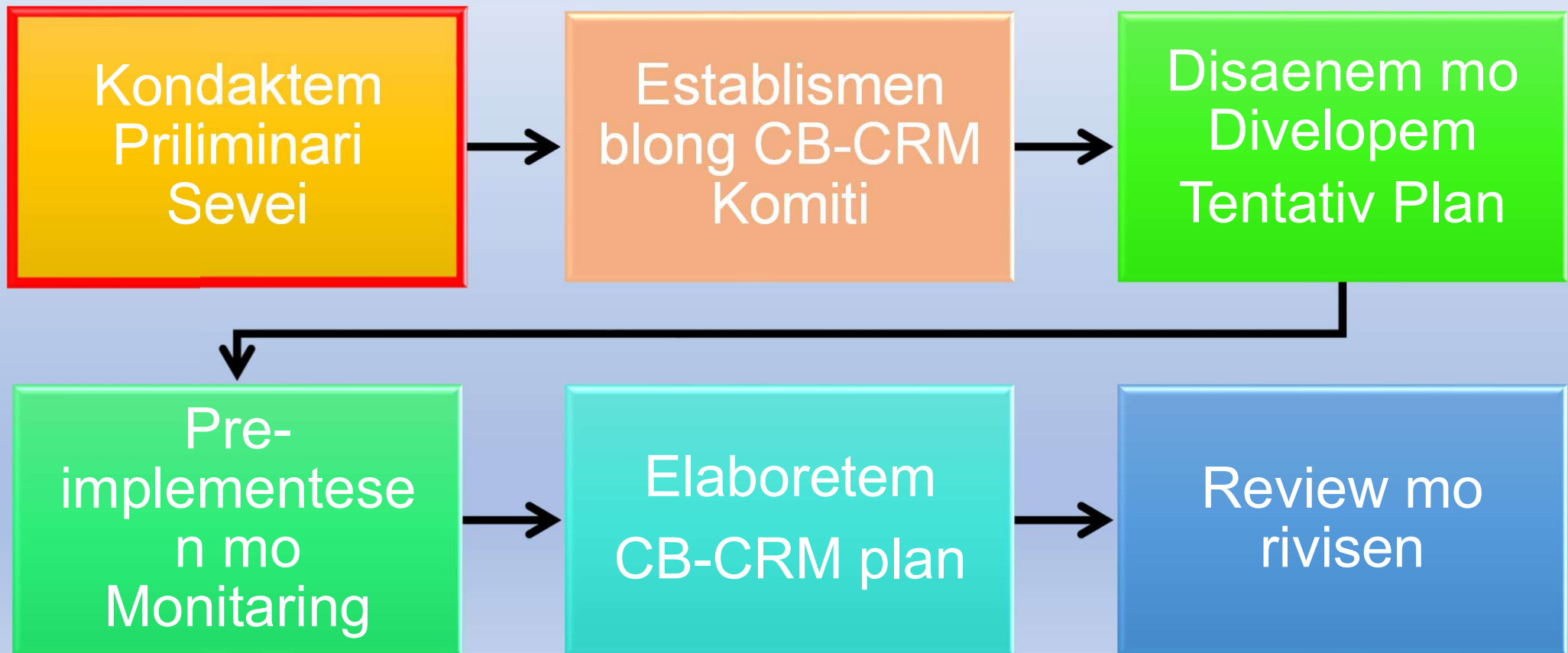


Be olsem wanem lo situasen naolia, mo wanem nao ol taket spisis, ol ples, taket fising gia mo ol sesen?



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 infomasi nao umi nidim?①

- **Ekonomik aspek**

- Men inkam sos blo ol man mo woman
- Blo save level 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 level 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 I stap naoia I wok gud I 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 levol blo sistem blo ol chif
 - Blo save wanem kaen aproj I stret blo mekem chif sistem I strog
 - Facsenel levol blo aria kaonsel
 - Blo save wanem kaen aproj nao I stret blo mekem aria kaonsel I strog

Practis blo Preliminari sevei (socio-economic sevei)

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

Oli Simplifiem inteviw sevei (Historikal jens)

Exampol 1:

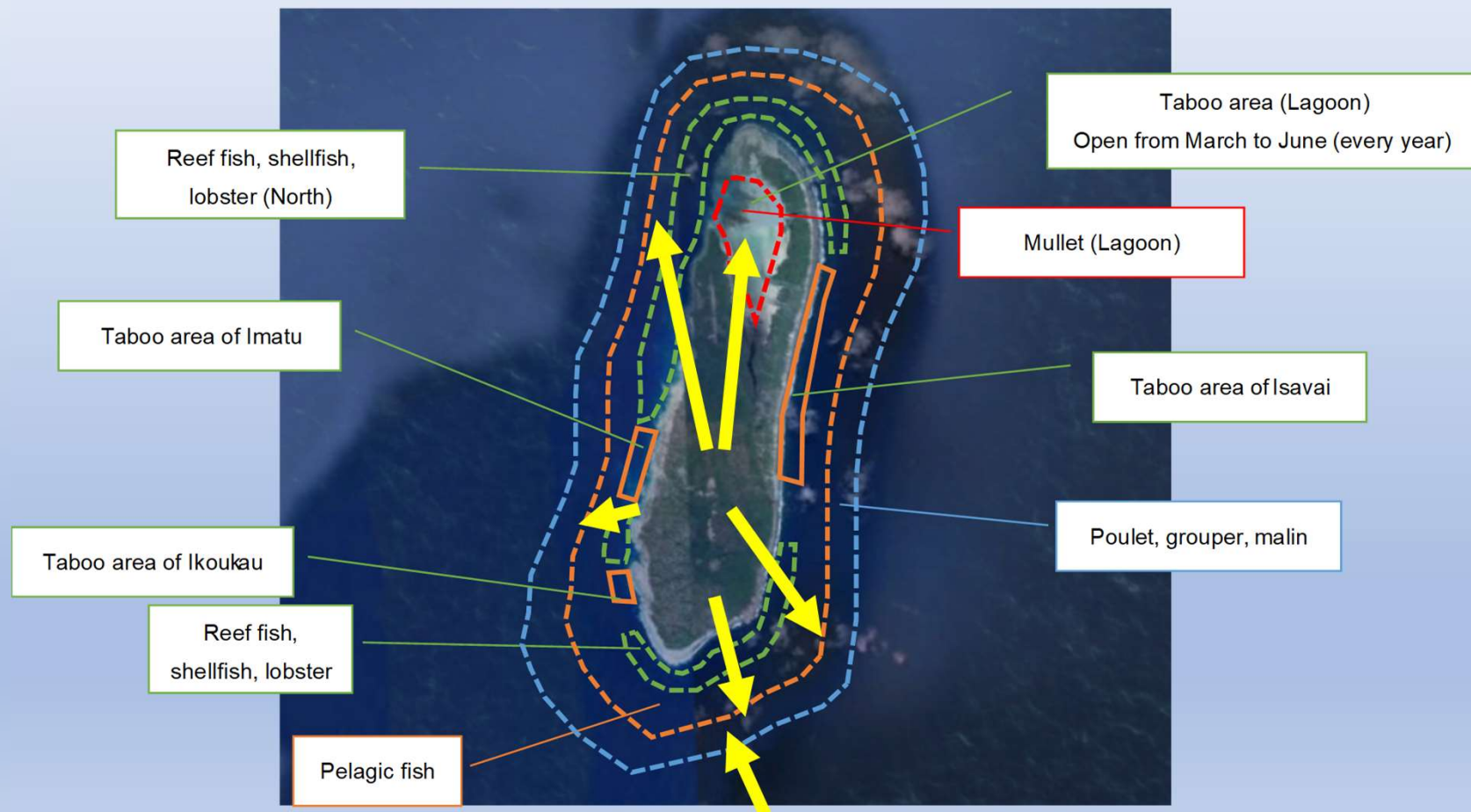
- Jens lo siz blo fis
- Jens lo caj volum
- Jens lo operasen awa
- Jens lo distens blo go lo fising graon

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

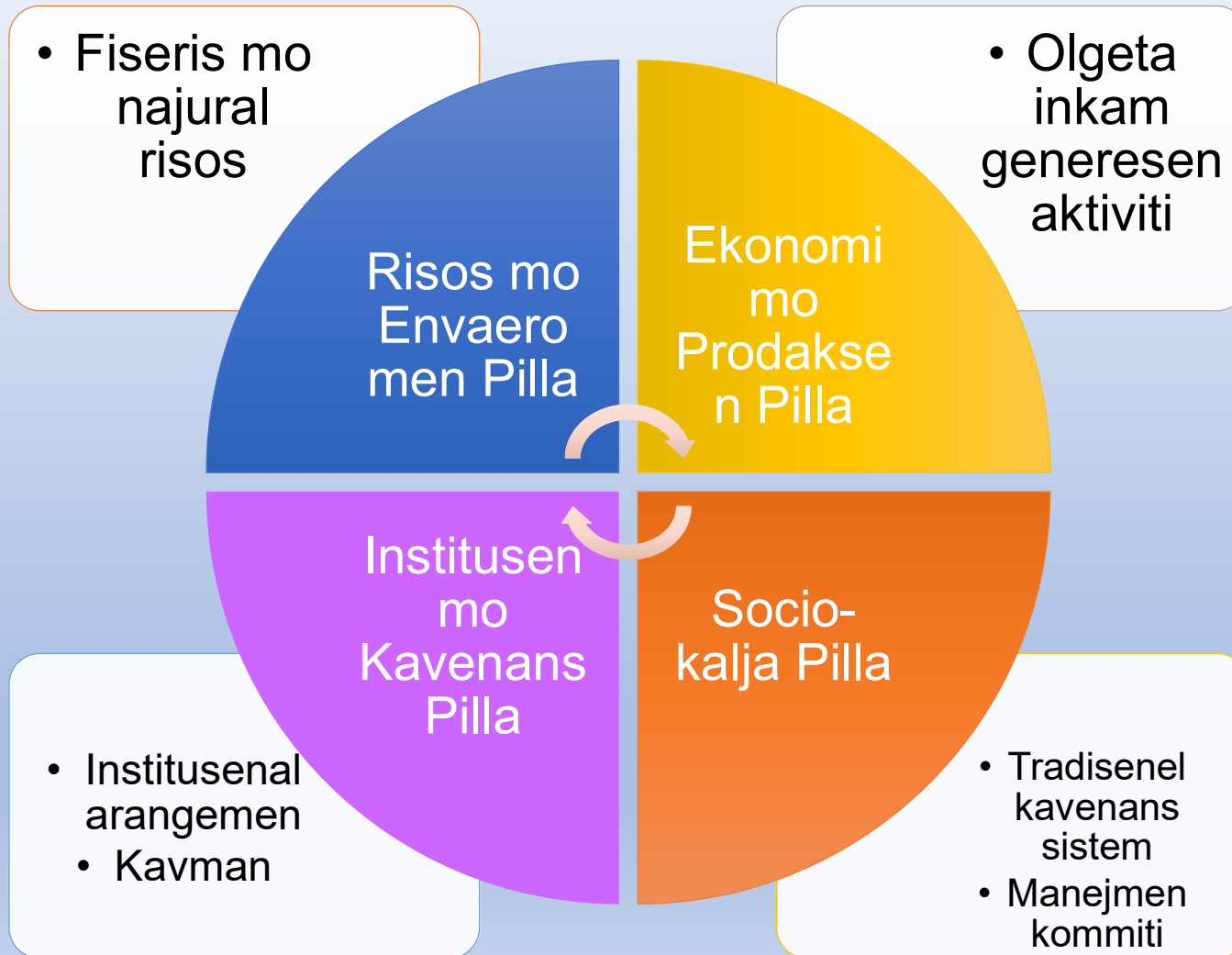


Ol simpel Socio-ekonomik sevei

- 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)

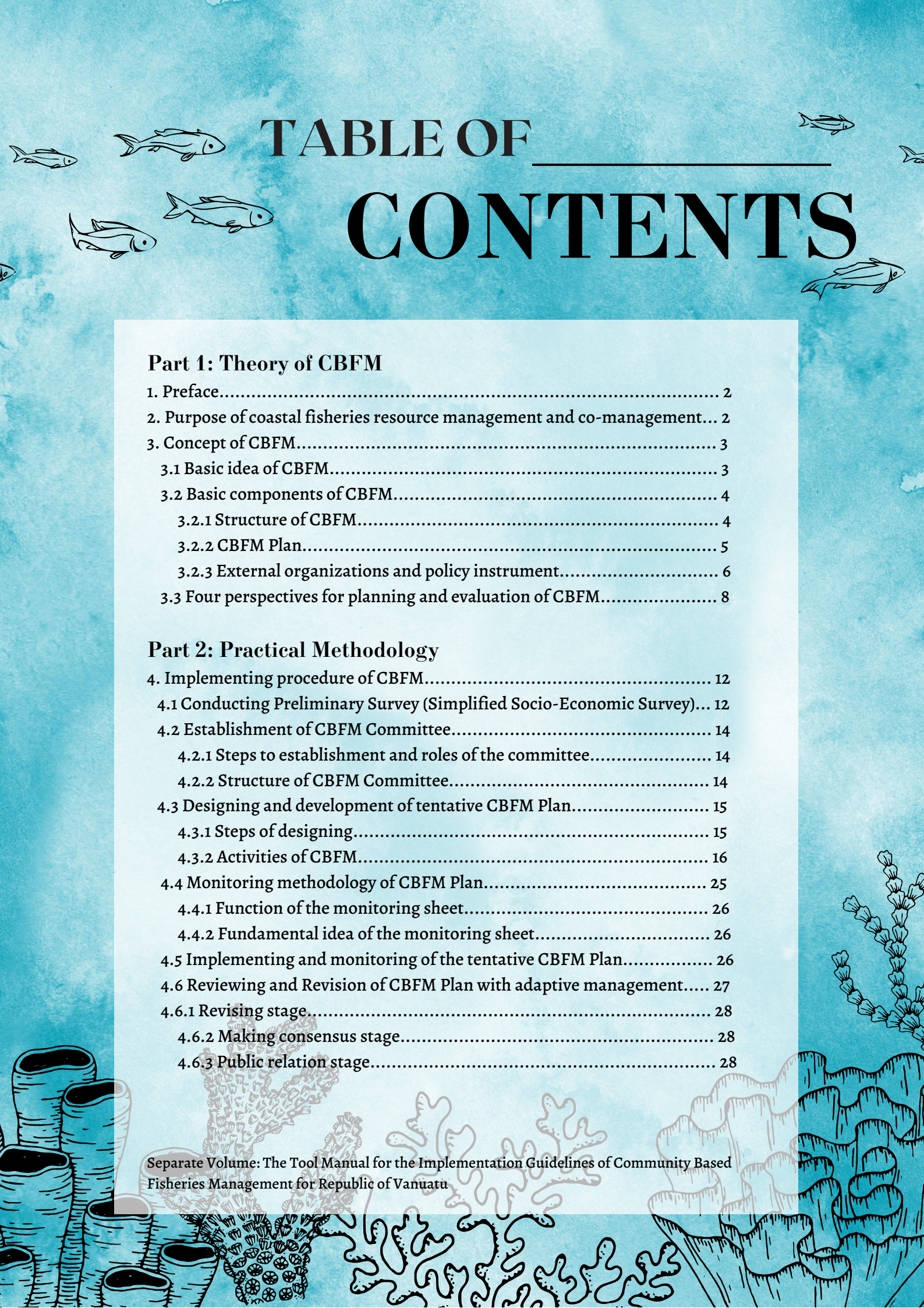


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Separate Volume: The Tool Manual for the Implementation Guidelines of Community Based Fisheries Management for Republic of Vanuatu



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.

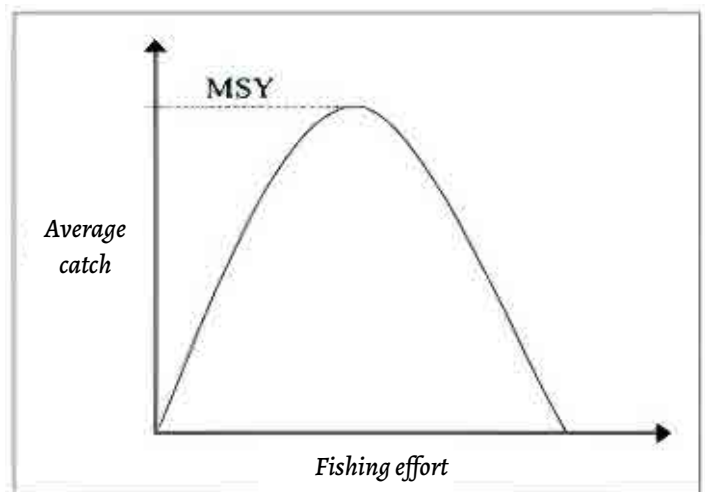
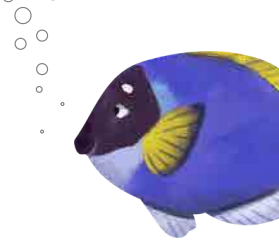


Figure 1: Maximum Sustainable Yield

(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.

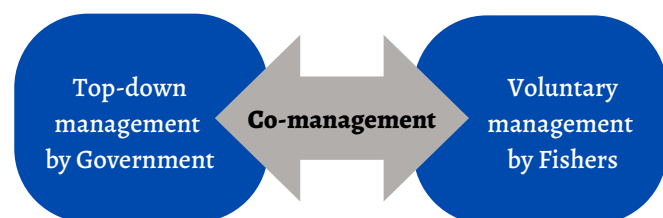


Figure 2: Concept of Co-management

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.

[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.

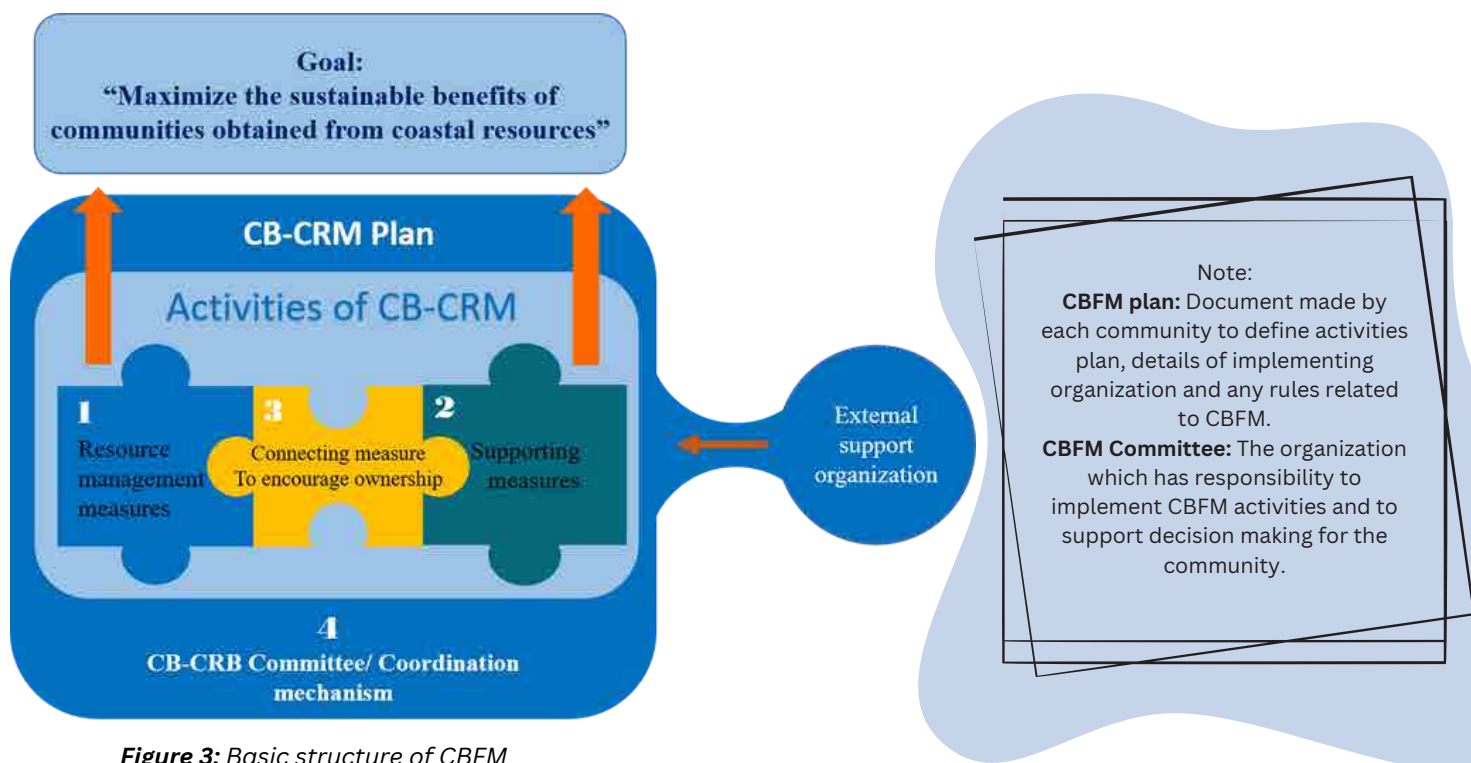
[3] Encouraging local participation measure is inclusive that; awareness raising program, underwater research, eco label, fund raising, etc.

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

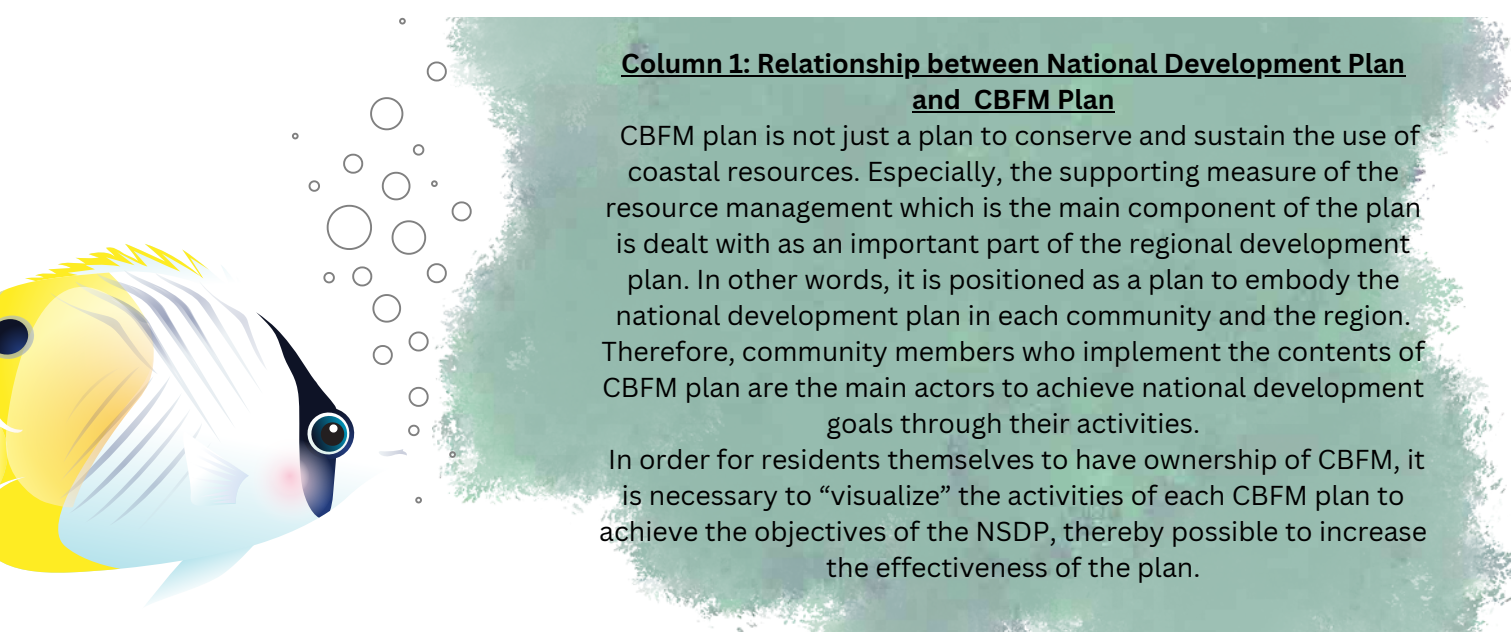
The CBFM plan should include the following items.

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.

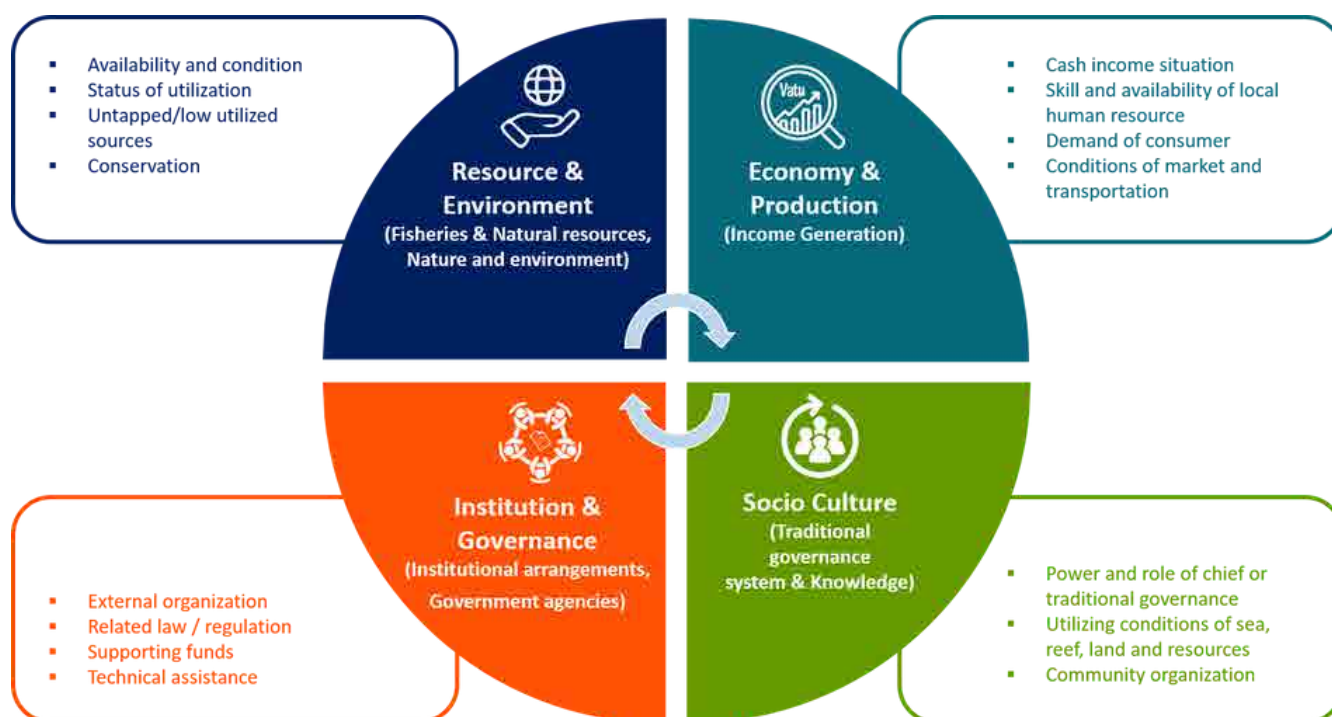
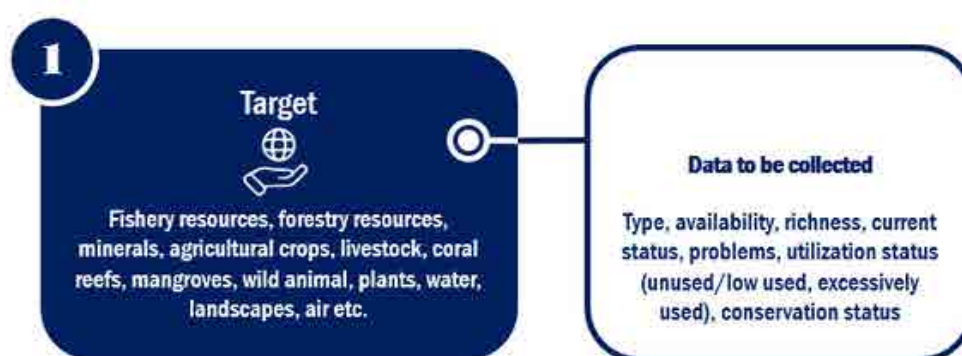


Figure 4: Four perspectives on CBFM

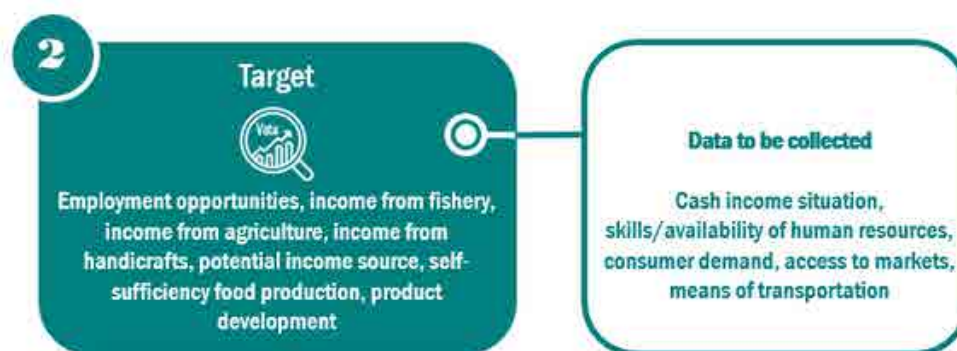
(1) Resource & Environment perspective

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.

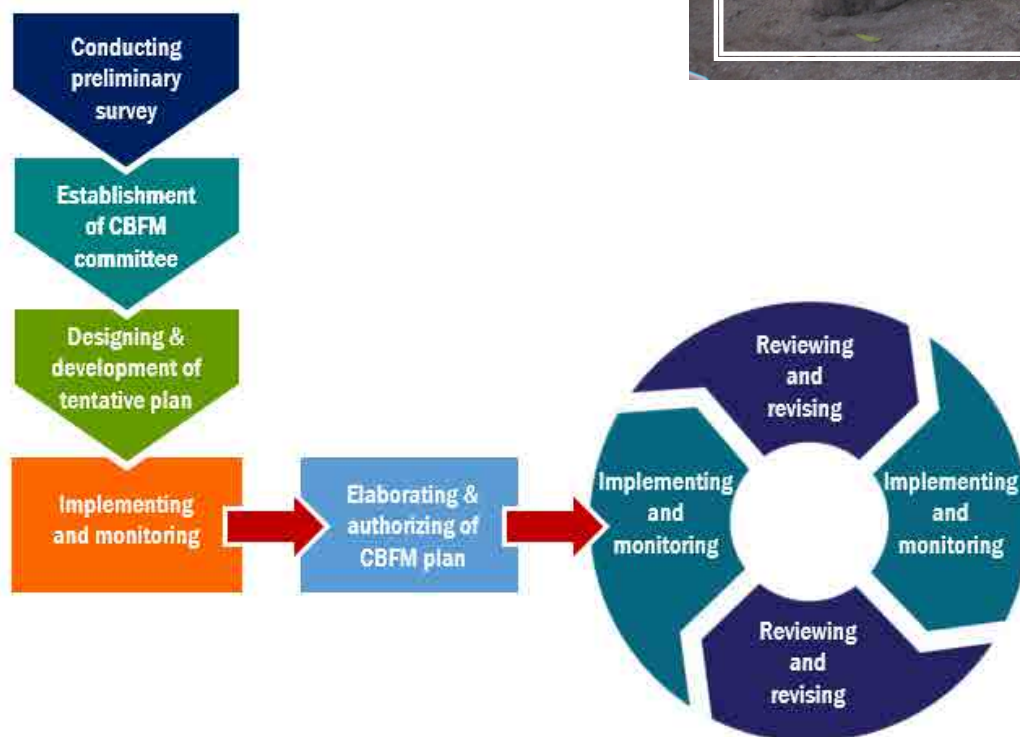


Figure 5: Implementing procedure of CBFM

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.

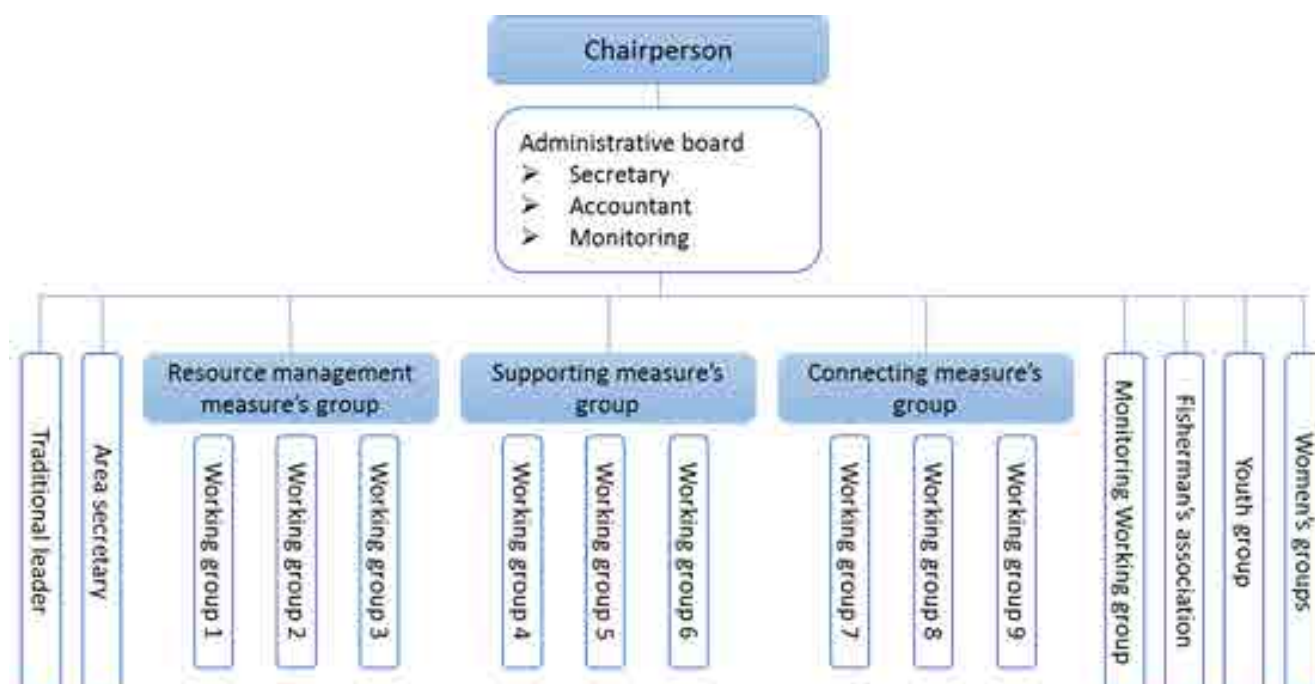


Figure 6: Example of structural composition of CBFM committee

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.

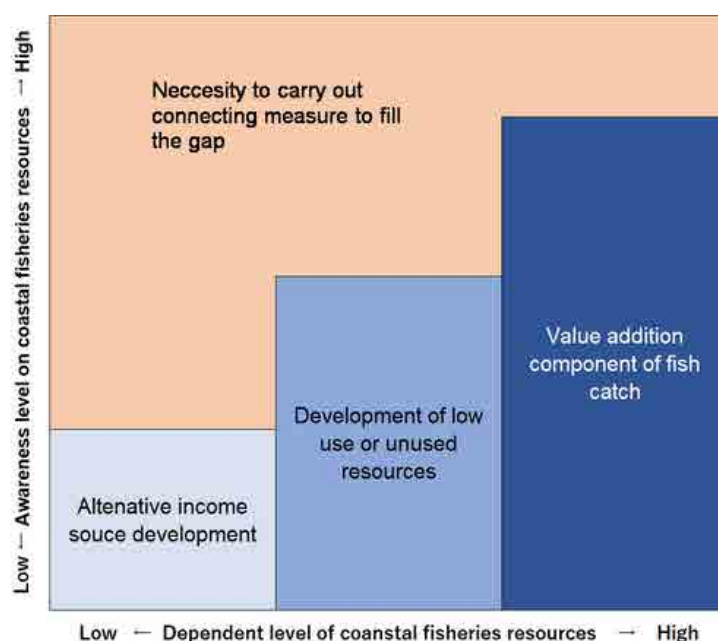


Figure 7: Relationship between supporting measure and connecting measure

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

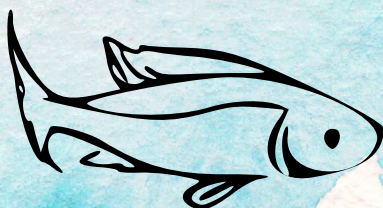
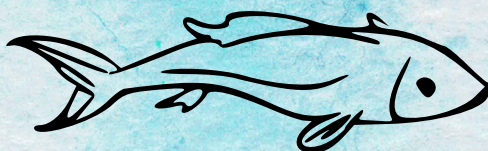
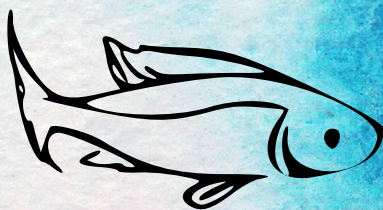
With the draft of revised plan, the community workshop is organized to collect several opinions and build consensus among the community. Revised plan is modified based on the opinion and discussion made at the community workshop. This is called the community-adopted version. Regarding this community-adopted 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)



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

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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.

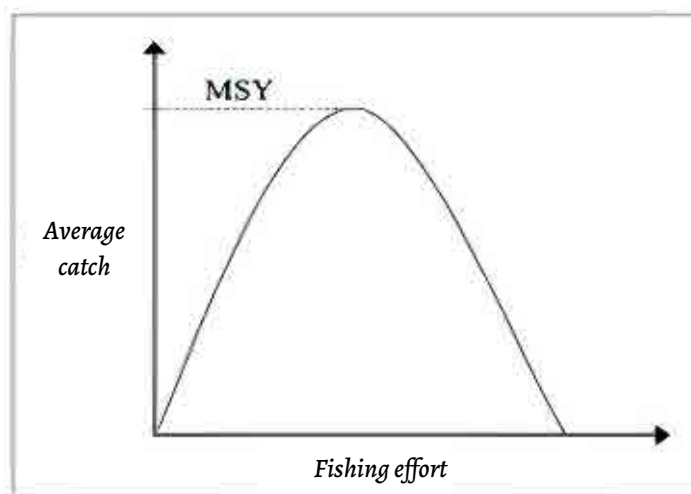


Figure 1: Maximum Sustainable Yield

(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.

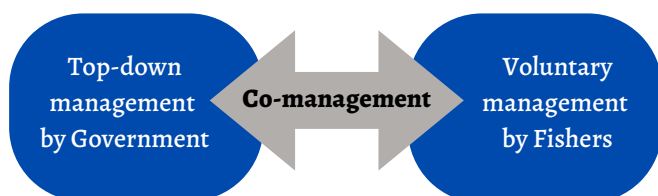


Figure 2: Concept of Co-management

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.

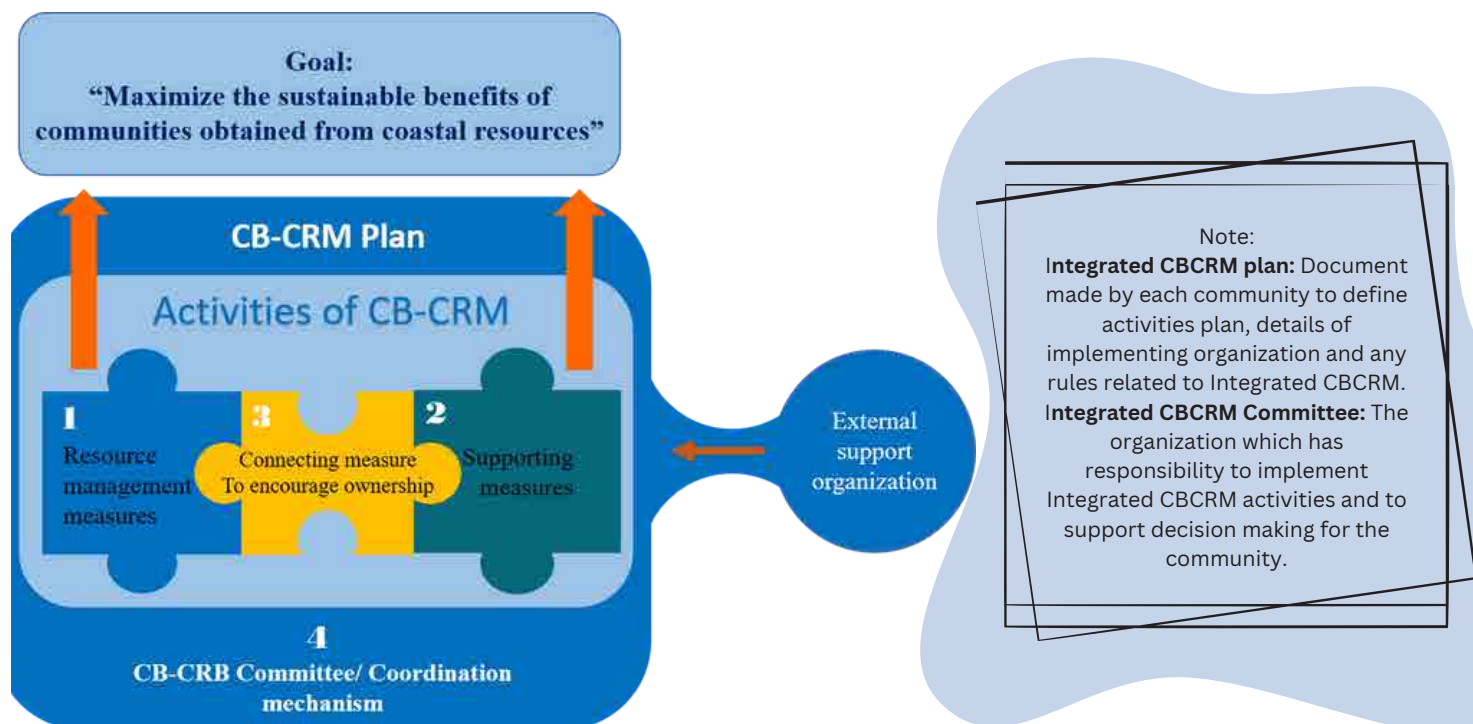


Figure 3: Basic structure of Integrated CBCRM

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

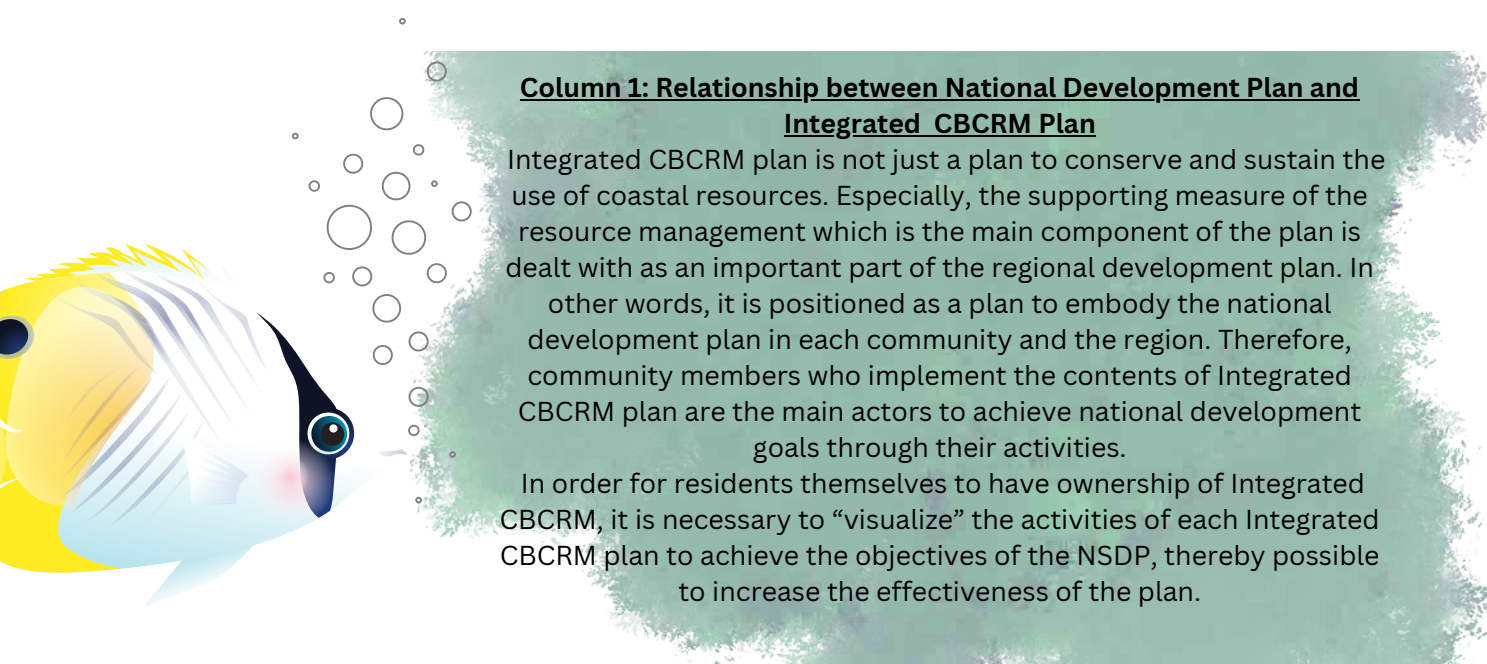
The Integrated CBCRM plan should include the following items.

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.

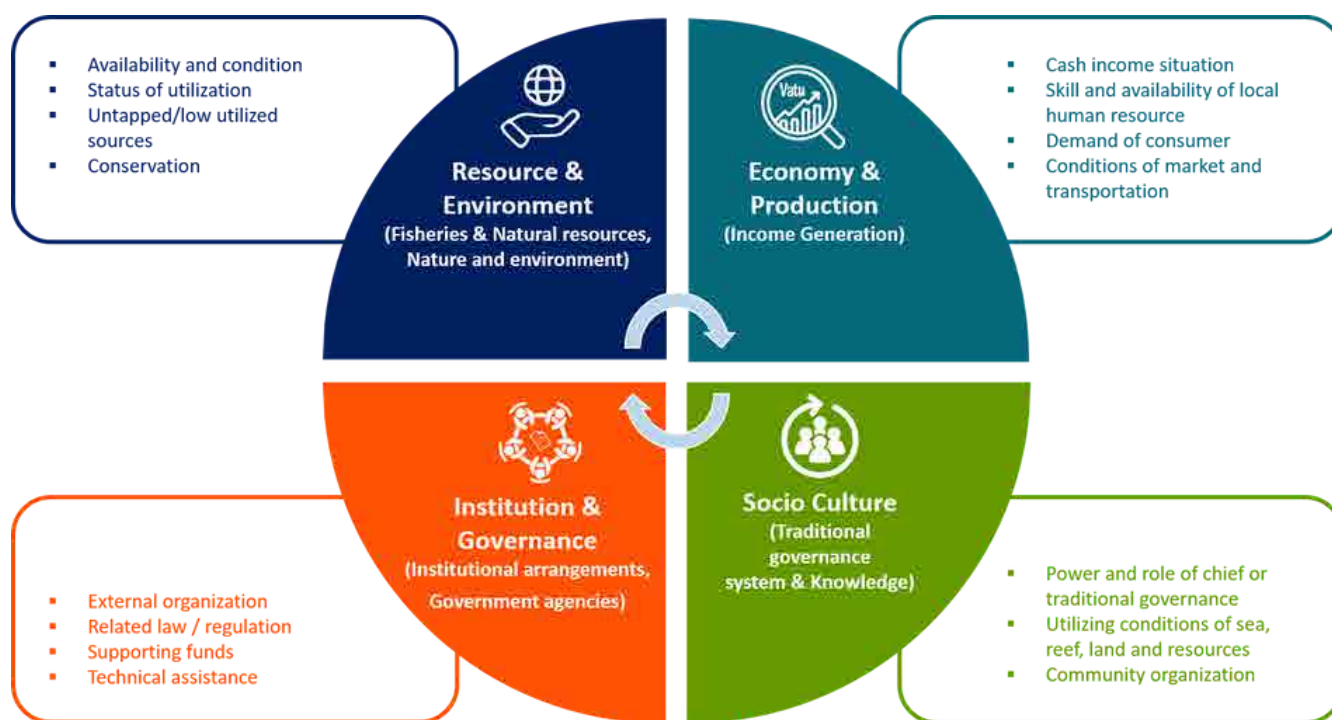
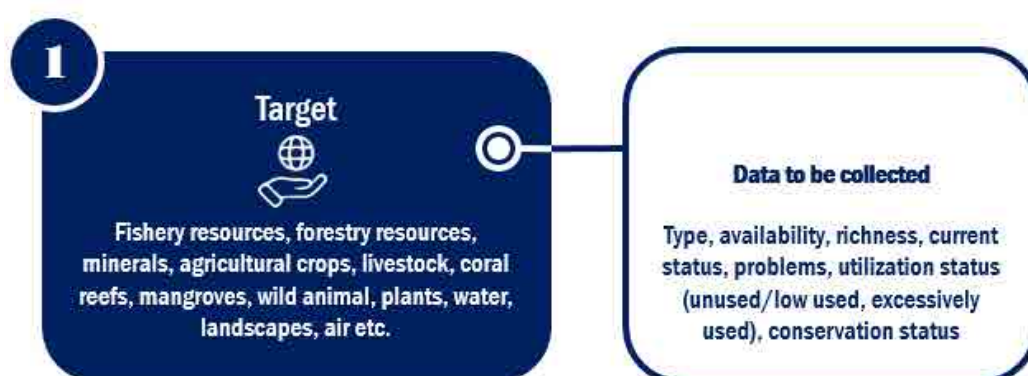


Figure 4: Four perspectives on Integrated CBCRM

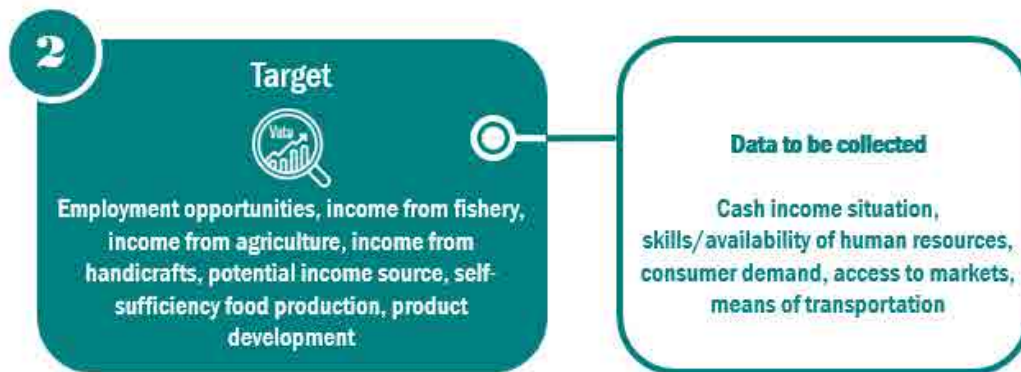
(1) Resource & Environment perspective

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.

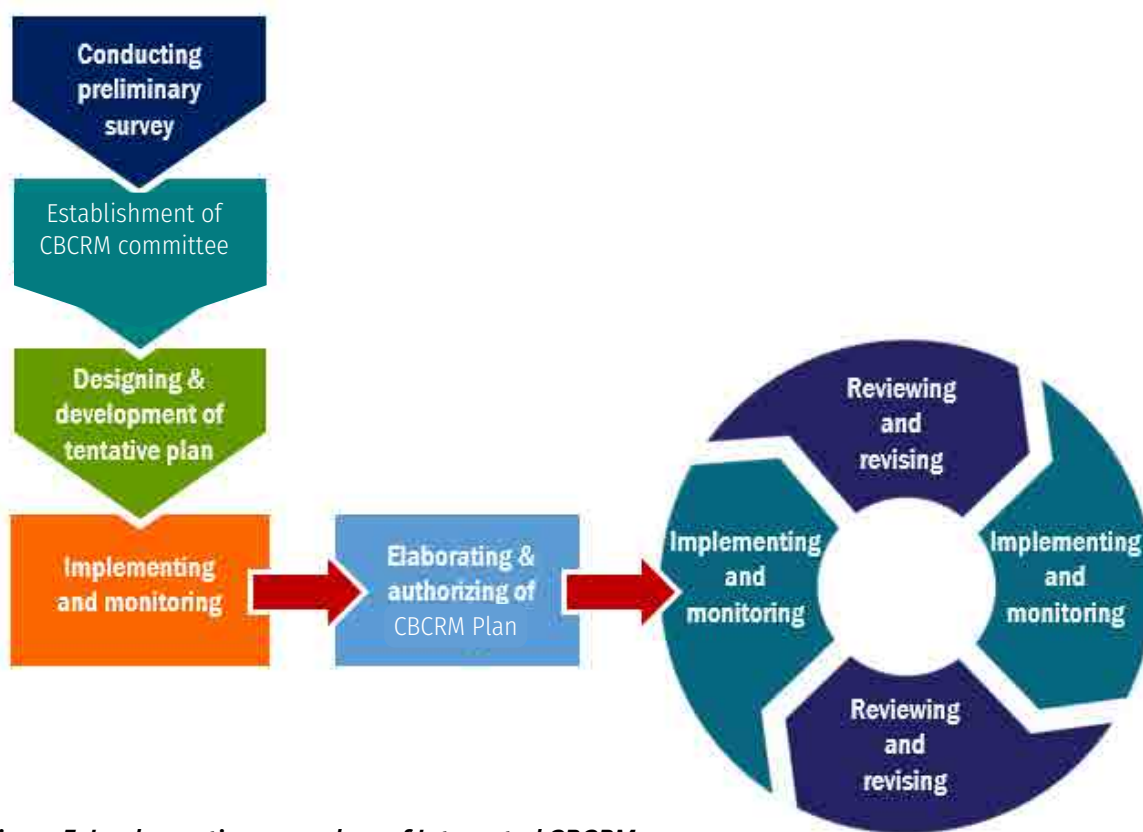


Figure 5: Implementing procedure of Integrated CBCRM

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.

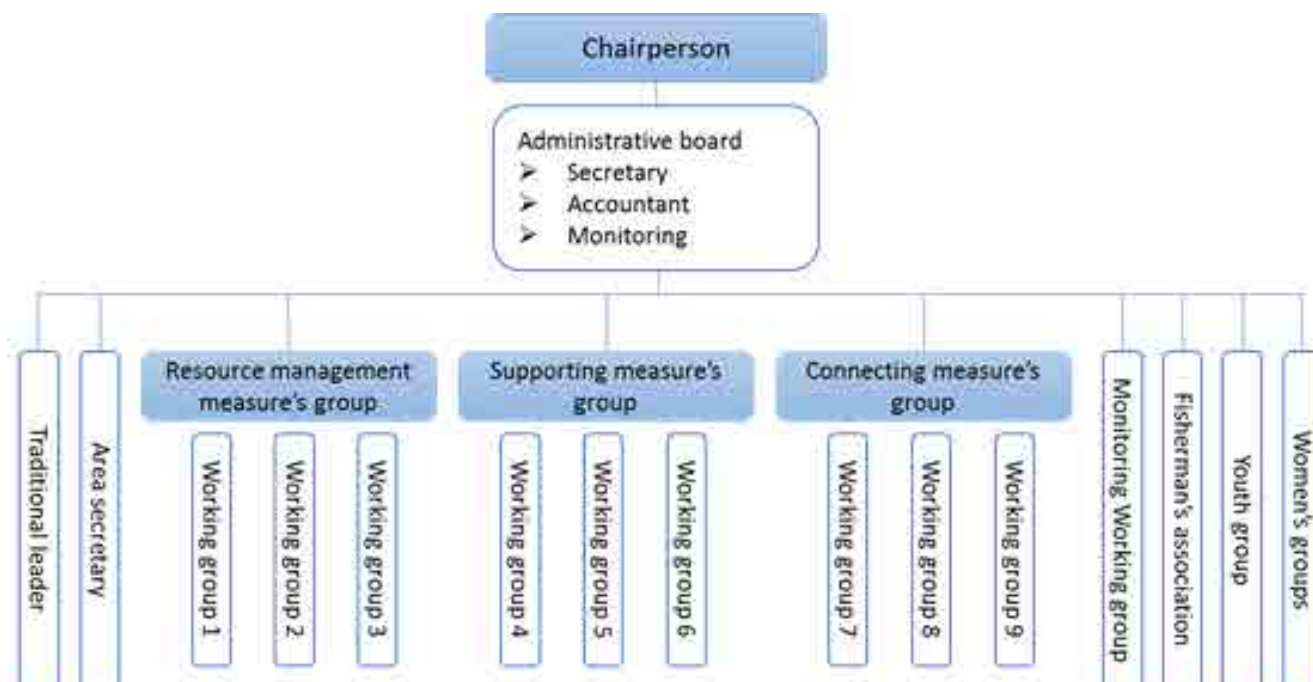


Figure 6: Example of structural composition of Integrated CBCRM committee

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.

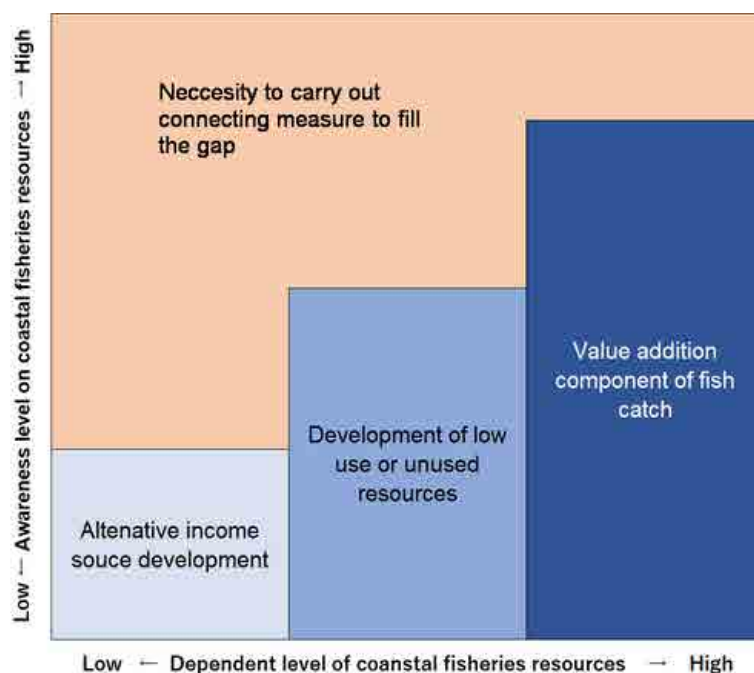


Figure 7: Relationship between supporting measure and connecting measure

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.

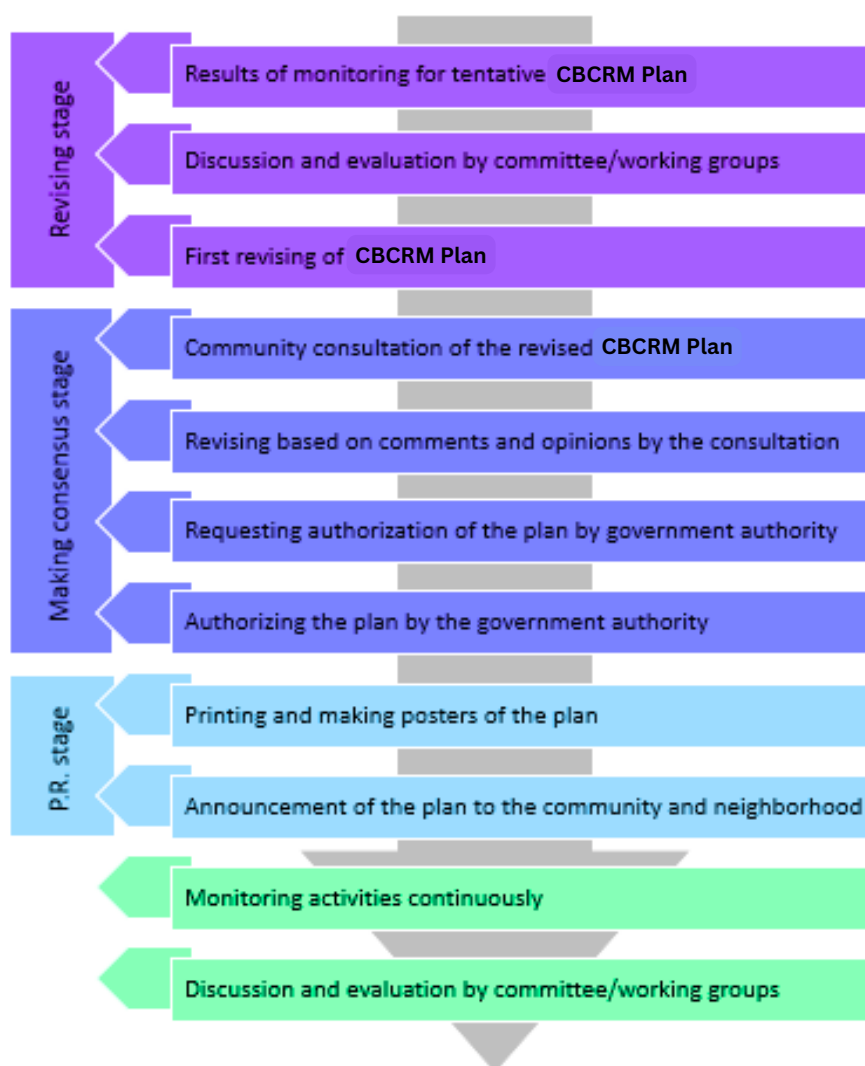


Figure 9: Reviewing procedure of Integrated CBCRM Plan

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

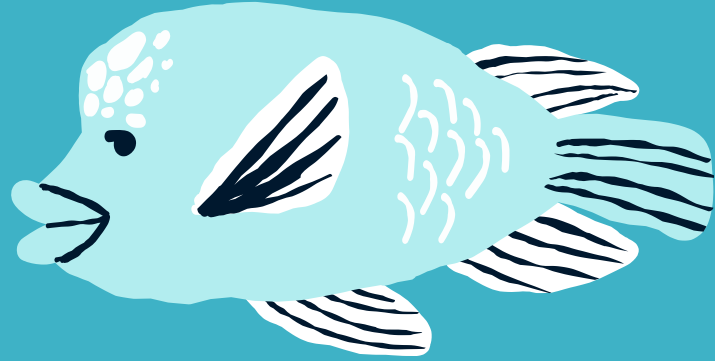
With the draft of revised plan, the community workshop is organized to collect several opinions and build consensus among the community. Revised plan is modified based on the opinion and discussion made at the community workshop. This is called the community-adopted version. Regarding this community-adopted 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.

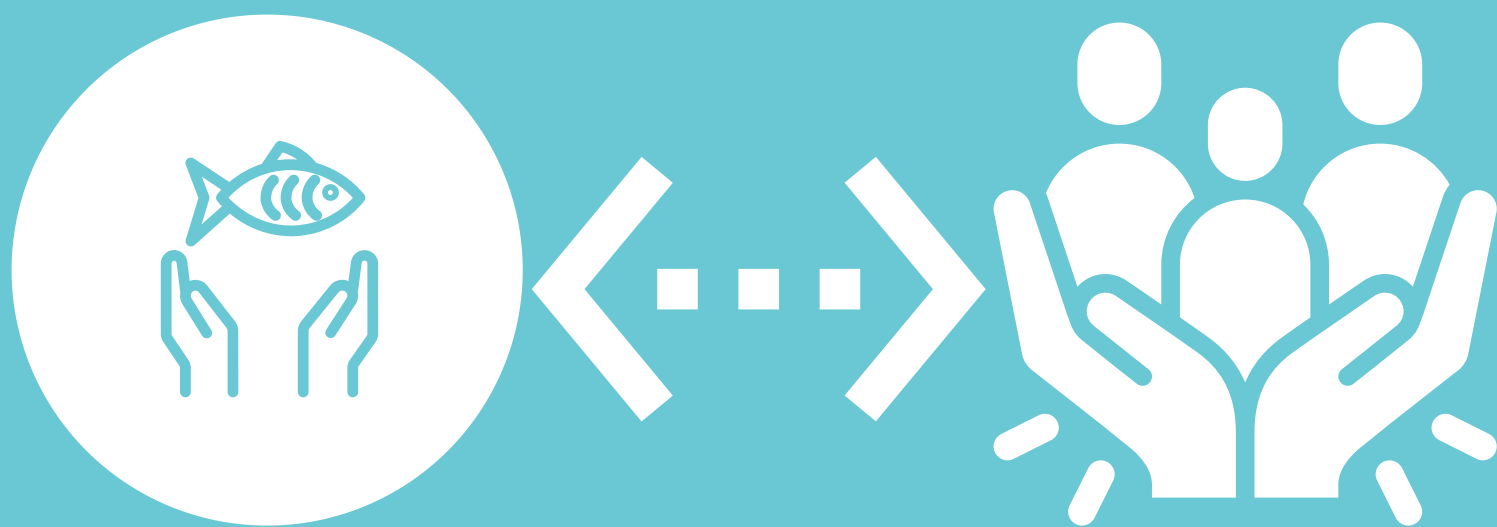
After that, monitoring is continuously carried out to continue the activities of Integrated CBCRM and it is periodically reviewed once a year. In addition, ministries concerned with fisheries collect this monitoring sheet from each community working on Integrated CBCRM, and assess the current situation,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

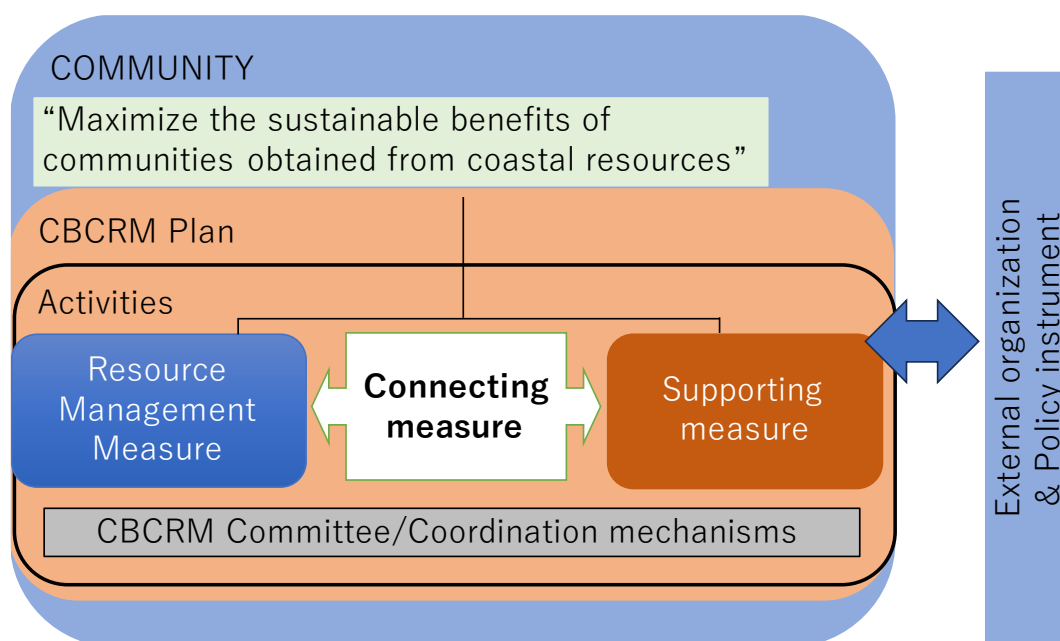


Figure 1: Basic structure of the Integrated CBCRM

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													

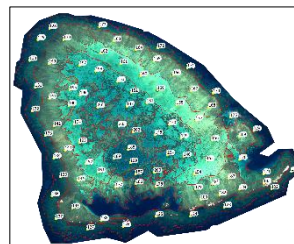
MT-4 Control by fishing seasons

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.

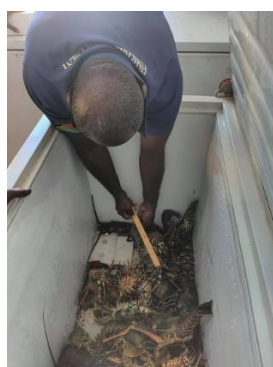
On the three islands of Emae, Makira, and Mataso in Shefa Province of Vanuatu where bottom fishing is thriving, a Deep-Bottom Fish Fishery Management (DBFFM) Liaison Conference was established in cooperation with the provincial government for making the deep-bottom fish fishery sustainable. The purpose 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

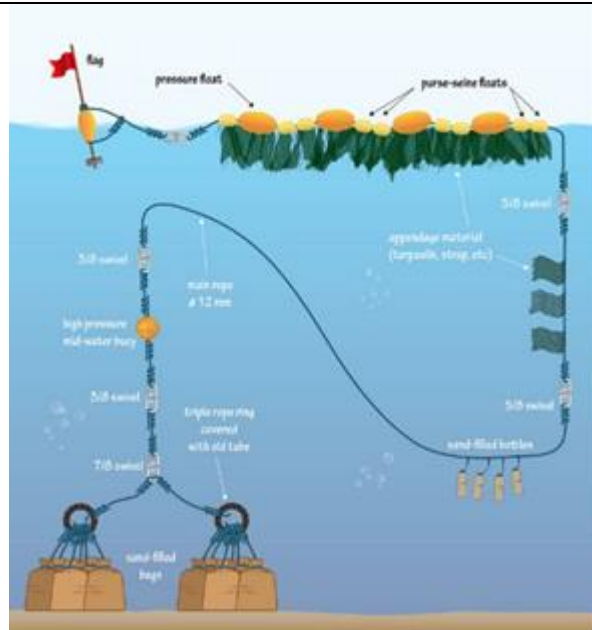
	Name of Tools	Serial No.
4-1 Diversification of fishing		
1	FAD development for large pelagic fishes	ST-1
2	FAD development for small pelagic fishes	ST-2
3	Deep sea bottom fishing development	ST-3
4	Diamondback squid fishing development	ST-4
5	Hybrid canoe development (Sailing/outboard engine)	ST-5
4-2 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.

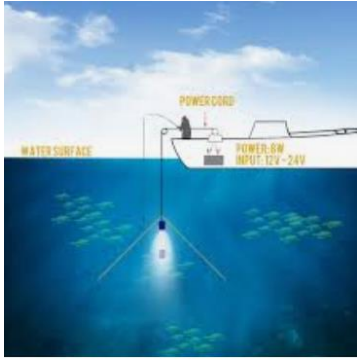
Relationship with resource management	<Direct relevance level with resource management: High> Fishing efforts and pressures by fishers is dispersed from shallow coastal areas to offshore through development of large pelagic fisheries. In addition, it can be expected to raise awareness about resource 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.

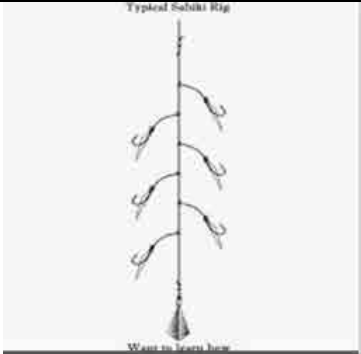


FAD developed by the Project for Promotion of Grace of the Sea in the Coastal Village/ JICA

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

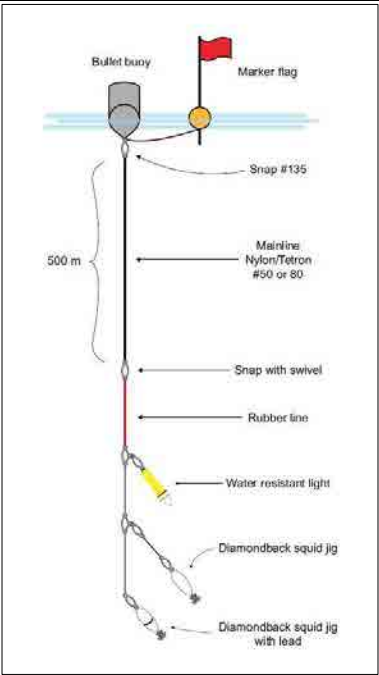
	 Typical Sabiki Rig Went to Japan here Design of Sabiki	 Hooks for Sabiki
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ST-3 Deep sea bottom fishing development

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 understanding of 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

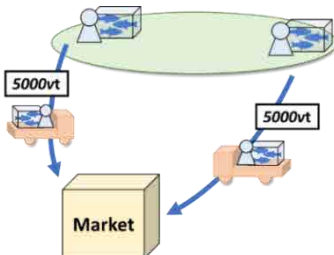
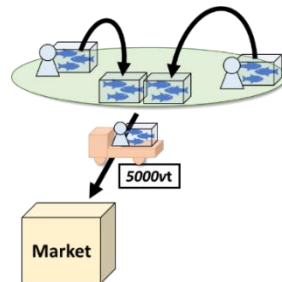
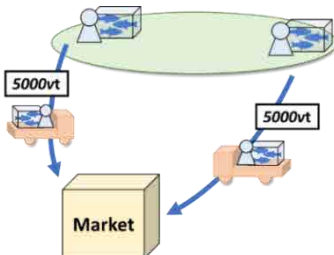
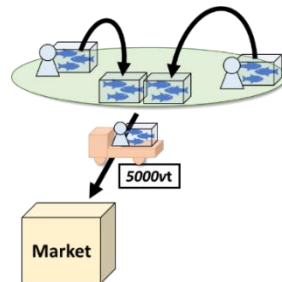
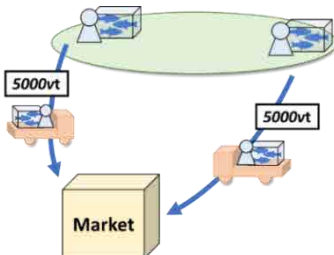
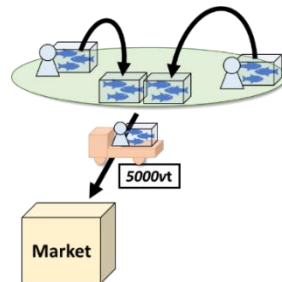


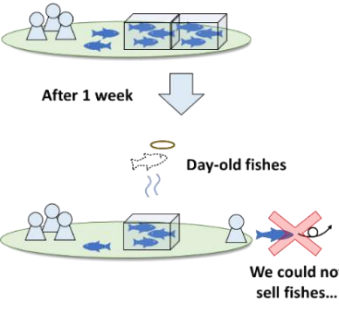
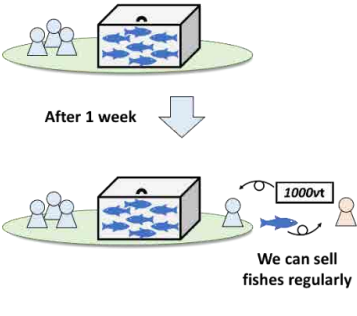
Hybrid canoe in Vanuatu

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



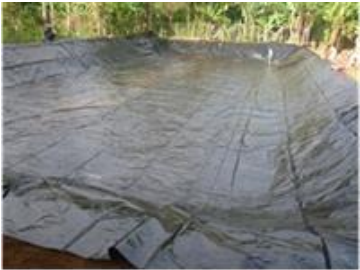
Distributed tilapia to 2,00 residents after tha attacked TC Pam.



Harvested tilapia.

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

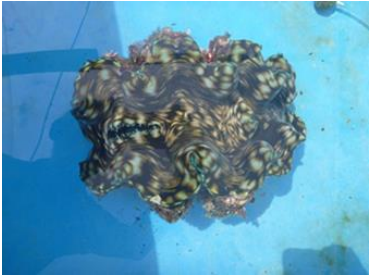
ST-13 Giant freshwater prawn culture

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).  Pellet making with locally available feed (meat and bon meal, coconut meal and etc.)
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.

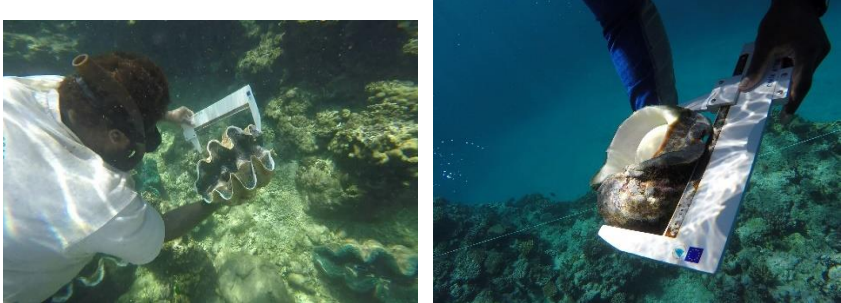
Table Average age of the players and the percentage of people who is involved in the fisheries activities

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. 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



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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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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

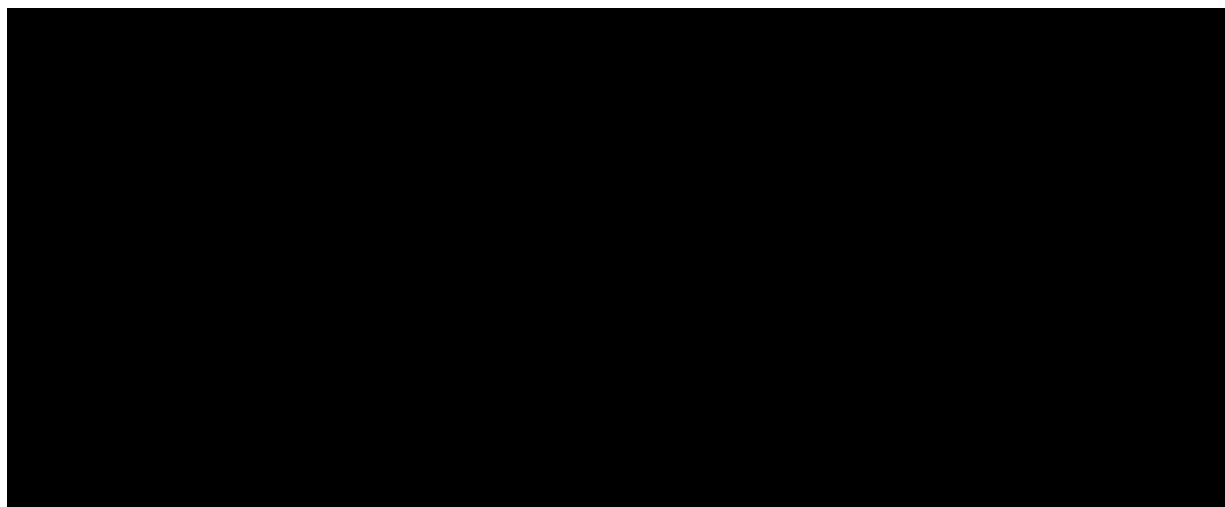
Upon your arrival in Nadi, Fiji, a shuttle service to and from the airport will be provided by the hotel according to your arrival/departure time, which has already been communicated to the hotel. This should also apply to non-funded participants who have also booked their accommodation at the workshop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



バヌアツ国豊かな前浜プロジェクトフェーズ3及び
ソロモン諸島国コミュニティ主体の沿岸資源管理・
利用による生計向上のためのアドバイザー業務

バヌアツのパイロット・プロジェクトにおける
資源管理・資源管理支援ツールの実証から得られた
有効性、適応性の評価と今後の活用における提言等

2023 年 11 月

アイ・シー・ネット株式会社
インテムコンサルティング株式会社

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1. 本報告書の目的

本プロジェクトは、豊かな前浜プロジェクトフェーズ 2 で確立した CBCRM アプローチの応用性と実用性を強化の過程で得られた知識や経験を国家研修プログラムとして標準化し、バヌアツ国内の他地域や周辺のメラネシア地域へ普及することを目的として実施された。その過程で、CBCRM を機能させるための資源管理方策、支援方策、連結方策のツールを開発し、統合的 CBCRM 実施ガイドラインの別添としてツール集を作成した。本報告書では、主に豊かな前浜プロジェクトフェーズ 1～フェーズ 3 におけるツール開発と実証の経験から、その有効性、適応性を評価し、その今後の活用に対する提言を行うことを目的とし、作成された

1-1 分析の対象としたツール

上記のツール集には、資源管理方策、支援方策、連結方策を併せて全部で 34 のツールが記載されているが、一部のツールについては一般的に適用が想定されるツールもリストアップされているものもあり、本プロジェクトでは実証していないものも含まれている。そのため、本報告書での分析からは除外した。分析の対象としたツールについて表 1 に示すように網掛けをした。

表 1:分析の対象とした資源管理ツール

	ツール名	シリアル 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

表 2: 分析の対象とした支援ツール

	ツール名	シリアル 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

表 3: 分析の対象とした連結ツール

	ツール名	シリアル No.
1	Data collection on catch and fish distribution	CT-1
2	Activities on awareness raising and environmental education program	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	Nutrition improvement	CT-8

2. 資源管理方策

2-1 規制方策

2-1-1 魚種による規制 (MT-1)、漁具・漁法による規制 (MT-2)、漁場による規制 (MT-3)、漁期による規制 (MT-4)

(1) ツール開発の背景

バヌアツでは、資源管理は伝統的にコミュニティの自主性に基づくタブーエリア（漁業活動の規制区域）の設置を通して行われてきた。そのため、コミュニティや水産局の担当者レベルでは、多くの場合コミュニティベースによるタブーエリアの設定に焦点が当てられてきた。また、豊かな前浜プロジェクトフェーズ 2 では、タブーエリアの設定以外の管理方策として魚種による規制、漁具による規制などが資源管理計画に盛り込まれたが、適用範囲はタブーエリア内であった。



図 1 豊かな前浜プロジェクトフェーズ 2 のパイロットサイト、タフエア州アネイチュム島のタブーエリアの位置図

表 4 豊かな前浜プロジェクトフェーズ 2 のパイロットサイト、タフェア州アネイチュム島の各タブーエリアにおける資源管理方策

ZONE	BOUNDRY	Location	TABOO AREA (LANDMARK)	MANAGEMENT MESURE (Gear or species)
ZONE 1	Aniplithei to Analvinec	S 020°14'15.97" E169°48'54.97"	Aniplithei (river mouth) to 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 Anithwunam aukuri	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	Anithwunam aukuri to Anthwunabunmop (Coconut)	S 020°12'55.88" E169°45'28.55"	Ivahak to Anwaj bay	No take for all species Lobster by night diving
		S 020°10'19.00" E169°44'31.04"	Anabras to Anthwunabunmop	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

出所：アネイチュム CBCRM 計画（豊かな前浜プロジェクトフェーズ 2）

地域に根ざした沿岸資源管理には、上述のタブーエリアの設定による規制だけでなく、地域の資源の状況に応じてそれ以外にもいくつかの手段があることをコミュニティや水産局に認識してもらうため、魚種による規制、漁具・漁法による規制、漁期による規制等をタブーエリアの設定と分離し、新たなツールとして紹介した。

(2) 実証結果

豊かな前浜プロジェクトフェーズ 3 では、上記の点を念頭において各パイロットサイトにおいて CBCRM 計画が策定された。以下の表に、3 か所のパイロットサイトの CBCRM 計画に明記された 4 つの規制方策についてまとめた。

表 5 豊かな前浜プロジェクトフェーズ 3 のパイロットサイトの CBCRM 計画に明記された規制方策

	南サント（ワイラ パ、タンゴア島、ア ラキ島、ナケレ）	エマエ島	ワイシシ
魚種による 管理		- タカセガイ、ナマコ、ヤ コウガイ、ココナツク ラブ、シャコガイの採集 の禁止	- ロブスターのサイズ規 制
漁具・漁法 による規制	- 網の目合の規制 - フィッシングライ ンの規制 - 投網の規制 - ナイトダイビング の規制	- 刺網の規制 - 投網の規制 - ハマダイ漁獲のための刺 し網の規制と底延縄利用 の推奨 - ナイトダイビングの規制 - ロブスター漁獲を手での 採集に限定 - タンクを使ったダイビン グの規制 - カヌーを使った漁業の推 奨	- 釣針のサイズの規制 - 底延縄の規制
漁場による 規制	- タブーエリアの設 定	- 村のタブーエリアの設定 - クックスリーフでの複数 コミュニティ間による共 同タブーエリアの設定	- タブーエリアの設定
漁期による 規制			- 貝の禁漁期間の設定

一例として、ハマダイをはじめとする底魚漁業が盛んなタンナ島ワイシシコミュニティの CBCRM 計画には、タブーエリアによる規制だけでなく、漁場全体における釣針のサイズ規制、底延縄などの禁止漁具の規制、ロブスターのサイズ制限、貝類の禁漁期間の設定など 4 つの方策がすべて網羅されている。これまでも、ワイシシではコミュニティで独自に貝の禁漁期を設けていたなど、タブーエリア設定以外の管理を行える素地がバヌアツのコミュニティにあったことから、資源管理はタブーエリアだけではないという考えはコミュニティに容易に理解された上で、CBCRM 計画が作成された。

(3) 有効性、適応性の評価と今後のツール活用への提言

CBCRM 活動のモニタリング結果によれば、すべてのパイロットコミュニティにおいてポイントが伸びている。CBCRM モニタリングシートは活動が継続されていることでポイントが伸びる仕組みとなっていることから、資源管理方策は全般的に継続されていると見られる。管理が継続されている要因は、伝統的にコミュニティの自主性に基づく管理を行うという素地があり、本プロジェクトで複数回にわたり、丹念にコミュニティによるワークショップを開催して決定した内容について、コミュニティが遵守する傾向にあったことが挙げられる。

表6 プロジェクトが開発したモニタリングシートによるパイロットサイトごとの4つの管理方策活動評価のポイント推移

		魚種による 規制	漁具による 規制	漁場による 規制	漁期による 規制
タンナ島	2019/10	3	3	3	3
ワイシシ	2023/7	7	6	7	7
エマエ島	2020/2	7	7	7	-
マラエ	2023/6	10	10	10	-
エマエ島	2020/2	5	5	5	-
サンガバ	2023/6	8	8	8	-
エマエ島	2020/2	6	6	6	-
トンガメア	2023/6	9	9	9	-
アラキ島	2020/3	-	5	5	-
	2023/8	-	8	8	-
サント島	2020/3	-	7	4	-
ナケレ	2023/7	-	8	5	-
タンゴア島	2020/3	-	6	6	-
	2023/7	-	8	8	-
サント島	2020/3	-	2	2	-
ワイラバ	2023/7	-	5	5	-

バヌアツで実施されている豊かな前浜プロジェクト以外の CBCRM のプロジェクトにおいては、依然としてタブーエリアまたは No take zone が資源管理活動の中心となっている。資源管理の手段は漁場による規制だけではないという点について研修や地域セミナー等の機会を通じて Vanuatu Fisheries Department (VFD) や他国の水産局等に情報共有するなど粘り強く啓発を行い、資源管理の方策はタブーエリアだけではないという点について理解を得ていけば、他地域においても十分に適応可能なツールであると考えている。

本ツールの活用については以下のように提言する。

- 資源管理方策は、CBCRM 計画当初はどの程度の規制にして良いかがわからず、コミュニティが自ら厳し過ぎる資源管理方策を決めてしまうことがある。豊かな前浜プロジェクトの実施時にも、自ら設定した厳しい資源管理の規制を後悔するコミュニティがいくつか見られた。資源管理方策については本アプローチで提言する 1 年程度の試行期間を持ち、コミュニティが自らポジティブ、ネガティブ面を認識する機会を持ち、その試行結果をもとに最終的なコミュニティの資源管理方策を決めることが望ましい。
- バヌアツのケースでは、コミュニティが独自に設定していたタブーエリアとは異なり、漁業局や自治体に関与する CBCRM の場合、サイクロンなどの自然災害などの緊急時に食料源を確保するためにコミュニティの判断でタブーエリアを開放したいが、コミュニティがチーフの判断等独自に判断して管理を続けるべきか判断に迷うケースが散見された。管理方策の遵守を継続する意識は評価できるが、規制事項を単純に守るという姿勢そのものは、反面資源管理の本来の目的である将来資源の利用を必要とする際自らの判断で決定する能力、つまりコミュニティのレジリエンス強化の視点においては逆効果となりかねない。したがって、CBCRM を実施する際には、緊急時にはその資源を自らの判断で利用できることを明記しておく必要がある。

2-1-2 漁業調整の枠組み作り (MT-6)

(1) ツール開発の背景

本プロジェクトのフェーズ 2 までは、タブーエリアの設置を中心とした「沿岸のリーフ内」資源の管理を対象としてきた。一方、フェーズ 3 のパイロットサイトであるタンナ島ワイシシ、エマエ島を含むシェパード諸島など一部のパイロットサイトではリーフ外の底魚資源も利用されている。バヌアツに底魚一本釣漁業が導入されたのは 1980 年代であるが、現在ではバヌアツの主要な漁業の一つとして定着し始めている。地元漁業者によればバヌアツの各島の周辺には漁場となる小規模な海山が多く、多くの場合資源状態も比較的良好であると考えられる。しかし、都市部での消費需要の伸びや船外機船の普及に従い漁獲量は増加傾向にあると考えられ、将来的には資源問題が発生することも危惧される。このことから、予防措置的な対策として底魚資源の管理を現時点から開始することが望ましく、水産局も底魚資源管理ガイドラインを設定している。タンナ島ワイシシの漁業者はアニワ島周辺の漁場も利用しているが、アニワ島の漁業者との資源利用に関する調整は行われていない。また、シェファ州のエマエ島は近隣のマキラ島やマタソ島と漁場を共有しているが、エファテ島からの漁業者との競合が問題となっている。そこで、これまで実施してきたコミュニティ単位の資源管理アプローチとは違い、州政府の参加の下、複数のコミュニティが共同で管理を行う漁業調整の枠組み作りという新たなツール開発を行った。

(2) 実証結果

本プロジェクトでは、各プロジェクトサイトにおいてリーフ魚の資源管理に対する支援方策として漁獲物の流通改善や付加価値向上に取り組んできた。しかし、対象となる漁獲物には沖合で漁獲されるハマダイやヒメダイ等の深海底魚類が多く含まれており、これに対応した資源管理措置を採る必要がある。とりわけエマエ島は深海性底魚資源への依存度が比較的高いことから、資源管理方策の開発に向けたパイロット・プロジェクトを実施した。

<エマエ島他シェパード諸島での活動>

a) 漁場利用の課題

エマエ島周辺の底魚一本釣漁場は、エマエ島の複数の集落、マキラ島、マタソ島及びエファテ島の漁業者によって利用されている。この中でエマエ、マキラ、マタソの3島は地理的に近いため伝統的に人的・物的交流が盛んであり、また現代においては同一の行政区分であるため、いわば一つの文化圏となっている。このことから、底魚一本釣漁場に関してもエファテ島を除く「3島の入会漁場」という感覚が強いのが実情である¹。このため、まずはエマエ、マキラ、マタソの3島において資源管理の枠組みを確立することが必要と考えられた(図)。

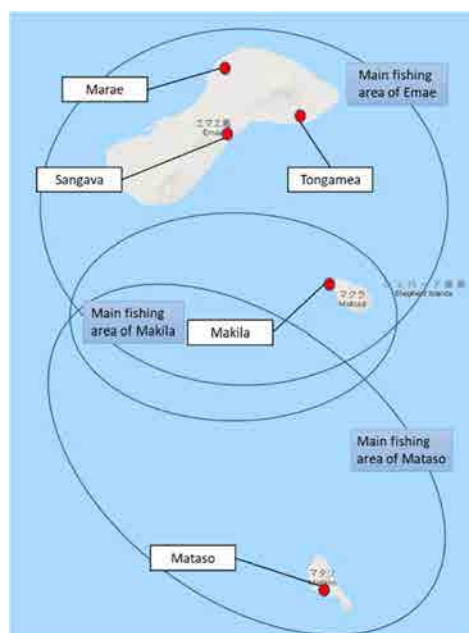


図2 エマエ、マキラ、マタソ3島の底魚一本釣漁場の範囲

b) エマエ、マキラ、マタソ3島による協議

以上の事由から、プロジェクトでは2019年3月にエマエ島サンガバにおいて、エマエ島の主要な3つの漁業集落(マラエ、サンガバ、トンガメア)とマキラ島、マタソ島の漁業者の代表を集め(合計約20名)、底魚資源管理の枠組み作りに関する予備会合(Consultation meeting)を実施した。この中で各代表からは、①全体的な資源状況は概ね良好であるが一部では魚体サイズの小型化等の問題も出始めている、②3島に比べてエファテ島からの漁船が操業している頻度が高く漁獲圧力を高めていることが危惧される、という問題が指摘された。また、これらの問題の解決や予防的措置の確立に向けて3島による資源管理のための枠組み作りが必要であるという認識で一致し、今後本格的な協議を進めることとなった。

¹ 2018年6月にマキラ島、マタソ島を対象とした聞き取り調査を、2019年2月にエマエ島の主な3つ漁業集落(マラエ、サンガバ、トンガメア)を対象とした簡略的な聞き取りをそれぞれ実施した。

その後 COVID-19 の世界的流行のため一時期活動が停滞していたが、2023 年 10 月に活動を再開し、VFD 及びシェファ州政府担当者と底魚資源管理枠組み作りの基本的な方針・考え方について協議を行った。この結果、枠組みは「底魚資源管理連絡協議会（Liaison Conference for Deep-Bottom Fish Fishery Management (DBFFM))」とし、当初想定していた漁業調整員会よりも緩やかな組織とすることになった。これは、本枠組みの基礎になると考えられている国レベルでの底魚資源管理計画（Vanuatu National Deep-Bottom Fish Fishery Management Plan）や漁業管理水域を設定する National Marine Spatial Plan の進捗と理解が十分でないこと、また底魚資源管理の主体となるべき州政府の実施体制が整っていないことから、まずは準備段階の枠組み作りを行うこととしたものである。

その後エマエ・マキラ・マタソの関係 5 漁村の底魚漁業者代表と連絡協議会設立のための会合を開催し、連絡協議会設立に関する協議を経てこれに合意を得た。合意内容は議事録にまとめて各漁村の代表者、シェファ州政府代表者（Acting Secretary General）、VFD（Acting Director）による署名を行い、州政府の主導による公式な管理の枠組みを設立した。

c) 想定される資源管理方策等

プロジェクトでは上記の連絡協議会を設立するまでを支援した。連絡協議会の目的は、①底魚漁業管理に必要な情報交換、②管理ルール協議／合意形成、③水産局からの技術支援の枠組み作り、の 3 点である。また、基本的な枠組みとしては、海岸線から 12 海里までの海域の管理権限を有する州政府が管理主体者となり、漁業者との Co-management を行う。VFD は外部の支援組織として、必要な技術的支援を行って活動を援助する。枠組みの概念図を図 3 に示した。ここでは漁業管理の対象海域を定めるための National Marine Spatial Plan (MSP) プロジェクトも外部支援組織として加えているが、これは VFD と一体に活動を行っている。また、現行の国家底魚資源管理計画（Vanuatu National Deep-Bottom Fish Fishery Management Plan）で底魚漁業者に義務付けられている漁獲データを州政府と共有し、VFD からの支援を受けてその分析結果を漁業者側にフィードバックすることを想定している。

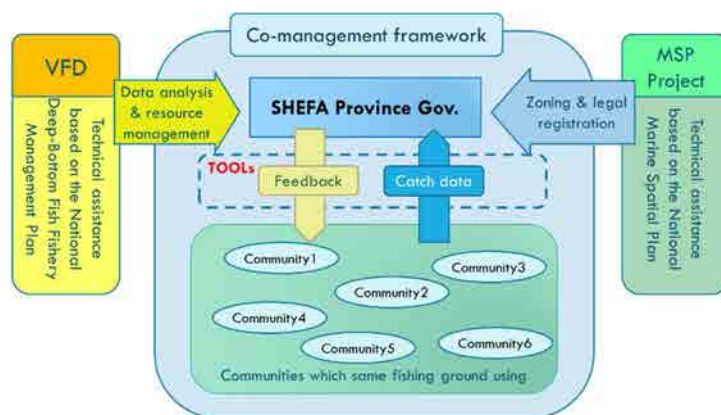


図 3 シェファ州底魚資源管理連絡協議会の枠組み

プロジェクト・フェール 3 では COVID-19 の影響により連絡協議会の設立までを支援するに留まった。連絡協議会の今後の活動としては、①漁業管理海域の設定、②州政府主導

による底魚漁業管理計画の策定、③管理活動のモニタリング手法の設定、④管理活動開始後の情報共有・意思疎通・問題解決等、が想定されている。管理海域の設定には VFD と MSP プロジェクトによる Marine Special Plan がベースとなる。また、底魚漁業管理計画は州政府が漁業者との協議と VFD による技術支援の下で策定を行う。モニタリング方法は原則として漁獲量調査を想定しており、VFD が採用した TAILS 方式で各地域に任命されている調査員を通じて行うことが考えられる。これによって漁獲量や CPUE（漁獲努力量当り漁獲量）の変動を指標として資源動向を把握する。

(3) 有効性、適応性の評価と今後のツール活用への提言

バヌアツ政府による地方分権化の流れの一環として、海岸線から 12 海里までは州政府に管轄権がある。これは、地方の特性に合った漁業管理を実施するためには優位である一方、組織が脆弱で水産部門への対応能力が十分ではない州政府の実行能力に課題がある。このため、沖合の漁場であってもトップダウン型の管理ではなく、関係する漁業集落と共に漁業調整を行おうとする本枠組みは、バヌアツや他の島嶼国に有効な方法であると考えられる。また、VFD も人的資源は十分とは言えない状態であるため、州政府が主体となる活動に技術支援を提供するという形は、底魚漁業管理を普及する上で現実的な対応策である。

一方で、州政府を漁業管理の主体者とするためには、活動開始当初は VFD のイニシアティブと十分な技術的インプットが必要である。とりわけ底魚漁業管理計画の策定には具体的な指針を示すことが求められる。

本ツールの活用については以下のように提言する。

- 連絡協議会の設立は漁業者・州政府の双方から歓迎され、ニーズの高い取り組みであると思われる。しかし、法制上の管理主体となる州政府の実施能力は限定的であるため、漁業者との Co-management と VFD による支援の体制作りが極めて重要である。VFD はその点に配慮して実施支援を行う必要がある。
- 州政府はこの枠組みを基盤とした底魚漁業管理計画を策定する必要があるが、それには VFD の強い支援が求められる。VFD は管理水域の設定や入漁規制の内容、漁獲データに基づいたモニタリング方法の設計、入漁料の設定など、計画に含めるべき具体的な項目や内容について定めたガイドラインを策定する必要がある。

2-1-3 漁場監視 (MT-7)

(1) ツール開発の背景

地域に根ざした沿岸資源管理では、地域ぐるみで緩やかな資源管理のための監視体制がとられている。しかし、資源管理ルールの遵守を徹底するためには、専任者による漁場の監視体制を確立することが望ましい。そのために、このツールの実証が行われた。

(2) 実証結果

豊かな前浜プロジェクトフェーズ 3 のパイロットサイトでは、漁場監視のための 2 つのシステムが見られた。ひとつは水産局による CBAO (Community-based Authorized Officers) の配置であり、もうひとつはコミュニティによる監視である。

CBAO は、豊かな前浜プロジェクトフェーズ 2 にて提言を行い、水産局にて採用が実現したコミュニティ開発オフィサー (Community Development Officer (CDO)) の機能の一部である監視部分を具現化したものである。CDO は CBCRM を地域開発の一部とみなし、地域レベルで資源管理を含めた開発を実施するためのリーダー的な存在として考えられていたが、CBAO に変更された際に水産局で統括する部署は漁業開発部からコンプライアンス部へと変更になり、地域レベルの漁業法を順守させるための警察官のような存在として規定され、違反者を取り締まる権限が与えられている。CBAO の配置については漁業法の遵守という点で結果が得られている一方で、コミュニティとの協力が困難なケースも見られている。一方、CBAO が設置されていないサイトでのコミュニティベースの漁場の監視・モニタリングは、誰が中心となり、どの程度の頻度で実施するのが明確に定義されておらず、緩やかな監視システムとなっている。パイロットサイトでのモニタリング結果によれば、漁場監視活動のための資金が CBCRM 委員会から十分に配分されなかったなどの課題も見られた。このような状態であったにもかかわらず、バヌアツの場合においてコミュニティによる緩やかな監視により違反者は取り締まられ、資源管理計画で設定されているルールに則って罰則が適用されている。

(3) 有効性、適応性の評価と今後のツール活用への提言

CBAO については、バヌアツでは、漁業法を監視する存在として CBCRM とは別に配備されている。豊かな前浜プロジェクトフェーズ 3 においては、CBAO を当初想定していたような CDO のような形で活用することを模索し、バヌアツ水産局のコンプライアンス部と共同で CBAO 研修時における CBCRM アプローチに係る研修の組み入れを試みてきたが、コロナ禍による中断などで十分な成果をあげたとは言い難い。CBAO の配置には、研修や手当などの資金が必要であると同時に、一人でできるモニタリング活動には限界があり、コミュニティの協力が不可欠である。

また、バヌアツではコミュニティが決めたルールを守るという素地があるため、CBAO を置かないコミュニティでも緩やかな漁場監視が機能している。このようなアプローチがメラネシアの他の国々に適用可能か否かは各国の社会・文化的側面から検討することが不可欠である。

本ツールの活用については以下のように提言する。

- CBCRM プログラムの一環として CBAO の活動を取り入れ、CBAO による執行力とコミュニティによる監視の相乗効果に基づく漁業監視体制を確立することが望ましい。

- CBAO は監視のほか、コミュニティ開発オフィサーとして活用し、CBCRM を支援すると同時に支援方策の実施によって得られた資金を活用し、定期的なモニタリング体制を確立する必要がある。

2-2 資源増殖ツール

2-2-1 定着性が強いまたは移動性の低い種の種親の移植 (MT-8)

(1) ツール開発の背景

バヌアツでは、豊かな前浜プロジェクトフェーズ 1 (2006 年-2009 年) の実施当時、定着性の強い資源である貝類の資源、特にヤコウガイやオオシャコガイなどの資源が絶滅の危機に瀕していた。この解決策として、他地域から輸送してきたヤコウガイやシャコガイを住民が自主的に管理する海域 (タブーエリア) に移植 (成貝移植事業) を行ない、同種の増殖を試みるというツールの実証を行うことを目的として本プロジェクトフェーズ 1 が実施され、本活動はフェーズ 2 においても継続された。

(2) 実証結果

バヌアツで JICA が 2006 年から実施した技術協力プロジェクト「豊かな前浜プロジェクトフェーズ 1 (2006～2009)」および「豊かな前浜プロジェクトフェーズ 2 (2011～2014)」で、VFD と住民が協働して沿岸水産資源管理活動を行なった。この中で、バヌアツで絶滅に瀕しているヤコウガイを住民が自主的に管理する海域 (タブーエリア) に成貝移植事業を行ない、同種の増殖を試みてきた。表にこれまで行なったヤコウガイ成貝移植実績を示した。

表 7 ヤコウガイ成貝移植記録

	成員移植場所	地域名	放流数	移植年
北エファテ	マンガリリウ	コトア	205	2007 ・ 2008 年に移植
		マンガリリウ村	262	
	レレパ島	ラカンタマス	195	
	モソ島	スナエ村	150	
	計		812	
ウリピブ島東部			299	2012 年に移植
			28	2013 年に移植

出所：豊かな前浜プロジェクトフェーズ 2・完了報告書

豊かな前浜プロジェクトフェーズ 3 では、パイロット・プロジェクトの対象サイトの一つであり、資源増殖やエコツーリズム振興の観点から、現地コミュニティがヤコウガイ移植を強く望んでいるシェファ州エマエ島にヤコウガイ成員の移植を計画した。移植に際しては、ヤコウガイ個体群の豊富なタフエア州アネイチウム島から移植することが最善であるが、アネイチウム島はバヌアツ最南端に位置し、エマエ島に直接輸送する方法が限られ、輸送に長時間を要する弊害がある。このため、本プロジェクトがマンガリリウに建設したコミュニティ畜養施設の周辺と水槽でいったん輸送個体を養生させ、そこからエマエ島へ移植することとした。



図4 ヤコウガイへのマーキング

今計画を実施するため、2018 年 11 月に、ヤコウガイ個体群の豊富なアネイチウムからマンガリリウに成員 35 個体を移動し、各個体にマーキングした後にマンガリリウのタブーエリアで約 3 か月間の養生を行った後、2019 年 3 月にマンガリリウで採取したものを合わせ合計 48 個体のヤコウガイをボートで輸送し、放流選定地に放流した。

(3) 有効性、適応性の評価と今後のツール活用への提言

エファテ島での移植の成果を確認するため、豊かな前浜プロジェクトフェーズ3では、エファテ島周辺におけるヤコウガイの資源調査を実施した。調査の結果、これまで「豊かな前浜プロジェクトフェーズ1・2」を通じて、ヤコウガイ成員の移植を行なった地点では、ヤコウガイの生息密度が他地点と比較してきわめて高かった。成員を移植する以前には、地元の漁業者がヤコウガイを海底で見つけることは皆無だった、と言われており、成員移植の効果の高いことを強く支持する結果と考えられる。

一方、ヤコウガイの成員移植を行った地域では、ヤコウガイ資源の移植・管理活動を肯定的にとらえている住民がほとんどであったが、大規模な資源管理活動によって、漁業活動が永続的に制限されてしまうことに違和感を覚えている人もおり、資源管理活動と漁業による経済活動のバランスを求めていることがうかがえた。このような経験をもとに、管理方策と支援方策のバランスをとって考えるという本プロジェクトのCBCRMモデルの改定の元となった。

また、本調査を通じて、ヤコウガイ資源を保全するだけでなく、人為的に手を加える「移植」などの手法による増殖の効果も非常に有用であることが判明した。これまでの資源の利用を規制し自然増殖を待つ欧米型資源管理活動から、資源管理方策には人の手を加えて自ら増やす増殖という里海をモデルとする日本型資源管理活動も選択肢の一つとする考え方は、本フェーズ3のツールマニュアルの資源管理ツールを取りまとめる上で、新たな視点を与えることとなった。

研修等の機会に本ツールについて説明した際、参加者からは高い関心を示し受け入れられている。本活動については他地域においても十分適応可能なツールであると考えられる。

本ツールの活用については以下のように提言する。

- 特に欧米系のドナーによるプロジェクトでは、資源管理＝漁獲を制限するという見方が一般的である。しかし、本プロジェクトではこれまでのフェーズ 1～フェーズ 3 のプロジェクトの積み重ねから、資源を増やすことも資源管理につながることを示した。この考え方は豊かな前浜プロジェクトが実施・支援した研修に参加したコミュニティ普及員や地域セミナーの参加者からも新しい考え方だと評価をされている。今後、類似のコミュニティを主体とした資源管理のプロジェクトを行う上で、規制だけでなく、増殖という視点を強調していくことは、コミュニティの資源管理に対するモチベーションを醸成する上で重要なことと考えられる。他方、国や他のドナーの方針によっては、例えば種が同じであっても島や国を超えての移植は本来の生態系を攪乱させるという意見も根強く残っているところ慎重な対応が不可欠である。

2-2-2 ロブスターの幼生と稚エビのための育成場（人工海藻）の設置（MT-9）

(1) ツール開発の背景

ロブスター類は、世界中で最も高価な水産物の一つであり、バヌアツ水産業にとって非常に重要な漁獲物である。このためロブスター資源に対する漁獲圧も高く、資源量の減少が懸念されている。このような背景からバヌアツ水産局は、ロブスター資源を持続可能な状態で維持するために、漁獲体長の制限などの漁獲規制を行っている。

ロブスターの卵から孵化した幼生は、通常およそ 1 年間の浮遊期を経て非常に小形のロブスターに変態し近海の海底の海草場や藻場を隠れ場として底生生活に移行するがこの浮遊期に他の魚類の捕食や自然死等により 9 割以上が減耗するとされている。この若いロブスターは、成長するにつれて、岩場やサンゴ礁に移動して生息するようになる。今後、ロブスター資源の増殖を効率的に行う方策の一つとして、幼生や着底後間もない若個体の生息適地を整備することが考えられる。しかし、通常、バヌアツのような熱帯域では、海草場や大型海藻の繁茂する場所は非常に限られている。

一方、魚介類の稚仔を蛸集させ、生息地を提供するための人工海藻が日本で開発された。この人工海藻は、特にナマコやロブスターの幼稚仔育成場に利用すると効果が高い。通常、漁場等としてあまり利用価値のない砂または砂利の海底にこの人工海藻と小型ブロックを設置することで、稚エビや稚ナマコの生息地を効果的に整備できる可能性が高い。さらに、このような人工魚礁の設置は、コミュニティレベルで資源に対するオーナーシップを高め、資源管理活動に対し積極的な参加を促す可能性もあるため、この人工海藻を利用したロブスター幼稚仔育成場の形成を実験的に試みることにした。

(2) 実証結果

人工海藻の効果を判定するため、タフエア州タンナ島ワイシシの管理海域（禁漁区）の中の砂や砂利の海底域に一定期間人工海藻を設置し、ロブスターなどの有用海産物の稚仔の増集効果を確認する。それを確認した後、人工海藻と小型のブロックを組み合わせた構造物を同じ海底に設置・モニタリングし、ロブスターの幼稚仔育成場の可能性を検討することとした。まず、予備試験として、2 基の人工海藻をワイシシの管理海域内の砂底域に設置した。約 1.5 ヶ月後に、人工海藻を回収し、人工海藻内に隠れていた 4 尾のロブスター稚仔を採集した。禁漁となっている管理海域で、ロブスターの新たな生息地を造成するというアプローチが効果的であることが推測された。

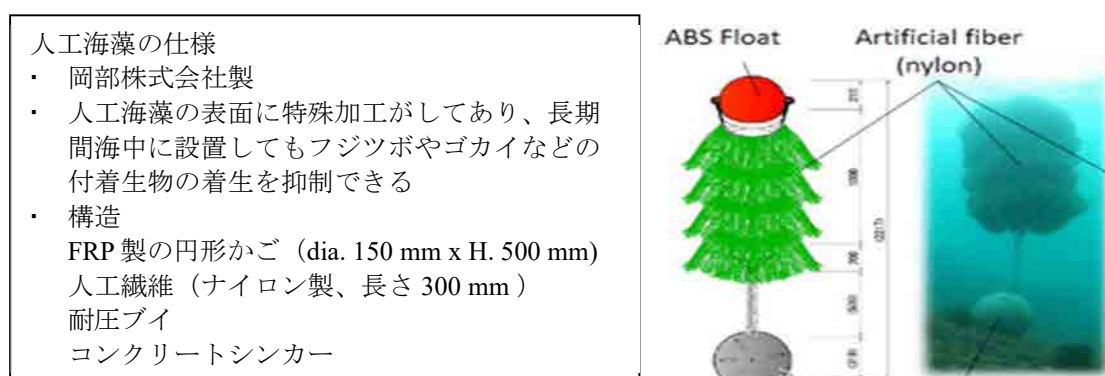


図 5 人工海藻の仕様



図 6 人工海藻から採集したロブスター個体

(3) 有効性、適応性の評価と今後のツール活用への提言

実証の結果から、これまでほとんど利用されることが無かった砂底域に新しい幼稚仔育成場を造成できることが確認された。ロブスターは高価でありコミュニティの関心も高いとみられることから、他地域においても十分に適応可能な活動と考えられる。

本ツールの活用については以下のように提言する。

- 資源管理＝規制だけでなく資源増殖という選択肢を増やすことができると同時に、コミュニティの資源に対するオーナーシップ意識を高める新たなツールになると期待できるため、水産局として規制するだけでなく、増やす取り組みを推進していくことが望ましい。

3. 支援方策

3-1 漁業の多様化

3-1-1 大型浮魚のための FAD 開発 (ST-1)

(1) ツール開発の背景

多くの太平洋島嶼国では、漁業圧力は通常、沿岸の浅瀬、特にリーフ周辺に集中している。したがって、リーフ資源に対する漁獲圧力の削減は不可欠である。漁獲圧力を削減する手段の一つとして、カツオなどの大型回遊魚の漁獲を推進することが考えられる。大型回遊魚の漁獲を推進するにあたり、FAD を設置することは一般的であるが、これまで FAD の開発の歴史は耐久性を重視し頑丈なもの、すなわちコスト増、及び設置のための大型船の必要性からその設置は非常に高価であると考えられてきた。FAD 漁業を普及させるには、住民自身で敷設・保守できる簡易で安価な FAD ユニットが求められる。そのため、安価な FAD 開発を目指して本ツールは開発された。

(2) 実証結果

豊かな前浜プロジェクトフェーズ 2 においては、カリブ海で実施されている類似案件での経験をもとに、FAD の設置費用の中で大きな割合を占めるアンカーをサンドバックで代替する方法が試行された。実施当時で 1 基の製造コストは約 1,300 米ドルと非常に安価なものが開発された。バヌアツでは「VATUIKA FAD」の名称で普及が行われている。

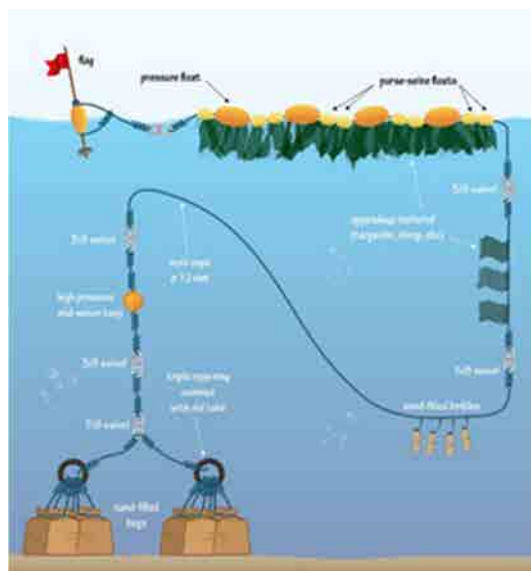


図 7 VATUIKA FAD

当初、対象地域の沿岸住民の要望に応じて、所有するボートと既存の漁法で操業できる沿岸域（海岸線から 1～3 マイルの海域）に敷設された。しかし、沿岸域に敷設した FAD には、魚の蛸集が安定しなかったり、魚の蛸集効果が現れるまでに長い期間を要したり、

沿岸域を航行する船舶に切断されたりとの管理上の問題がいくつか見られたため、さらに沖合側のより深い場所に敷設することとし、各サイトで沖合 600m 以深の海域（海岸線から 4～8 マイルの海域）に FAD を追加して敷設した²。

表 8 豊かな前浜フェーズ 2 で敷設した浮き魚礁 (FAD) (2014 年 2 月時点)

サイト	敷設位置	深度	敷設日
北エファテ	モソ沖北 3 マイル	314 m	2012 年 11 月 21 日
	マンガリリウ北 3 マイル	189 m	2012 年 11 月 21 日
	レレバ北北西 4.5 マイル	730 m	2013 年 5 月 23 日
	レレバ沖北西 4.5 マイル	600 m	2013 年 10 月 10 日
マラクラ	ウリビブ島より		
	北北西 1 マイル	200 m	2012 年 12 月 5 日
	北東 1.2 マイル	550 m	2012 年 12 月 5 日
	東 2.2 マイル	660 m	2013 年 7 月 14 日
	北 2 マイル (中層)	300 m	2013 年 12 月 16 日
	東 1.5 マイル (中層)	300 m	2013 年 12 月 16 日
アネイティム	クラブ湾より		
	北東 3 マイル	300 m	2013 年 12 月 18 日
	アナルカハット村より		
	南西 3.7 マイル	350 m	2012 年 12 月 14 日
	北西 4.7 マイル	270 m	2012 年 12 月 15 日
	南西 7.5 マイル	805 m	2013 年 6 月 25 日

出所：豊かな前浜プロジェクトフェーズ 2 業務進捗報告書

北エファテやアネイチムでは、沖合域に敷設した FAD 周辺では、カツオやツムブリなどの沖合浮魚の蛸集効果が顕著であることが確認された。それにより、FAD 周辺にて曳き縄漁（トローリング）でカツオなどの浮魚を漁獲して、そのカツオを餌として用いて、底立て延縄漁でハマダイなどの沖合底魚を漁獲する漁業パターンが定着した。

バヌアツでは、ハマダイなどの沖合底魚は高価で取り引きされ、その需要は大きい。底魚漁（底立て延縄）では、安定した餌の確保が課題であったが、沖合 FAD の敷設や改良漁法の指導により、安定的に沖合浮魚が漁獲できるようになった。

(3) 有効性、適応性の評価と今後のツール活用への提言

本 FAD については、コスト VS 耐久性、設置の容易さ、並びに魚類の蛸集効果が漁業者による認識・定着の過程を経てすでにバヌアツの中では標準となっており普及している。特に国中に普及していった要因にはプロジェクト導入後に他のドナーによって採用されタイムリーに導入が行われた点も大きいと考えられる。また、コストがかからない分、どうしても耐久性の点で難点がある。また制作コストが安価とはいえ漁業者間で自己投資して

² 残念ながら、これらの FAD はプロジェクト終了後にすべて流出しており、現在は残っていない。

設置するところまでは達していない。今後は、コストの一部でも漁業者間で負担するなどの方策を取り入れるなど漁業者間の組織化、イニシアティブの発揮を念頭に置きつつ普及戦略を確立し、大洋州地域において普及が進むことが望ましい。

3-1-2 底魚漁業開発 (ST-3)

(1) ツール開発の背景

多くの太平洋島嶼国では、漁業圧力は通常、沿岸の浅瀬、特にリーフ周辺に集中している。したがって、リーフ資源に対する漁獲圧力の削減は不可欠である。漁獲圧力を削減する手段の一つとして、沖合の底魚漁業を推進することが考えられる。そのため、本ツールが開発された。

(2) 実証結果

豊かな前浜プロジェクトフェーズ 2 においては、沖合 FAD を活用するための漁法として、曳縄、流し立縄（ドロップライン）のほかに、流し底立縄漁法に関する研修が実施された。

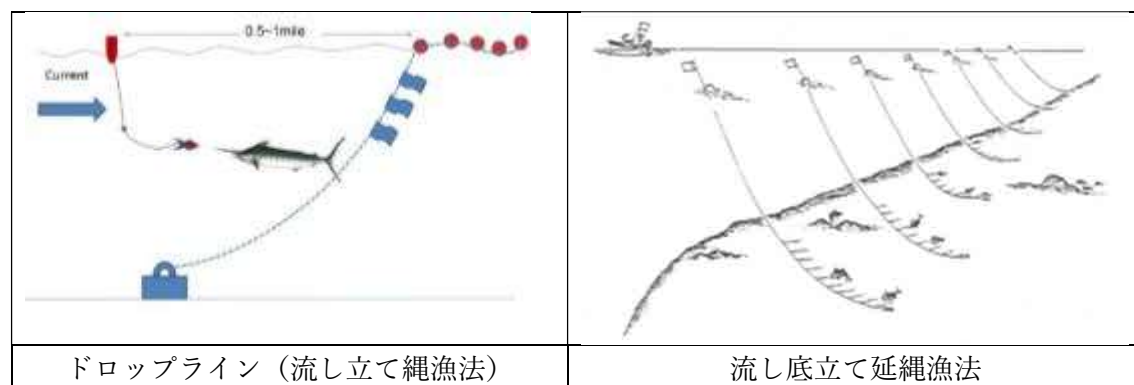


図 8 ドロップラインと流し底立て延縄漁法の模式図

プロジェクトが導入した底立縄は積極的に活用され、導入した漁具を独自に改良する先進的な住民の数が増加するなどの成果が見られた。

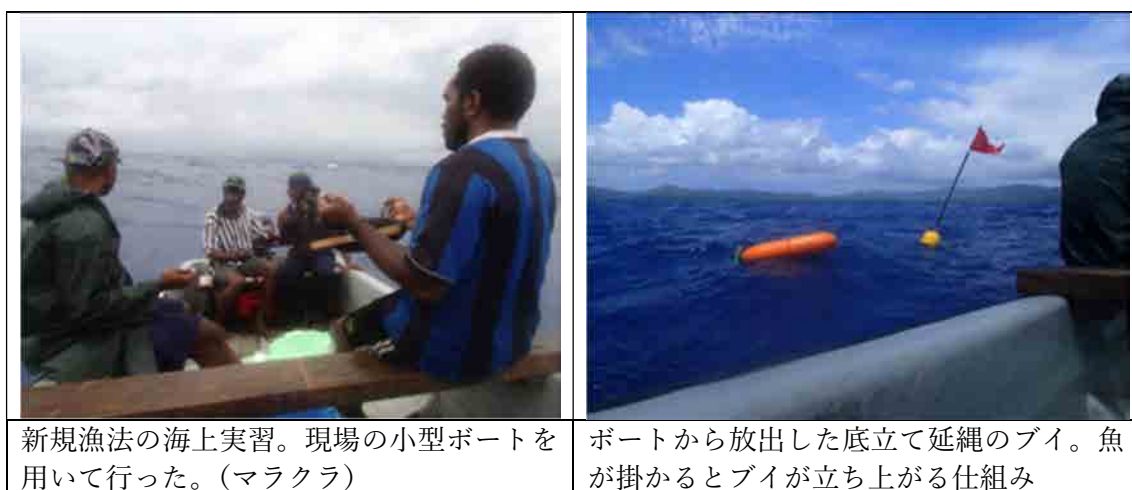


図9 底魚漁業開発に関する活動の写真

(3) 有効性、適応性の評価と今後のツール活用への提言

沿岸資源への漁獲圧力の緩和という点、底魚は市場の需要が高く高価であるため、支援方策としての有効な手段であるという点で、本ツールの有効性は高い。ただし、バヌアツの沿岸集落においては手漕ぎのカヌーが主体で漁船の動力化率が高いとは言えず、どの地域でも適応できるツールとは言えない。本ツールを振興するためには、エンジン付きのボートを併せて供与する必要がある。

本ツールの活用については以下のように提言する。

- 底魚漁業は普及が進むと急速に資源状況が悪化する懸念があり、釣り針の数を制限する、漁場のローテーションを行うなど慎重に管理を行いながら振興を行っていく必要がある。特に、底魚漁業を活発に行っている漁業コミュニティにおいては、底魚漁業に関する管理方策をあらかじめ予防的に CBCRM 計画に含めておくことが望ましい。

3-1-3 ソデイカ漁業開発 (ST-4)

(1) ツール開発の背景

多くの太平洋島嶼国では、漁業圧力は通常、沿岸の浅瀬、特にリーフ周辺に集中している。したがって、リーフ資源に対する漁獲圧力の削減は不可欠である。漁獲圧力を削減する手段の一つとして、沖合の未利用資源を活用していくことが求められる。そのため、生息は確認されているものの未利用資源であったソデイカ漁業の振興というツールを開発し、実証することとなった。

(2) 実証結果

豊かな前浜プロジェクトフェーズ 2 では、タフエア州アネイチウム島での海上実習でソデイカ漁業の試験操業を行い、ソデイカを漁獲に成功した。バヌアツでは初めてのソデイカの漁獲事例であった（当時）。その後、エファテ島レレパ沖でも試験操業を行い 1 日で 7 匹の漁獲を行うことができた。南太平洋地域では、ニューカレドニアとクック諸島で SPC がマグロ延縄船を用いてソデイカの試験操業を行った実績があるが、一般の小型ボートでソデイカを釣り上げた事例は希有であった。



図 10 ソデイカの漁具



図 11 ソデイカ漁業開発の活動

(3) 有効性、適応性の評価と今後のツール活用への提言

ソデイカは食用としての価値が高く、観光客向けの商材として有望である。ソデイカ漁では生餌を必要としないため、漁具さえ持参すれば、沖合底魚漁と組み合わせてできる利点もある。また、バヌアツ海域では、小型ボートでも行ける沖合域でソデイカが釣れることが判明したことから、適当な漁場と漁期が判明すれば、今後、安定してソデイカを漁獲できることが期待されている。残念ながら、バヌアツではその後本活動に進捗は見られないが、観光ホテルなどを対象とした市場開発を合わせた活動を行う等将来的な開発が期待される。

3-1-4 ハイブリッドカヌー開発 (ST-5)

(1) ツール開発の背景

離島部では、タンパク源として鮮魚が重要である。沿岸部での漁獲圧力を軽減するために、沖合漁業を振興することが対策の一つとして考えられるが、実際に定期的に漁に出ている住民は限られている。その理由として、離島部でのガソリン単価が高いことがあげられる。そのため、漁にかかる燃料経費を抑えるために、動力源として小型船外機と帆を併用できる改良型カヌー（ハイブリッドカヌー）というツールを開発した。

(2) 実証結果

豊かな前浜プロジェクトフェーズ 2 では、タフェア州アネイチウム島、シェファ州エファテ島マンガリリウ村においてハイブリットカヌーを導入し、特にマンガリリウ村とシェファ州レレパ島においては住民で普段の漁業活動に活用した。その改良型カヌーの導入に刺激を受けて、Fish Aggregating Device (FAD) 委員会の漁獲物販売の利益を原資にして、マンガリリウ村とレレパ島のコミュニティが共同で大型の帆走動力エンジン付カヌーを建造したなどのインパクトが見られた。さらに、マンガリリウ村では、ユネスコ世界遺産センターとバヌアツ観光局が進めているコミュニティ経営による観光バンガロープロジェクトと連携して、青年グループによる改良型カヌーを活用した観光活動と FAD 周辺の曳き縄漁の実施が検討されていた。



マンガリリウ村で製作中の大型カヌー。
観光・漁業に利用する (2013 年 10 月)



完成した大型改良カヌー (2013 年 12 月)



図 12 ハイブリッドカヌー開発の活動

豊かな前浜プロジェクトフェーズ3においては、サンマ州エスピリツ・サント島のプロジェクトサイトのコミュニティであるワイラパとタンゴア島向けに、シェファ州エファテ島で購入した現地製 FRP カヌーをサントにある水産局の造船所に輸送し、アウトリガーの装備、その他漁船としての改造し、船外機付き FRP 製帆走カヌー2 隻を建造した。このうちの 1 隻にマストとセールの艀装をし、利用者候補に対する操船研修を実施した後、1 隻をタンゴアコミュニティに導入した。

このようなカヌーの操船に習熟してもらうため、プロジェクト専門家のほか、本プロジェクトフェーズ 1、2 の対象コミュニティであったシェファ州エファテ島マンガリリウ・コミュニティの資源管理委員会の構成員、かつセーリングカヌーの専門家でもあるメンバーにより、タンゴア、ワイラパ・コミュニティ代表者に対し 2 日間にわたり以下の研修を実施した。

- 船体艀装：マストとセール、関連ロープのとりつけ
- 船外機の取り扱い：燃料コックの位置、エンジン緊急停止法、エンジンオイル交換時期等
- セーリング：風下セーリング、舵としてのパドルの扱い等
- 操業記録：漁獲量（高）と操業経費一覧表の記入方法

その後、2020 年 11 月にタンゴア島の漁協に 2 サイクル船外機付きの FRP カヌーを引き渡し、操業は 12 月に開始された。しかし、それ以前に本プロジェクトで漁協に導入したソーラーフリーザーに不具合が発生し、氷が生産できない状況が続いた。そのため、漁獲物の保存に支障をきたしたと、また、この不具合発生が年末に重なったため、交換部品や技術者の手当てが思うようにいかず、最終的な修理は 2020 年 3 月までかかり、その間、州都のルーガンビルより氷を取り寄せて操業を維持してきたが、操業日数は残念ながら当初の計画を大幅に下回る結果となった。また、ワイラパの導入した同型船はサイクロンハロ

ルドにより船外機の水没の被害を受け使用不能となっている。

(3) 有効性、適応性の評価と今後のツール活用への提言

本活動の有用性については、豊かな前浜プロジェクトフェーズ 3 のパイロット活動においては、自然災害の被害をはじめとする様々な要因で十分に有効性が検証されたとは言えないが、フェーズ 2 のパイロット活動において確認できた。他の地域においても適応は十分に可能と思われるが、導入のコストについては課題がある³。

本ツールの活用については以下のように提言する。

- プロジェクトとしては個人ではなくグループに供与する必要があるが、沿岸コミュニティ内でハイブリットカヌーの運営・管理方法を明確にする必要がある。

3-2 水産物の付加価値化

3-2-1 水産物流通システムの改善（ST-6）

(1) ツール開発の背景

バヌアツでは、水産物の流通経路や流通手段がまだ十分に発達していない。流通コストの高さ」「流通頻度の低さ・不定期性」など、流通システム上の問題も生じている。つまり、非効率な流通システムのもとで水産物が販売されている。それは、漁獲から流通・販売まで一貫して行う漁業従事者の家族の生活にも悪影響を及ぼしている。同時に、非効率的な流通により、特に遠隔地では一般市民が水産物を入手することが難しくなっている。資源管理の観点からは、流通システムの脆弱性は、ポストハーベストロスなど漁業資源の非効率な利用を引き起こす。そのため、魚の流通システムの改善を行うためのツールの開発を行った。

(2) 実証結果

1) ソーラーフリーザーを活用した離島部での流通改善の試行

豊かな前浜プロジェクトフェーズ 3 では、流通改善に寄与するため、シェファ州エマエ島トンガメアとサンガバにソーラーフリーザーを導入することとした。以下のような計画とした。

- ①エマエ島サンガバ、トンガメア、およびマラエ（コミュニティ主導で市場建設中）の 3 か所を水産物生産の拠点とし、各コミュニティ内で消費しきれない水産物は、フィノンゲに集積して販売する。
- ②マラエで一次加工品を製造し、ポートビラに輸送するとともに、水産物の需要が多いト

³ 豊かな前浜プロジェクトにおいては、日本の民間会社のご厚意により船外機の無償供与が得られたが、実際には購入する必要がある。

ンゴアへの流通開発も検討する。

- ③ポートビラへの流通手段として、週一度エマエ島に寄港する定期フェリーに加え、航空機での輸送も検討する。
- ④これまで流通経路のなかったマキラ・エマエ間の流通開発を計画し、エマエが水産物集積地としての機能を持つことができるか検討する。

このうち、サンガバでは既に2019年1月から市場活動を開始し、約1か月間の収支記録を確認したところ、収入13万8000バツ、支出9万3100バツで、約4万4900バツの収益を記録していた。本プロジェクトから、このような収益の一部をソーラーフリーザーの修繕費として、コミュニティで責任をもって貯蓄・管理して行かなければならないことを説明した。

本プロジェクトでソーラーフリーザーを導入したサンガバ・コミュニティFAでは、大量の漁獲物の鮮度を保持したまま、これまでよりも長期で保存することが可能となった。これにより、便数の少ないフェリーの利用、突然のフライトスケジュール変更により左右されることなく、出荷調整が行えるようになった。その結果、ポートビラへの流通の効率性が向上し、利益を多く得ることができるようになった。

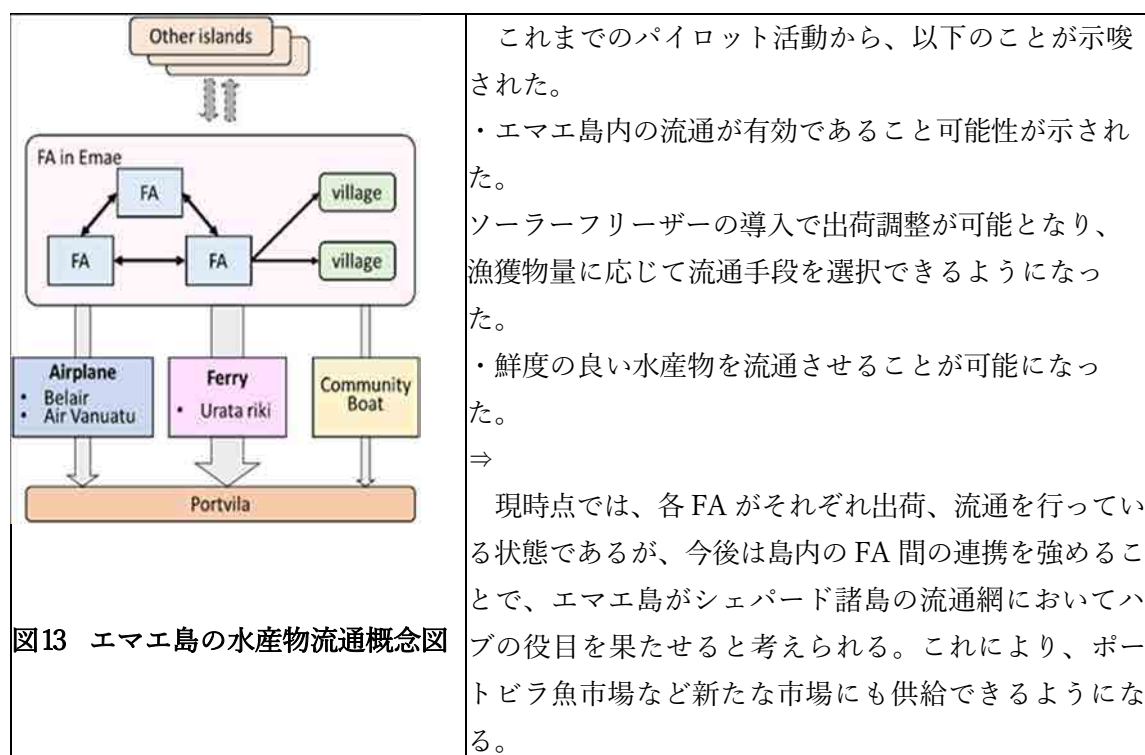


図13 エマエ島の水産物流通概念図

一方、ソーラーフリーザーの維持管理体制には課題が見られている。その後のモニタリングでソーラーフリーザーを活用して得られた利益が十分に貯蓄されておらず、故障した

り、バヌアツを度々襲っている大型サイクロンによってソーラーパネルが吹き飛ばされたりといったトラブルがあった際にパーツを調達できず、そのまま使用ができなくなるなど十分に活用できていないケースが見られた。

2) 離島から離島への水産物流通開発

タフエア州アニワ島から豊かな前浜プロジェクトのパイロットサイトの一つであるタフエア州タンナ島ワイシシへの流通開発の可能性を検討することを目的に、アニワ島のイコウカウ **Fisheries Cooperative Association** (FCA) の組合員らを対象にワークショップを開催した。現状のアニワからレナケルへの流通経路は、タンナ島ホワイトグラスを経由し西部タンナに流れるケースとワイシシを経由しレナケルに流通するケースである。両ケース共に漁業者もしくは漁業者組合がレナケルまで運送し販売するが、この2通りの経路の選択要因はアニワにおける燃料の保有量による。ワークショップでは、①アニワ島の漁業者がワイシシを経由してタフエア魚市場に輸送・販売するケースと、②ワイシシ漁民組合に販売するケースを比較した。その結果、1回当たりの輸送量が120kg以下の場合はワイシシ漁民組合に販売した方がアニワ漁業者はより多くの利益を得られることが分かった（ワークショップ実施時の販売価格の場合）。

このワークショップを契機に、ワイシシ漁民組合がアニワの漁民組合から漁獲物を5回購入した。また、2019年7月に水産局普及員と組合局職員が、アニワにおいて流通開発の啓発活動を行った。以前にはイコウカウとワイシシ漁民組合の流通経路はなかったことから、ワークショップや啓発活動は、流通網拡大のための大きな一歩になったと思われる。

本活動はしばらく機能していたが、輸送に使用していたプロジェクトの車両の故障やワイシシ漁民組合の運営の弱体化などが原因で、活動は停止したままとなっている。

(3) 有効性、適応性の評価と今後のツール活用への提言

これまでの実証の結果から、電気のない村落においてソーラーフリーザーの導入による効果は大きいことは検証できている。ソーラーフリーザーについても、他ドナーの支援などによりバヌアツでは普及しており、適応性は高いとみられる。一方、その維持管理には課題が見られている。豊かな前浜プロジェクトでは維持管理に課題があることは理解したうえで定期的なモニタリングによって運営改善に努めてきていたが、コロナ禍でのプロジェクト活動の一時停止というモニタリングの空白期間に、多くのソーラーフリーザーの運営が停止してしまうという事態に陥った。

本ツールの活用については以下のように提言する。

- 本活動を行うにあたっては、帳簿の記録と利益の貯蓄、減価償却を念頭においた更新計画の策定、定期的なモニタリングなど、運営維持管理の構築に努めることが不可欠であり、水産局普及員による定期的な啓発活動が必要となる。

- 魚の流通以外の収入源を得るため、ソーラー発電の活用方法を考える必要がある。特に、携帯電話の充電の需要は高いと考えられるため、携帯の充電に対して課金するなどの方法が考えられる。

3-2-2 水産加工 (ST-7)

(1) ツール開発の背景

太平洋諸島のような熱帯諸国では、魚の取り扱いや加工に適切な施設や技術がないため、衛生状態が悪くなり、ポストハーベストロスが発生している。特に、季節的に回遊する遠洋性魚類は短期間に大量に漁獲されるが、これらの資源をいかに効率的・効果的に活用するかが課題となっている。

これらの問題を解決するためには、魚の取り扱い、保存、加工を含む適切な技術の導入が重要である。また、水産物の付加価値を高めることで、より多くの利益を生み出し、漁業コミュニティの販路を拡大することが期待されることから、本ツールの開発と実証が行われた。

(2) 実証結果

豊かな前浜プロジェクトフェーズ 3 のパイロットサイトの一つであるサンマ州エスピリツ・サント島では、切り身になっていないホールの生鮮魚が主に流通しており、水産物の一次加工品および二次加工品は一般的に流通していない。そのため、研修や試験販売を通じて今後のパイロットサイトにおける二次加工品の開発・普及に向けた教訓を得ることを目的とし、以下の活動を行った。

a) 水産加工とマーケティング研修の実施

水産加工とマーケティング研修を実施した。座学でパイロットサイト関係者の付加価値化に対する理解を促すとともに、実習により加工技術を学んでもらった。研修では、生鮮魚の漁獲後処理方法、フィレ加工、塩蔵、燻製、ボトルフィッシュ、フィッシュボールを作った。

b) 水産加工品の販売

カヴァバーで水産加工品の試験販売を実施した。試験販売の目的は、水産加工品に対する一般住民による購買意欲の確認とマーケティングのための基礎情報の収集であった。総じて売れ行きは伸びなかったが、カツオやイカなど普段から食べ慣れている魚種の燻製品については比較的購買が進んだ。一方、ティラピア燻製は購買が進まなかった。一般的にバヌアツ人は食に対して保守的であり、見慣れない加工品が敬遠され、ティラピア燻製は見た目の悪さや骨の多さから避けられた可能性がある。しかしながら、補足的に実施した昼食時の市場の総菜屋でのティラピア素揚げの売れ行きは良好であったことから、販売場

所・時間を含めたさらなる分析が必要である。食味に関しては、試食会において好評だとする意見が多数聞かれたことから、バヌアツ人にも受け入れられることが確認できた。

また、魚類の二次加工品の開発をするため、比較的利便性の良いシェファ州エファテ島マンガリリウで、住民と魚類の燻製製造、販売試験を行った。できあがった燻製は、村のカヴァバーで販売し、30分で完売した。

	
魚類の燻製を製造する様子	出来上がった魚類と玉子の燻製

図14 水産加工品の開発の活動①

そのほか、タロイモとキハダ、カマスサワラなどを用いたハンバーグの試作を行った。

		
出来上がった燻製	クッキングデモンストレーションの様子（見学者も積極的に参加）	ハンバーグの試作品

図15 水産加工品の開発の活動②

これらの二次加工品は、塩分の量を調節することで、長期保存が可能となる。サイクロン発生時などには、災害時の食料安全保障に役立つことが考えられる。また、長期保存により沿岸部の住人だけではなく山岳部への流通も可能となることからマーケットの拡大また、普段口にすることができない海産物の流通が可能となれば栄養改善にも資する。二次加工は、加工者にとっては新たな収入源として、消費者にとっては生活の改善手段として役立つと考えられる。

(3) 有効性、適応性の評価と今後のツール活用への提言

本プロジェクトでは、水産加工品の開発、研修と試食の段階までは行っており、研修の参加者には概ね好評であったが、研修のあとで普及には至っていないのが現状である。本ツールの有効性、適応性については引き続き検証していく必要がある。

本ツールの活用については以下のように提言する。

- 普及にまで至らない要因でもあったと考えられるが、馴染みのない燻製品やティラピア加工品を普及させるための今後の展開として、水産局が実施主体となり、①継続的なプロモーションにより一般客の警戒心を解く、②販売に併せて試食も行い味を知ってもらった上で販促を行う、③食堂オーナー等の飲食業者を対象とした試食会を実施する、等の活動が必要である。

3-2-3 貝細工の支援 (ST-8)

(1) ツール開発の背景

タカセガイ、ヤコウガイなどの貝殻は、工芸品の材料として高く評価され、手工芸品の材料として珍重されている。これらの種は、多くの国や地域で乱獲のため禁漁の対象となっている。一方で、これらの貝類は長い間、沿岸地域社会にとって重要な食糧であり収入源であった。これらの貝類は、干潮時に岩場で女性たちによって簡単に採集される。そのため、漁獲制限は女性により大きな影響を与える傾向がある。言い換えれば、貝類資源と女性の収入源の両方が同時に減少するという問題がある。

貝細工は、貝殻を加工することで付加価値をつけ、収入源とすることでリーフ内資源の漁獲圧力を軽減し、収入源を向上させる効果がある。そのため、ツールとして開発し、実証を行うこととした。

(2) 実証結果

豊かな前浜プロジェクトフェーズ 2 において、シェファ州エファテ島マンガリリウ村の貝細工を得意とする住民をタフエア州アネイチウム島に派遣して、地元女性を対象に「貝細工製作ワークショップ」を開催した。その後、対象のコミュニティでは、貝細工委員会が組織され、貝細工の製作活動を始めた。また、2013 年 11 月より、アネイチウム島に隣接し、クルーズ船が頻繁に訪問するミステリー島の売店でのクルーズ船観光客への販売も開始した。アネイチウム島では、さらに、以前に水産局がアネイチウム島に導入した未利用のソーラーパネルを利用して、バッテリー、レギュレーターなどの他機材を追加導入して、貝細工製作用のソーラー発電システムを整備し、貝細工製作に取りかかった。

	
貝細工製作ワークショップ（アネイチウム島アネルカハット村：2013年5月）	青年グループによる貝細工製作（2013年8月）
	
観光クルーズ船の訪問時に、ミステリー島の売店での貝細工品の販売を始めた（2013年11月）	地元貝細工品の宣伝ポップとして、試験的にエコラベルを配布・利用している（2013年11月）
	
新しいソーラー発電システムの導入により、整備された貝細工工房（2014年2月）	貝細工工房で製作中の貝細工品（2014年2月）

図16 アネイチウム島における貝細工に関する活動

また、既述のエファテ島マンガリリウ村の貝細工専門家を派遣して、2014年にパイロットサイトの一つであるマランバ州マレクラ島クラブ湾村落の女性グループ代表者を対象に、貝細工製作ワークショップを開催し、その後、ワークショップに参加した女性たちで貝細

工委員会を組織して、貝細工作りを始めた。

当初は、クラブ湾の村々には公共電気が届いていないため、マレクラ州の州都ラカトロの水産事務所で貝細工用の工作機械（グラインダー、ドリルなど）を管理し、女性グループは水産事務所の電源を利用して貝細工を製作する計画であった。しかし、裨益者の多くが主婦のため、ラカトロまで出向いて作業する時間を取るということが困難なことから、コミュニティで工作機械や金具を管理したいとの意見を受ける形で、クラブ湾とウリピブ島の2つの女性グループに工作機械と発電機を提供して、貝細工のサンプルを作り始めるに指導した。

また、第1回貝細工製作ワークショップには、ラカトロに出向くことできる限られた女性しか参加できなかった婦人たちを対象に、貝細工製作ワークショップを開催した。

課題は貝細工の販売であったが、ラカトロ市場に併設されるクラフトセンターや、ラカトロ魚市場での地元貝細工の販売が期待されていた。また、観光クルーズ船が入港するワラ島での販売も期待されていた。

	
貝細工製作ワークショップ（マラクラ島）クラブ湾村落の女性グループ代表が参加した。（2013年7月・ラカトロ）	当ワークショップの参加者が、各自の村落で貝細工製作を女性たちに指導する予定であった。
	
ウリピブ島での貝細工ワークショップ 現地インストラクター・ラプサル氏からの貝細工製作の基本技術を指導した（2013年11月）	クラブ湾ロウニ村での貝細工ワークショップ 会場の手配が付かなかったため、屋外での開催になった。（2013年11月）



図 17 マレクラ島における貝細工の活動

また、アネイチウムでは本邦研修に参加した住民代表の女性がコミュニティの小学生に生きた貝ではなく死んだ貝のみを集めさせそれらを利用した貝細工をクルーズ船の観光客に販売しているとのことである。その後、本活動は TIVET（職業訓練局）に引き継がれ本活動を通して制作技術を高めたレレパの女性が研修講師として各地で研修を実施するまでに発展した。

(3) 有効性、適応性の評価と今後のツール活用への提言

貝細工の活動については、材料となる貝は沿岸地域であれば入手は容易である。すでに貝細工を行っているエファテ島マンガリリウなどから技術を持った人を講師として研修を行うことも可能であり、適応性は高いとみられる。観光業はバヌアツの経済を支える産業であるが、土産物の多くは輸入品に頼っており、本活動には開発の余地は大きい。

本ツールの活用については以下のように提言する。

- 観光局、女性局なども本活動については関心を示しており、今後は他省庁とも連携してエコタグの普及を介して資源管理と生計向上を同時に成立させるよう本活動を推進していくことが望まれる。

3-2-4 フィッシュ・カフェ (ST-9)

(1) ツール開発の背景

豊かな前浜プロジェクトフェーズ 2 の対象サイトの一つであったタフェア州アネイチウム島に隣接するミステリー島には年間 70 隻以上のクルーズ船から多くの観光客が来訪していた。しかし、観光客向けの地元料理は唯一ロブスターに限られていた。ロブスターには漁業法で尾部 20 cm 以下の漁獲が禁止されているが、同島の住民はミステリー島資源管理委員会の取り決めにより漁業法よりも厳しい 25 cm 以下の採捕禁止を設け、自主的にすべて

の漁獲物の尾部の計測を行っている。それにもかかわらず、本種に過剰な漁獲圧力がかかりつつあった。そこで、観光客向けに提供する地元料理を魚料理にまで多様化し、ロブスター資源を維持することが大きな課題であった。このような背景から、本プロジェクトでは、現在利用率の低い魚資源の有効活用を促し、同時にロブスターへの漁獲圧力を軽減することを目的として、フィッシュ・カフェ経営を導入・指導した。

(2) 実証結果

2013 年 7 月～8 月に、JICA シニアボランティアの紹介により、その配属先である観光・レジャー産業研修センター（Hospitality Tourism and Leisure Training Centre）の調理担当講師 2 人をタフエア州アネイチウム島に派遣し、地元で獲れた魚を用いた料理指導の研修会を開催した。当研修には、アネイチウム島アナルカハット村の住民から選ばれた 15 人が受講した。本研修では、カツオ、サワラなどの浮魚、フエダイ、ハマダイなどの底魚を利用した魚の串焼き、揚げスティックとタルタルソース和えなどの 4 種類の魚料理メニューと、ココナッツジュースを使用したカクテルの作り方を主に指導した。また、仕入れ方法、コスト計算なども指導した。また、本研修中に 3 日間クルーズ船観光客への試作料理の試験販売を実施した。ちなみに、研修受講者には本センターの研修終了書が授与された。なお、講師の派遣費用を含めて、料理研修会に要した約 50 万バツの経費は、アナルカハット村観光委員会が全額負担した。

	
フィッシュ・カフェの調理場で、地元魚料理を準備する研修受講者	バーベキュー料理の調理の様子



図 18 フィッシュ・カフェに関する活動

研修中の 3 日間の試験販売で、約 270 千バツを売り上げたなど、5 回（5 日間）のクルーズ船観光客への魚料理の販売で 1 回の平均売上約 60 千バツ（粗利 20 千バツ/回）をあげるなど、ミステリー島での観光フィッシュ・カフェは経営的に十分に成り立つと考えられた。

しかし、2013 年 10 月以降は、カフェ委員会がサワラなどの浮魚が確保出来なかったことや、またカフェの开店場所が決まらないことなどから、フィッシュ・カフェは休業状態に陥った。そのため、クルーズ船の訪問日程に合わせて、数日前から魚を購入したり、漁に出る住民に燃料代を提供して、適当な魚を用意したり、沖合浮魚だけでなく、ハマダイなどの底魚も活用するなど、カフェに必要な魚確保について、カフェ委員会と議論・指導した。また、ミステリー島観光委員会の幹部と面談して、开店場所の固定化など、フィッシュ・カフェ・プログラムへの理解と協力を依頼した。こうしたプロジェクトと水産局の働きかけから、フィッシュ・カフェ経営を再開できたが、その後も適当な魚の調達や开店場所の確保の問題は解決されず、カフェ経営は休業状態に戻ってしまった。このような状況を繰り返しながらも、現在も魚料理を提供する場は継続されているとの報告を受けている。

(3) 有効性、適応性の評価と今後のツール活用への提言

実証の場面では、極めて順調に進んだ時期もあったが、様々な要因によりフィッシュ・カフェの運営はなかなか予定通りに進まない状態となったり再開したりと安定的な状態とは言い切れない。ただし、ミステリー島でのフィッシュ・カフェの取り組みは、従来あまり利用されてこなかった水産資源の有効活用とロブスターへの漁獲圧力軽減実現に向け十分な可能性を示した。未利用資源の有効活用という点で、フィッシュ・カフェのようなアプローチが推進されることが望ましい。

年間 70 隻以上のクルーズ船が寄港するミステリー島でのケースは非常に特殊であり、ど

の地域でもそのまま適応するというのは難しいと思われたが、プロジェクトに関係した住民間の交流の機会を設けたことで、その中のマクラ島の日本の支援で建設された魚市場のマネージャーに抜擢されたコミュニティカウンターパートがこのコンセプトを応用し、魚市場に食堂を併設するなど少なからず好影響を与えた。この成功要因として住民間でクルーズ船の来訪数の増加による収入増加の期待が高まる半面、ロブスター資源の持続性に不安を覚えるなどの背景をベースに、プロジェクトによる活動案の提示、観光・レジャー産業研修センターの協力と本活動資金が提供できるミステリー島観光委員会の存在があげられる。沿岸集落地域によっては観光が盛んな地域もあるため、そのような地域においては、本ツールの適応が検討できる。



図 21 ナケレに建設されたコミュニティ魚市場

3-2-5 コミュニティ魚市場 (ST-10)

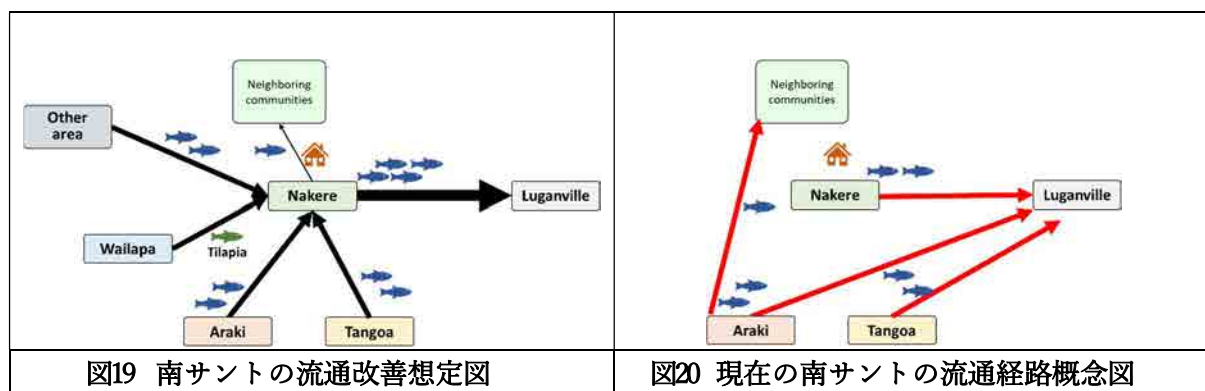
(1) ツール開発の背景

島や村においては、魚の安定供給は、対象地域外から訪れる観光客だけでなく、地域住民の魚消費拡大のために不可欠な要素である。また、地域社会における水産物の市場開拓は、漁業者にとって重要である。漁業者は、資源管理の重要性を理解していても、利益を感じなければ、それを実行する意欲を失ってしまう。地元で冷蔵施設を設置し、市場を整備することで、漁業者、仲買人、協同組合が安定的に水産物を扱えるようになる。このような観点から、コミュニティ魚市場というツールが開発され、実証が行われた。

(2) 実証結果

豊かな前浜プロジェクトフェーズ3においては、パイロットサイトの一つであるサンマ州エスピリツ・サント島南サント、ナケレにおいて、コミュニティ魚市場の建設を試みた。当初南サントでは、水産物流通の改善、効率化として以下の方法を考えていた。

- アラキ島やタンゴア島で漁獲した水産物を、ナケレに建設するコミュニティ魚市場で集荷する。
- その後、マーケットを拠点として共同出荷を行うなどして流通コストや手間を削減する。



本活動を実施するにあたり、同じく南サントをパイロットサイトとするUnited Nations Development Programme（UNDP）が実施していたVCAPプロジェクトがソーラーフリーザーを購入し、豊かな前浜プロジェクトは運営維持管理を支援することで合意していた。しかしながら、VCAPプロジェクトが予算不足によって活動を中止し、当初導入が予定されていたソーラーフリーザーの調達が頓挫して以降、ナケレにおけるコミュニティ魚市場建設は停滞した。

停滞の他の要因として、建設の遅延が挙げられる。住民自身のコミュニティ魚市場に対するオーナーシップを醸成させるために、プロジェクト側から労賃の負担、あるいは建設業者の雇用等の必要以上のインプットをせずに、コミュニティと合意の上で建設資材のみをプロジェクトが提供し、コミュニティが建設のための労力を提供することが決まっていた。しかし、ボランティアということもあり、コミュニティで有償の仕事があるとそちらが優先され、2020年におこったコロナ禍の影響でプロジェクト活動がストップしたうえに、2020年4月6日にサント島を直撃したハリケーン・ハロルドの影響もあり、建屋が最終的に完成したのは2023年7月となった。

(3) 有効性、適応性の評価と今後のツール活用への提言

残念ながら、コミュニティ魚市場の完成が豊かな前浜プロジェクトフェーズ3の最終年となってしまったため、どのような効果が出たかについてのモニタリング結果は得られていない。そのため、本ツールの有効性、適応性の評価は困難である。

しかし、水産物の流通改善において、コミュニティ魚市場のような冷蔵設備を備えた場所の整備は非常に重要であることから、今後もこのようなアプローチが水産局主体で推進されることが望ましい。

3-2-6 品質管理と衛生管理（ST-11）

(1) ツール開発の背景

衛生管理に関しては、水産物を扱う場所として、建屋の床やテーブルは清掃されている場合が一般的であったが、魚を保管するフリーザーやアイスボックスは清掃されていない

場合が多かった点が、また、品質管理に関しては、首都の魚市場 2 か所では十分な量の氷を使った管理が行われていたが、地方の魚市場では漁村から中心地まで車で 1 時間かかるにも関わらず氷を使った管理は行われていなかった。

上記状況や、漁獲物の品質管理面において衛生状態を維持することは、食中毒等を避けるためだけではなく、廃棄魚を最小限にして資源を無駄なく利用できる点で重要であることから、品質・衛生管理のツールを開発した。

(2) 実証結果

衛生管理に関しては、衛生管理及び食中毒の予防を目的にフリーザー等の清掃方法を 1 枚紙による簡易な説明書を作成した。機材供与で 15 台のソーラーフリーザーユニットが各地に配布される予定であったことから、上記 1 枚紙も同封した。既存のフリーザーを有するプロジェクトサイトには、他団員や普及員に協力してもらい、配布した。最終的には、各コミュニティの普及員に引継ぎを行った。

品質管理に関しては、魚の品質管理・腐敗防止の研修用教材として、水産局の既存の教材にフリーザー等の清掃方法や腐敗した魚を起因とする食中毒の危険性についての教材を追加した。8 月 7 日から 10 日にかけて、研修を実施したことのなかったエビ島にて水産局担当職員と 20 人の漁業者を対象に研修を実施した。研修の実施後、地方の実態を踏まえて研修教材を更新した。既存の教材は基本的に氷を使った品質管理が紹介されているため、フリーザー・ソーラーフリーザーを有しない地域では実践が難しい。よって、今後は氷の供給が不可能な地域における船上での漁獲物の取り扱いを推奨していくこととし、水産局の担当職員に引継ぎを行った。

(3) 有効性、適応性の評価と今後のツール活用への提言

本稿で述べる品質・衛生管理は「支援方策」の一つのオプション、つまり複数ある支援方策の一つ、あるいは地域の実情に応じて複数の支援方策の組み合わせにより、統合的 CBCRM を効果的に機能させる側面的な手段と理解する。

本活動は、今後の統合的 CBCRM の普及を視野の中心に据えた場合、極めて重要な位置づけであることを認識できたが、第 4 年次の活動として新規に認められたもので活動期間も極めて短期であった。そこで、他のツールの評価結果と違い PDM の指標の達成への貢献度をより明確にしつつ、有効性、適応性、課題を明確にし、今後の活用への提言を行う。

PDM 上の有効性とインパクト

成果 1：統合的 CB-CRM アプローチの応用性と実用性が強化される。

衛生管理、品質管理とも以下の直接の目的達成を介して、漁獲物の付加価値を高める点において成果 1 の達成に寄与する。

衛生管理：大洋州のいくつかの国では、清掃されていないフリーザーやクーラーボックス

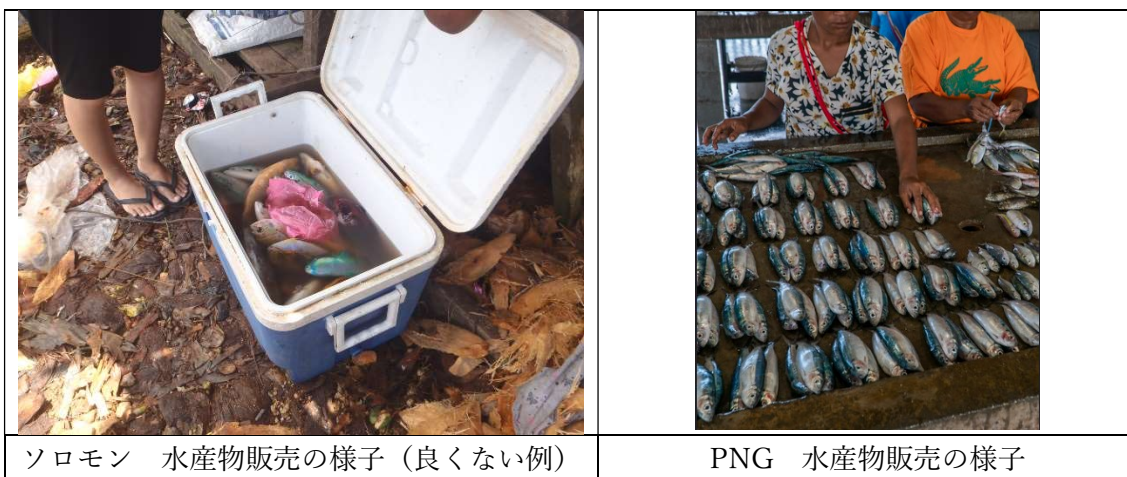
の使用が良く見られる。海水中に存在する細菌の一つは 15℃以上で活発になり、25～37℃で極めて早く増殖し、食中毒を起こす細菌量になる。フリーザー内では増殖しなくとも消費者が購入し常温で持ち帰っている間に増殖する可能性もある。毒素には耐熱性があるため、汚染食品を加熱しても中毒症状が引き起こされる。これらの点を防ぐためにも水産物を扱う場所を清潔に保つことは不可欠である。提案したフリーザーの清掃方法は大きく 6 つのステップからなるが、実際にはそれほど手間がかかるものではなく実用性が高いものとする。

品質管理：大洋州のいくつかの国では、品質が適切に扱われていない水産物を、市場が買い取らない事例がある。また、通常、品質管理された水産物はされていない水産物よりも高額で売買されることが多い。しかし、フリーザーやソーラーフリーザーを有しない地域も多いため、今回の活動に含めた「氷がない地域における水産物の品質管理」の紹介は、他地域でも応用可能で実用的な提案である。

- 実践可能な提案：フリーザーの清掃、氷がない地域における水産物の品質管理ともに、実践のハードルが低い有効なものを提案しているため、応用性と実用性の強化に寄与する。

プロジェクト目標：プロジェクトで開発された統合的 CB-CRM アプローチが国内・メラネシア域内で実践される。

上述の内容は、バヌアツだけの状況ではなく、広くメラネシア域内で見られる状況であるため、バヌアツだけでなくメラネシア域内で導入される可能性は高い。



上位目標：

- ① 統合的 CBCRM アプローチが、バヌアツ国における沿岸資源管理推進のための標準アプローチとして正式に採用され、普及する。
- ② 太平洋地域において、住民主体の総合的沿岸資源管理アプローチが推進される。

品質・衛生管理は水産局の Seafood Verification Agency division としても力を入れている分野であり、漁業者もその重要性を理解しているため、将来的にバヌアツ国における沿岸資源管理推進のための標準アプローチとして正式に普及される予定である。

適用上の課題

多くの国で水産局の中で衛生管理や品質管理を担当する部署が組織内にあるのは一般的である。これらの活動の実効性を高めるには、他の省庁に類似の部署の有無を確認し、有る場合はどのような機能と活動計画を持つのか、連携した活動が可能か否かを確認しておくことが重要である。次に、どのように連携できるのか、各目的、一般大衆や漁業コミュニティ向けの研修が可能か、研修時期、予算の配分について連携できるか否かが課題となる。これら本来の目的の発展形として統合的 CBCRM を促進する研修内容を水産局独自で、あるいは関係省庁と連携した活動を企画できるかどうか第二の課題となる。対処法としては、統合的 CBCRM 研修の地域セミナー等を介して直接関与する各国の水産局普及部署だけに限定することなく、品質管理部署等の担当者もセミナーへの参加を通じて統合的 CBCRM アプローチの中に衛生・品質管理を位置付けられる能力強化を行うことが考えられる。

3-3 代替生計手段の開発

3-3-1 ティラピア養殖 (ST-12)

(1) ツール開発の背景

バヌアツのような太平洋島嶼国では豊富な沿岸水産資源を有しているが、近年、内水面養殖が内陸部での動物タンパク源供給や現金収入源として注目されている。また養殖魚はサイクロンなど自然災害時には緊急の食糧ともなることから、食糧の安全保障の面からも内水面養殖に期待が寄せられている。島嶼国では内水面養殖の歴史は浅く技術の蓄積もわずかであるが、ティラピアは種苗生産が容易で粗放的な養殖にも耐えられることから、島嶼国における内水面養殖の対象種として適していると言える。さらに、コミュニティによる養殖の場合は、販売による収入があった場合に、売り上げの一部を資源管理活動に拠出するなどして資源管理活動への積極的な参画も可能である。そのような観点から、ティラピア養殖をツールとして開発し、実証をおこなった。

(2) 実証結果

バナアツでのティラピア養殖方法は左図にあるように、畜産、農業、そして養殖、三位一体の複合養殖と給餌を組み合わせたハイブリッド式で、生産物は養殖からだけではなく、畜産そして野菜栽培からも得る事が出来るアプローチを採用した。

1) ワイラパ・コミュニティポンドでのティラピア養殖

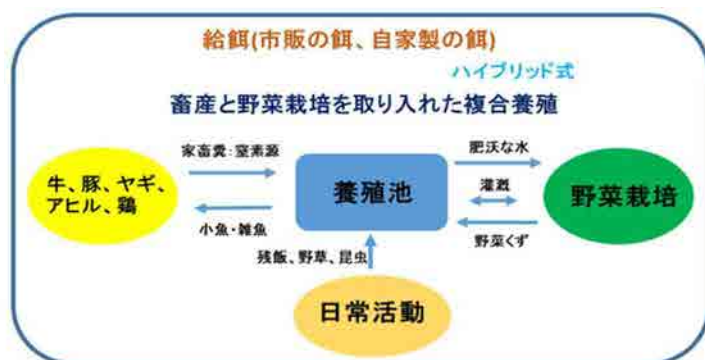


図 22 ハイブリッド式ティラピア養殖模式図

豊かな前浜プロジェクトフェーズ3のサイト、サンマ州エスピリツ・サント島のワイラパのコミュニティティラピア養殖池では、水産局の協力のもと、水漏れ対策として中国から輸入された HDPE (High Density Polyethylene) シートを敷設して 1,300 尾の稚魚 (5g サイズ) を放養して 2019 年 1 月に養殖を開始した。養殖期間は 4 か月とし餌は、フィジー産のティラピア用ベレット (1 袋/25 kg、約 3,400 バツで輸入可能) を使用 (水産局からの供与)。フィジー産の餌は、餌としての効率と高価な輸入餌を使用して実際に収益が得られるのかを見るために使用した。また、池の周りにて栽培したアイランドキャベツを追加で給餌し、施肥用にアヒルのヒナを 10 羽購入し飼育を開始した。養殖開始後から 4 か月での取り上げ結果を下記に示す。4 ヶ月間で与えたフィジー産のベレットは 225kg で、取り上げられたティラピアは 500 バツ/kg で販売され完売した。



サント島ワイラパコミュニティ養殖池。HDPE養殖シートを使用しているため水漏れも無く池が緑色で非常に安定した状態を保っている

表9 養殖開始時と終了時 (4 か月) のティラピアの変化と増肉係数

開始時			終了時			増肉係数
尾数	平均体重	総重量	尾数	平均体重	総重量	食べた餌の量 (乾) ÷ 増えた体重 (湿)
1,300 尾	5g	6.5 kg	780 尾	190g	146 kg	1.54



養殖を開始して4ヶ月で、146kg
を取り上げ

この結果を見ると増肉係数が1.54と、フィジー産の餌の効率が良いとは言えない結果になった。ただし、今回は養殖魚が消費した餌の量ではなく、与えた餌の量で計算しているので実際の増肉係数はこれより低いものとなることを考慮すると、餌としての効率は良いことが考えられる。この他、1.54の増肉係数を得られたことの原因として、HDPEシートを使用したことにより水漏れが無くなり施肥の効果が高まり安定した飼育水作りができたこと、非常に嗜好性が高いアイランドキャベツを追加で与えたことによる効果が高かったこともあげられる。単純に与えた餌の額と売上額を見ると、餌代は30,600バツで売り上げは72,500バツとなった。

また、2019年8月からは、現地（サント）で手に入る安価な養鶏用のペレット（2kg＝2,200バツ、タンパク質量17～20%）を用いて前回同様に1,300尾の稚魚（5gサイズ）を放養して養殖実証を開始した。また今回の養殖期間は概ね5～6か月とし、目標取り上げ平均魚体重を250gと設定した（住民からの聞き取りで1kgあたり4尾サイズが最も好まれたため）。前回同様に、池の周りにて栽培したアイランドキャベツを追加で給餌すると共に、施肥用のアヒルも投入した。

2) ワイラバ・コミュニティバックヤード養殖

上記ワイラバ・コミュニティ養殖場のティラピア養殖の好事例を見て、住民の多くが各世帯での小規模なティラピア養殖を実施したいと、一部の世帯では自主的に20㎡から30㎡の池を掘削し水産局とプロジェクトに援助求めてきた。そのため、これに対応すべき、水産局とも協議し共同で支援することとした。但し個人に対する支援は公平性の点から難しいため、コミュニティとしてバックヤードの養殖実証を行うこととしてプロジェクトは技術支援を主に資材と餌の一部を、水産局は水漏れ対策用のシートの敷設、資材と餌の一部を支援する事とした。

その結果、2019年10月末時点で、15軒のバックヤード池が作られ、さらに2020年3月の時点ではバックヤード池が26軒に増えており、水産局からも高く評価されている。現地から2020年3月末に、バックヤード池から75kgのティラピアを取り上げた。

	
ワイラパのバックヤード養殖池 (15 m ²)	ワイラパのバックヤード養殖池 (20 m ²)

図23 ワイラパにおけるバックヤード養殖の活動

その後、本活動には大きな転機があった。2020年4月4日から5日にかけて、カテゴリー5の熱帯性サイクロンがバヌアツを襲った。ハロルドと名付けられたこのサイクロンは、バヌアツ北部を中心に深刻な被害をもたらした。死者は5名と多くはないが、159,000人以上が被災し、家屋の被害も甚大（17,000棟以上）であった。復旧は過去に例のないものとなった。その理由として、コロナ禍により国外からの援助が得られず、国内資源を活用せざるを得なかったことが挙げられる。バヌアツ政府は、被害の少なかった地域から食料を購入した。

2015年にバヌアツを襲ったカテゴリー5のサイクロン・パムの教訓から、バヌアツでは気候変動と災害リスク軽減（CCDRR）の調整フォーラムとして、8つのクラスターが形成されていた。クラスターの機能は、気候変動などによる自然災害が発生した際に、調整機能を果たすことであった。食料安全保障・農業クラスター（FSAC）はクラスターの一つであり、農業省および国家災害管理局（NDMO）の支援を得て調整体制を構築していた。

サンマ州エスピリツ・サント島のワイラパでは、緊急物資は、ハロルドが通過した2週間後に到着した。政府からの緊急物資は米、卵、魚の缶詰で、FSACからは地元食材とツナ缶が提供された。また、別のNGOの活動として、ワールドビジョンがテントを提供した。

サイクロンの被災後、緊急物資や救援物資が届くまでの2週間、コミュニティは豊かな前浜プロジェクトのパイロット活動として実施していたティラピア養魚池から156kgのティラピアを収穫し、自分たちや他の被災したコミュニティと共有した。その後、FSACは156kgのティラピアを、緊急食糧を配布したと同義とみなし、その買い取り代金に相当するVT156,000を村の人たちに救済金として支払った。受領した現金は、魚の池を持つ人々にVT3,000ずつ分配された。

コミュニティでの聞き取り情報では、緊急支援物資が到着するまでの2週間、ティラピアを食料として得ることができて助かったとの意見があった。ティラピア養殖の自然災害時における緊急食糧源としての極めて有効であると思慮される。



図24 被害を受けたコミュニティ池



図25 被害を受けて使用できなくなったバックヤード池

(3) 有効性、適応性の評価と今後のツール活用への提言

豊かな前浜プロジェクトでは、ティラピア養殖が動物タンパク源供給や現金収入源として機能することは検証できた。また、サイクロンなど自然災害時には緊急の食糧ともなることから自然災害に対するレジリエンス強化にも貢献できる。

一方、2015年にバヌアツを襲ったサイクロン・パムの被害に対する援助として、多くのドナーがティラピア養殖を振興するための支援を行ったが、すべてが良好に機能しているとは言い難い。それらの大きな要因は、水を確保できる場所が少ないこと、池の水漏れを防ぐためのHDPEシートの質が悪く、すぐに水漏れを起こしてしまったこと、種苗の供給体制が整っていなかったこと、内水面の魚を食べられない住民に対するティラピア食の普及などの活動が合わせて行われなかったことなど主に技術的な要因が挙げられる。そのため、本ツールについて有効性は高いものの、適応性については課題を残していると言える。その反面、質の高いシートの確保、現在サント島、マラクラ島、タンナ島で進められているコミュニティハッチェリーの建設が進むことでその有効性が発揮されることが期待されている。

本ツールの活用については以下のように提言する。

- ティラピア養殖を振興するにあたっては上記のような課題を解決しながら養殖エリアを拡大しつつ、ティラピアの適切な料理法の普及を行うなど多面的な活動を同時並行で行う必要がある。
- 餌については配合利用を利用しつつも、現地で入手可能な食材を活用の上、歩留まりを高めるための試験の実施、アヒルの飼育や養殖池の栄養価の高い水を利用した農業の実施などと組み合わせた複合養殖を推進することが採算性を高めるだけでなく災害時の緊急食糧として栄養バランスのとれた食材の提供をできるプログラムを策定の上、推進することが必要である。

3-3-2 シャコガイ養殖 (ST-14)

(1) ツール開発の背景

小型のシャコガイ類は、その外套膜の美しさから欧米などを中心として観賞用として人気が高いため、これまで世界の市場で取引が行われていた。現在は、乱獲によりシャコガイ類の資源の枯渇が激しく一部の種は絶滅危惧種にも指定されていることから、バヌアツを含む多くの国では、シャコガイの天然物の輸出入を制限している。このため、多くの国で養殖が試みられている。そのため、シャコガイ養殖のツールが開発され、実証が行われた。

(2) 実証結果

豊かな前浜プロジェクトフェーズ 2 のパイロットサイトであったモソ島スナエ村とタシリキ村で、2012 年 7 月から 2013 年 1 月まで、シラナミ (*Tridacna maxima*) の養殖試験を行った。標本 10 世帯のうち、適切な生簀管理が出来たのは、スナエ村の 2 世帯だけであった。タシリキ村の 5 世帯のシラナミは全滅した。これは養殖を希望した住民の意識の問題が大きい。

2013 年 6 月に今回成績の良かったスナエ村の 2 世帯とフェーズ 1 で養殖経験のあるレレパ島の 1 世帯とレレマ本島側の 1 世帯にヒレジャコ (*Tridacna squamosa*) の種苗を配布して、本格的な養殖活動を始めた。観賞魚市場での販売が難しいシラナミの在庫も、食用目的（ローカルフードとして加工販売する予定）に切り替えて、希望者に種苗を配布した。シラナミは天然で枯渇しているわけではないので養殖の必然性はなく、今回はあくまでも水産局の在庫整理と対象住民の養殖技術の向上が目的であったが、将来、ヒレジャコやオオジャコも養殖されるようになれば、シャコガイ養殖も沿岸住民の禁漁代替収入源と成り得る可能性がある。

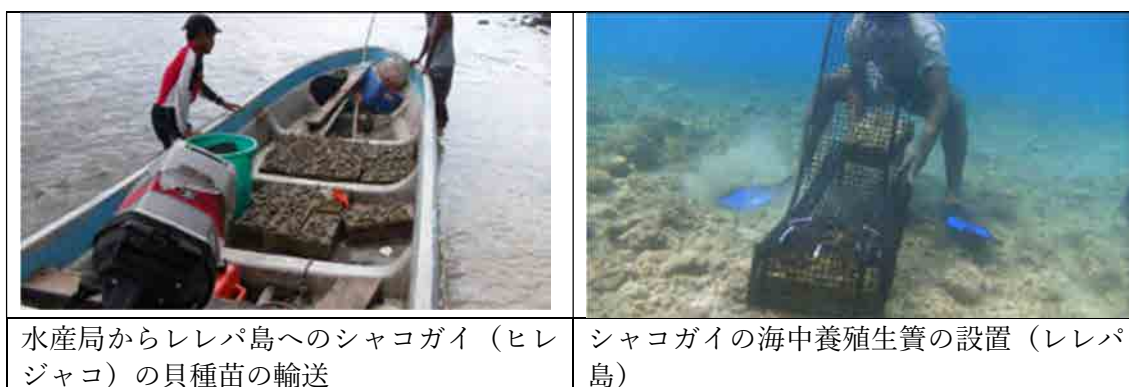


図 26 シャコガイ養殖の活動

(3) 有効性、適応性の評価と今後のツール活用への提言

バヌアツにおいても、本プロジェクトフェーズ 1、フェーズ 2 においてシラナミ (*Tridacna maxima*) の海面ケージ養殖の試験を行った。食用としての需要もあり、価格

に応じては食用で販売することもあり得るが、本プロジェクトでは観賞用の養殖生産を前提とする。観賞用シャコガイは単価が高く、成長にはシャコガイの食性から人工の餌を必要としないためコストが低く抑えられるというメリットがある。安定的に生産できれば利益も大きい。その一方で、海面ケージ養殖は日常的な手入れが必要で、出荷までに 1 年以上も必要なことから成功させるのは簡単ではない。また、種苗の供給が受けられることや、生産した貝を地元で買ってくれる観賞魚業者が必要であることも大きな課題である。

沿岸域あるいは漁業者がシャコガイ養殖による現金収入を得ることによって沿岸資源の漁獲圧を低減することができる。比較的まとまった規模で生産できれば大きな収入となることが期待されるが、ケージの管理に手間が掛かる他、種苗供給や販売などの諸条件にも影響されるというリスクもまた大きい。しかし、売り上げの一部を資源管理活動に拠出する、養殖施設を環境教育の教材として利用する、生産した貝の一部を移植するなどして資源管理活動への積極的な参画も可能である。

本ツールの活用については以下のように提言する。

- 養殖活動にはある程度継続したきめ細かい技術支援が必要であり、これは人員の少ない水産局にとって普及面の大きな障壁である。村に核となる人材がいるかどうかは今後の鍵となるとみられる。
- 養殖されたシャコガイは、水産局の仲介のもと、ポートビラの観賞魚輸出業者に販売されたが、これは水産局の本来の業務ではないため、コミュニティの養殖実施者と観賞海産魚輸出業者の仲介役となる仕組みを構築する必要がある。

3-3-3 ロードマーケット開発 (ST-16)

(1) ツール開発の背景

ロードマーケットは、比較的交通量の多い道路沿いにある簡素な店で、観光客や行楽客向けに食料品や土産物を販売することが主な目的である。バヌアツでは、地域の特産品や食品をロードマーケットで販売し、その収益は地域社会の活動に使われる。通常、地方で生産された水産物と農産物は 地方で生産された水産品や農産物は、大きな町やコミュニティ市場に持ち込まれる。コミュニティが運営するロードマーケットの大きな目的は、流通コストを削減し、販売を拡大することである。ロードマーケットは、その幅広い有用性を活用することで、地域社会の収入源を生み出す可能性を秘めていることから、ツールとして開発し、実証を行うこととした。

(2) 実証結果

本活動においては、豊かな前浜プロジェクトフェーズ 2 において、パイロットサイトの一つであるシェファ州エファテ島マンガリリウの幹線道路沿いに、コミュニティ自身によりロードマーケットを建設したなどの実施例がある。その有効利用を推進するため、プロジェクト側でカフェを運営するためのコーヒーマーカー等を提供した。一時期は、土産物や食品などが売られていたが、当時は現在のようにコミュニティから幹線道路までのアクセスが舗装されておらず比較的距離があること、考えていたほどの販売がされなかった点、またコロナ禍による観光客の激減などネガティブな要因が重なり現在は運営されていない。



図 27 コミュニティによって建設されたロードサイドマーケット

(3) 有効性、適応性の評価と今後のツール活用への提言

本施設の建設場所はエファテ島の北部に向かう要所で近くに類似の施設もなく、また駐車スペースも確保されているためビジネスを進める上で非常に良いことは明白である。今後、この地域が世界遺産である点、観光客用の宿泊施設がある点、観光向けのオオジャコファームの存在やコミュニティハッチェリーの存在、クルーズシップの訪問が実現している現在、本施設の再活性化の条件は揃っていると言える。このように、ロードマーケットを設置するための外部条件につき、もともと備わっている条件、外部者や外部機関の協力を得ることで設定できる条件をコミュニティと共同で精査することで動機づけすること、さらにその組織化についてファシリテーションできる人材をビジネス・共同組合局から派遣してもらうなどの対応が不可欠になる。

4. 連結方策

4-1 魚の漁獲・流通データの記録 (CT-1)

(1) ツール開発の背景

バヌアツでは、豊かな前浜プロジェクトフェーズ 2 当時、沿岸漁業に関する漁獲データは収集されておらず、沿岸資源の同行をデータで把握することが困難であった。漁獲データは水産局による管理にも有用であるが、コミュニティ自身がデータを記録し、データを視覚化することで、コミュニティによる沿岸資源管理を推進するためのツールの一つとして期待された。そのため、漁獲データを記録の上、その傾向を簡易に示して理解しやすいツールが開発され、実証が行われた。

(2) 実証結果

豊かな前浜プロジェクトフェーズ 2 の実施時に、FAD の設置と FAD 管理委員会の設立と同時に、対象地域に漁業活動記録シートを導入した。この漁業記録シートは、FAD 周辺だけでなく、沿岸・沖合域での浮魚・底魚の漁獲も記録し、さらに漁業活動による収入や漁業活動に掛かる経費も記録する構成になっていた。

本プロジェクトでは、この漁業活動データをパソコンに入力して、自動的に平均値や傾向を分析する MS Excel のプログラムを作成した。また、このプログラムを用いて、対象コミュニティ自らが漁業活動データを入力・分析できるようになるために、2013 年 6 月に各対象地域にて漁業活動データの入力・分析方法を指導するワークショップを開催した。ワークショップは、各対象地域の No Take Zone 委員会、FAD 管理委員会、漁業者組合など、沿岸資源管理に係わる代表者 5～10 名を対象とした。実際の記録データを活用して、データ入力方法や自動的に分析される図表の読み方について説明した。

		
漁業活動記録ワークショップ (エファテ)	漁業活動記録ワークショップ (マラクラ)	漁業活動記録ワークショップ (アネイチム)

図 28 魚の漁獲・流通データの記録の活動①

ワークショップ終了後は、各地域の No Take Zone 委員会にパソコン 1 台を提供し、各委員会で漁業活動データの入力・分析を進め、日本人専門家と水産局職員が現場を訪問した

際に、漁業記録活動の進捗状況を確認した。しかしながら、個人ベースでの記帳作業の継続は容易ではなく、各対象地域で、少数の関心の高い住民のみが漁業記録を継続していた。ただし、これまで日常的な漁業記録が全く行われてこなかったことから、漁業活動の傾向を知る上で貴重な取り組みであった。

タフェア州アネイチウム島では、本プロジェクトが供与したソーラーフリーザーの設置場所を共同集荷場として、FAD 管理委員長が漁獲データを記録し、本プロジェクトが導入した集計プログラムへの漁獲データの入力を行った。また、ミステリー島 No Take Zone 委員会は、クルーザー船観光客に販売するロブスターの漁獲データを長年に亘って収集しているが、その漁獲データも集計プログラムに入力して管理するようになった。これにより、必要に応じてコミュニティ関係者が漁獲データを閲覧できるようになった。

マランパ州ウリビブ島では、FAD 管理委員会会長が漁業活動データの収集の重要性を理解して、同島コミュニティで共同集荷場と漁具倉庫を兼ねた「フィッシャーマン・ハウス」を建てた。マランパ州水産事務所に配属中の青年海外協力隊員の協力を得て、ソーラーフリーザー（166 L）をフィッシャーマン・ハウス内に設置した。また、マラクラ本島のクラブ湾では、ロウニ村で漁業を営んでいる住民数名が漁業活動の記録を始めた。これらの結果はマランパ州水産事務所に報告され、上記 JOCV の協力を得て、集計プログラムによる分析・整理された。

また、以前からクラブ湾 No Take Zone 委員会がラカトロ市場で収集している陸ガニの収穫データについても、出荷量だけでなく、収穫された地区の情報も記録するように改善した。この陸ガニの収穫データについても、本プロジェクトが導入した集計プログラムへの入力を行い、コミュニティ関係者がパソコンでのデータ管理を行った。



アネイチウム FAD 委員会では、本プロジェクトが導入したソーラーフリーザーに漁獲魚を預かる際に計量して記録する。(2014 年 1 月)



マラクラ FAD 委員会でも、ウリビブ島のフィッシャーマンハウスのソーラーフリーザーで預かる漁獲魚のデータをノートに記帳している。(2014 年 2 月)

図 29 魚の漁獲・流通データの記録の活動②

(3) 有効性、適応性の評価と今後のツール活用への提言

豊かな前浜プロジェクトで開始したデータ収集という活動は、その後、水産局により有効性が評価され、The Pacific Community (SPC) による TAILS システムを活用したデータ収集活動へと進化した。水産局が各地に配置したコミュニティ内のデータ収集者がタブレットにて漁獲データ入力を行い、集計したデータをインターネットで送付するというのが現在のシステムである。データ収集の重要性が認識されたことは評価すべき点であるが、豊かな前浜プロジェクトが目指したコミュニティ自身で自分たちの前浜における漁獲データを記録・入力し、データを分析した上で資源管理の重要性を認識するという機能が TAILS の活動にはなく、資源管理の連結方策としての機能という点ではその有効性は低下したと考えられる。

本ツールの活用については以下のように提言する。

- 将来的に、水産局の統計部局が主体となってコミュニティが自分達の TAILS データにアクセスできる仕組みを構築し、自分たちの沿岸資源の現状を閲覧できるようにすること、その際、水産局職員によりデータの見方を住民に教授できる仕組みの構築を提言する。自分たちのデータを参照できることで、データ収集へのモチベーションとなり、資源管理の重要性をデータで認識することが可能となる。
- データが銀行からの融資を得やすくするツールとして機能する仕組みを構築することも連結方策としての役割を高める。融資機関に対して水産局がデータ提供者を推薦する制度などが考えられる。

4-2 啓発活動と海洋教育プログラム (CT-2)

(1) ツール開発の背景

これまでプロジェクトで実施してきた資源管理活動で得られた知見や経験を現地関係者だけでなく、小学校教師など教育関係者にも情報共有することで、バヌアツ国の次世代の子どもたちへの教育・啓発に利用すること、それによる統合的 CBCRM の普及につながる事が考えられる。よって、本ツールが開発された。

(2) 実証結果

マンガリリウのコミュニティ畜養施設を活用した海洋資源に関する啓発プログラム（以降、「海洋教育」）実施の可能性について、関係するバヌアツ水産局（VFD）調査部（RAS）職員と協議し開始した。特に同施設を利用することで、その持続的活用にもつながることを確認した。その後、VFD 職員と共にマンガリリウ住民に、海洋資源管理啓発活動の趣旨を説明し、コミュニティ畜養施設の利用促進に関する彼らの参加意欲を確認した。また、具体的な海洋教育の普及プログラムについて VFD 職員と住民と意見交換を行い、どのような方法で何を提供できるか、その仕組みづくりやコミュニティや VFD の実施体制を含めて

協議することにより地域住民のオーナーシップを醸成した。

(3) 有効性、適応性の評価と今後のツール活用への提言

本稿で述べる海洋教育は「連結方策」の一つのオプション、つまり複数ある連結方策の一つ、あるいは地域の実情に応じて複数の連結方策の組み合わせにより、統合的 CBCRM を効果的に機能させる側面的な手段と理解する。

本活動は、今後の統合的 CBCRM を普及するという点において、極めて重要な位置づけであることを認識できたが、第 4 年次の活動として新規に認められたもので活動期間も極めて短期であったところ、他のツールの評価結果と違い PDM の指標の達成への貢献度をより明確にしつつ、有効性、適用性、課題を明確にし、今後の活用への提言を行う。

PDM 上の有効性とインパクト

成果 1：統合的 CB-CRM アプローチの応用性と実用性が強化される。

海洋教育の目的として、UN environment program は、海洋教育を「持続的開発」に向けた社会変容を促す第一義的な「触媒」として認識し⁴、今後の 10 年間のビジョンとして、環境保全、人々の生活の質の向上、将来の世代を視野に入れての活動に対するイニシアティブの発揮を促す総合的アプローチとなることを掲げている。このような社会変革を支える海洋教育の展開に向け、幼児期から成人期まで一貫して体験による学びを止めず、蓄積し続ける重要性を説いている⁵。

本プロジェクトにおける当該分野の活動は、既述のように首都の島でフェーズ 1 からのプロジェクトサイトでヤコウガイやオオシャコガイ資源の復活させたコミュニティであった点、さらに、本プロジェクトで設置したコミュニティ畜養施設という当国唯一の施設を用いての活動であった。これらの利点を活用できたため、統合的 CBCRM の連結方策の一つとして以下の点で極めて高い有効性を発揮したと思慮する。

コミュニティ全体（男女全世代）を巻き込めた点：コミュニティの小学校の教員、生徒だけに留まらず、大人まで含めたコミュニティ全体に対して資源管理方策と同支援方策双方の活動が資源の持続的開発につながることを認識する機会となった。

観光開発との連携：フェーズ 1 で移植し種の保存、観光資源として重要度の高まったオオシャコガイとコミュニティハッチェリーを観光資源として位置付け、コミュニティ主体による双方の管理と維持、コミュニティ住民全体の生計向上に直接寄与できる環境を整備することができた。

⁴ UN environment strategy for environmental education and training

⁵ 中村（2022）海洋教育の変遷と今後の展望－社会変革への貢献に向けて 環境情報科学51-1

プロジェクト目標：プロジェクトで開発された統合的 CB-CRM アプローチが国内・メラネシア域内で実践される。

海洋教育を通じた他コミュニティでの実践の可能性：本活動の成功の要因でもあるが、既述のように教育省が課外事業の予算を確保しており、学校によって校長の裁量で予算の執行が可能な点、教育省が課外事業の具体的な案を持たず、コミュニティ畜養施設を活用した海洋教育の意義に同意し、エファテ島の別の学校からの教員と生徒の課外事業の場として同畜養施設が活用された点。さらに、本施設を活用した学校から、自身のコミュニティの学校の生徒によるサンゴ再生の課外事業の実施の可能性について打診を受け、専門家と水産局で当該コミュニティの海域における可能性を調査した。この活動を通して、コミュニティ畜養施設のような施設を所持しない一般的なコミュニティにおいても実践的な海洋教育が可能となり、プロジェクトと水産局による CBCRM アプローチを実践したコミュニティ以外にも本アプローチの実践と持続的な活用ができる可能性を示唆した。

上位目標：太平洋地域において、住民主体の総合的沿岸資源管理アプローチが推進される。

海洋教育は、地域を問わず、コミュニティの住民を統合的 CBCRM 活動への参加を誘発するツールとして適用性が高い。

プロジェクトチームは、太平洋地域における海洋教育の実践は、統合的 CBCRM アプローチ推進のためのプラットフォーム構築に貢献できる可能性を示唆していると考ええる。具体的には、海洋教育が、「資源の持続的開発」、「利益の最大化」を念頭に実施される点、そのようなマインドセットिंगを、小学生を主体としながらもコミュニティの大人まで含めて対象にしており、コミュニティ全体に対する動機づけと組織化を誘発できる可能性を有しているからに他ならない。そのような観点から、間接的に統合的 CBCRM プランの構造である資源管理方策と生計向上（経済開発）方策というブルーエコノミーの主要部分の構築に貢献できるため、本ツールはバヌアツに限定されることなく、広く適用できるツールであると考えて差し支えないであろう。

適用、普及の課題

関係省庁との連携の必要性：統合的 CBCRM アプローチが推進されるカギは、4つの視点における社会文化と制度ガバナンスの強化にある。具体的には、コミュニティレベルで可能な限り全世代が組織化された形で積極的な参加があること、そして、コミュニティの組織化、全世代の参加を促す関係省庁の連携による具体的かつタイムリーな資金と活動の投入が望ましい。その観点より、海洋教育はコミュニティの学徒を主体に大人の積極的な参加も見られた点で全世代、つまり真のコミュニティレベルの参加を促すツールであった。また、連結方策の中で世代別アプローチとして特に教育省と水産局との連携を具体化することが可能であった。このような教育省との連携以外にも、今後サンゴ再生活動を軸とする学徒による海洋環境の保全是、教育省、水産局だけに留まらず、観光資源として極めて

重要な健全なサンゴの維持を欲する観光局や環境局などにとっても共有できるメリットは多大である。

課題：離島における海洋教育の普及

コミュニティの学校の教員、生徒により、これまでもバヌアツ各地で行われてきたビーチクリーニングがあげられる。本活動を超えた実践的な海洋環境改善にかかる活動として本プロジェクトの活動主体であったサンゴ再生があげられる。サンゴ再生は海洋環境の変化が予測不可能なところ容易ではないが、仮にコミュニティの周辺海域で悪化が可視化された場合、その状況を傍観するのではなく、再生活動を積極的に行うことが望ましい。仮に移植したサンゴの成長が観察されない場合であっても、モニタリングの過程で多くのことを学び、環境保全の重要性、持続的開発の重要性について意識化することが期待できる。また、仮に移植したサンゴに成長が見られる場合、もし、このような活動が徐々に国レベルで普及していくなら、沿岸資源の環境改善による持続的開発につながるだけではなく観光資源としても貴重な海洋環境の悪化の歯止め、維持につながる点で水産局単独ではできない CBCRM アプローチ普及をツールとする国全体の関係者の連携による環境保全、資源の持続的開発、観光開発というブルーエコノミーによる国の経済開発の柱にもなる可能性も否定できない。国全体に普及するための課題として、教員が課外事業の実施を介してサンゴ再生活動の主導者となれるか、である。

本活動の成功要因として第一にあげなければならないのは、コミュニティ畜養施設の利用によるいわゆる水族館効果、つまり、海に入ることなくコミュニティのリーフ内に棲息する一部の海洋生物を間近に観察できる点、第二に教育省が課外授業のスキームを持ち、予算措置までされていた点、それにもかかわらず課外授業の内容について具体的なアイデアを持っておらず、プロジェクト側の提案を受けている条件が揃っていた点があげられる。

対応策：教員とマンガリリウ・コミュニティ住民に対する海洋教育手法のキャパシティ開発（CD）と実施体制の構築

全国の初等教育に携わる教員はエファテ島の教員養成施設において定期的に研修を受けている。そこで、水産局調査部が主体となってマンガリリウ畜養施設を活用した教員の海洋教育 CD を行う。また、本活動を通じて養成したマンガリリウ・コミュニティの人材を活用した他コミュニティへの出張授業の実施も想定できる。知識の伝達だけに留まらず、フィールド活動として可能性のある具体的な活動として、サンゴ再生、シャコガイの密集増殖、ヤコウガイの移植等が考えられる。

4-3 スポーツイベント（CT-3）

(1) ツール開発の背景

コミュニティ主体の沿岸資源管理を行うにあたり、コミュニティにおいて参加型ワーク

ショップを開催すると、参加するのは意識の高い年配者が中心となることが多く、実際に漁業に携わっている若者層は、そのようなコミュニティでの活動に消極的である。コミュニティで沿岸資源管理を行うにあたって、若者層に参加を促す手段の一つとして、バヌアツで人気のあるサッカー（主に男性に人気）、バレーボール（主に女性に人気）の大会を実施し、その場を利用して一般住民や児童に資源管理活動の重要性を認識してもらうことを目指すという新たなツールの開発を行い、実証を行った。

(2) 実証結果

スポーツイベントを通じた資源管理の啓発活動は、豊かな前浜プロジェクトフェーズ 3 において 3 回実施された。エマエ島で実施した第 2 回 CBCRM 杯では、島内にある 4 つのチームが参加し、シェファ州サッカー協会が子供たちへのサッカー教室を開催した。各試合の間や試合中にコミュニティのリーダーや現地 NGO のスタッフなどが、資源管理活動の重要性についてスピーチをしたり、関連するポスター展示をした。また、水産局スタッフとコミュニティ住民とのディスカッションを行い、沿岸住民の現状や課題についての共通認識を深めた。

この CBCRM 杯では、コミュニティ毎に行う住民参加型ワークショップでは、表に示すように参加度の低い若者を全島レベルで集めることができ、各コミュニティで設定された資源管理計画を全島資源管理計画として周知徹底させることを可能にした。その際、啓発活動を実施するための単に「人集め」手段としてだけではなく、集団型のスポーツが持つ「フィールド」、「ルール」、「役割分担」、「規律」を水産資源管理の対象海域、管理ルール、資源管理委員会メンバーの役割、ルールの順守にあてはめることにより、水産資源管理計画の一方的な説明ではなく、その計画に対する住民間の積極的な議論を可能にした。

表10 選手の平均年齢と漁業を職業としている人数

チーム名	Poloa	Sakamao	Iwoka	Matakina
平均年齢	24.75	27.41	23.24	29.37
選手数	20	17	21	19
漁民数 (%)	10 (50%)	7 (41%)	11 (52%)	14 (74%)

同様な試みはサント島でも本プロジェクトサイト、SPCのプロジェクトサイトや近隣のコミュニティ全10コミュニティの参加の下行われ、エマエ島でと同様な結果を示した。

(3) 有効性、適応性の評価と今後のツール活用への提言

スポーツイベントを活用した資源管理の啓発活動は、同国水産局や住民にも非常に好評であった。このようなスポーツ大会は、サッカーのルールを遵守、リスペクトする若年層が沿岸資源管理ルールも同様に扱うことの大切さを理解させるツールとなった点において、

住民の意識改革の醸成、行動変容を促すツールとして有効性が高いと考えられる。ただし、豊かな前浜プロジェクトが実施したCBCRM杯は、その評判ゆえに回を追うごとに規模が拡大し、その実施予算も徐々に大きなものとなっていた。本プロジェクトが実施した規模で将来的に水産局だけで本活動を実施することは現実的には難しいとみられる。

本ツールの活用については以下のように提言する。

- 本ツールで重要な点はスポーツを通じてコミュニティ主体の沿岸資源管理への参加者、特に若年層の参加を増やすことであり、その活動には大きな意義がある。そのため、隣接する2コミュニティによるスポーツイベントを通じた啓発活動など、資金がそれほど多くかからない方法・規模で継続されることが考えられる。その他、これらスポーツイベントを企画、実施するユース・スポーツ省やサッカー協会等と連携して行うことが望ましい。
- 現在、プロジェクトを進めているアメリカ合衆国国際開発庁（USAID）も本活動を支援し、タンナ島でCBCRM杯を実施する可能性が高いとされている。他ドナーに対し、本ツールの有効性を理解していただくことで継続的な活動をすることが望ましい。

4-4 調査・研究（CT-4）

（1）ツール開発の背景

調査・研究については、水産局による調査・研究が一般的である。ほとんどのケースにおいては、その結果はコミュニティには共有されない。一方、コミュニティによる調査・研究活動の実施、結果の分析と共有が行われることで、コミュニティ自身が資源の現状を把握することができ、資源管理活動継続のモチベーションとなり得る。そのため、本ツールが開発され、実証が行われた。

（2）実証結果

豊かな前浜プロジェクトフェーズ3のパイロットサイトの一つであるシェファ州エマエ島では、資源管理委員会による管理海域のリーフチェック（水中モニタリング）が計画され、本プロジェクトによるリーフチェック研修を行った。この研修では、座学によるライントランセクトによる海底目視やモニタリング対象とする魚介類の設定、実地の調査としてマラエのリーフで実習、実習で得られたデータを基にエクセルでのグラフ作成実習を行った。図6に実習風景と資源管理委員会が実習で作成したグラフを示した。

(2) 実証結果

豊かな前浜プロジェクトフェーズ2においては、貝細工製作・販売と資源管理活動との連携を促進するため、タフエア州アネイチュム島のミステリー島 No Take Zone 委員会では、島内で製作した貝細工商品に添付するエコラベルを有料配布して、住民主体の資源管理活動資金の一助することを計画した。プロジェクトでは、エコラベル 300 枚を印刷して、No Take Zone 委員会に提供した。No Take Zone 委員会は、エコラベル活動に協力する貝細工の生産者・販売者を



図 31 貝細工に付けたエコタグ

適切に選定して、配布・活用する予定であったが、関係者にエコラベルが浸透していないため、No Take Zone 委員会では貝細工販売者に試験的に無償でラベルを配布し、地元貝細工の宣伝用として活用してもらうことを目的として実施された。その後、本活動は水産局に派遣された JOCV 隊員により、安価なエコラベルがデザインされ一部の貝細工制作者に継承されている。

(3) 有効性、適応性の評価と今後のツール活用への提言

本活動が意義があるにも関わらず計画時点より普及・定着しない要因は、関係省庁の縦割行政の仕組みによるところが大きい。水産局側はこのような仕組みを推進するのは産業省や観光局であるべきとのスタンスでこれらの省庁と連携する努力をしてこなかった。しかし、既述のように TIVET（職業訓練局）や女性局を中心に貝細工の研修が各地で行われてきたところ、今後、質の高い貝細工が市場に出てくる可能性が高い。その反面、エコラベルが浸透しないと資源の乱獲につながりかねないことが懸念される。こうした点を考慮し、水産局は関係機関との連携を進めることが不可欠である。

4-6 資源管理活動に対する労働力の提供（CT-7）

(1) ツール開発の背景

CBCRM 活動を行うにあたっては、様々な場面で労力が必要となる。例えば、コミュニティ魚市場を建設する際、建設会社に委託することは可能であるが、材料のみを提供し CBCRM 活動の一部を自分たちの労力提供によって実施することにより、資源管理を行うモチベーションの醸成につながると考え、資源管理活動に対するコミュニティの労働力の提供というツールを開発し、実証した。

(2) 実証結果

豊かな前浜プロジェクトフェーズ3では、ソーラーフリーザーを格納する建屋や、コミュニティ魚市場の建設において、本ツールを活用している。

(3) 有効性、適応性の評価と今後のツール活用への提言

本活動は、資源管理を行うモチベーションの醸成につながっていると考えられるが、考慮しなければならないのは建設等の活動の遅れである。無償ということで、コミュニティに有償の活動があったり、他に優先度の高い活動があったりした場合、プロジェクトの活動が後回しにされてしまい、完成が遅れることがあった。そのため、期限が限られているような活動には本ツールは活用することは難しい。

4-7 栄養改善 (CT-8)

(1) ツール開発の背景

バヌアツ国水産セクター戦略には、魚食普及の促進により、非感染性疾患のリスクを軽減するとの内容が述べられていた。また、情報収集を行ったところ、バヌアツの栄養状況が一部不良であることが確認でき、健康維持上不可欠なカルシウムが多く含まれる食品の摂取量が推奨量を下回っていることがわかった。

魚は良質なタンパク質・脂質・必須アミノ酸等を含んでおり、魚を無駄なく活用すること、同時に栄養改善に繋がることを目指して、栄養改善のツールを開発した。

(2) 実証結果

活動では大きく、①魚の骨粉の作製、②魚の骨粉に含まれる栄養素の検査、③関係機関（商工省、ポートビラの学校 3 校、保健省、ポートビラ中央病院）への魚の骨粉の紹介及びトライアルクッキングの実施を行った。ポートビラのいくつかの学校では2021年以降、バヌアツ政府と学校が協力のもと、Farm to Table という給食食材の地産地消を目指したプログラムを行っていることから活動の対象とした。

魚粉の骨粉の作製は、①オーブンを使って干物にするもしくは油を使ってフライにし、②家庭用のミキサー等で粉碎する、という手順で行った。

骨粉に含まれる栄養素の検査は、日本では株式会社食環境衛生研究所で、バヌアツでは Vanuatu Bureau of Standards で行った。検査結果から、カルシウム・鉄・マグネシウム・リンなどの栄養素が豊富に含まれていることがわかった。

上記手順や検査結果を栄養改善の関係機関に紹介し、実際に体験してもらおうとトライアルクッキングを行った。関係者からは、学校や病院を拠点とした活動は、青少年や栄養不足の患者にとって不可欠なカルシウム摂取改善となり、地域全体の健康を促進すると賛同を得た。導入のハードルも高くはないとのことであった。

(3) 有効性、適応性の評価と今後のツール活用への提言

本稿で述べる栄養改善は「連結方策」の一つのオプション、つまり複数ある連結方策の一つ、あるいは地域の実情に応じて複数の連結方策の組み合わせにより、統合的 CBCRM

を効果的に機能させる側面的な手段と理解する。

本活動は、今後の統合的 CBCRM の普及を視野の中心に据えた場合、極めて重要な位置づけであることを認識できたが、第 4 年次の活動として新規に認められたもので活動期間も極めて短期であったところ、他のツールの評価結果と違い PDM の指標の達成への貢献度をより明確にしつつ、有効性、適用性、課題を明確にし、今後の活用への提言を行う。

PDM 上の有効性とインパクト

成果 1：統合的 CB-CRM アプローチの応用性と実用性が強化される。

栄養改善の目的として、JICA の「グローバル・アジェンダ（課題別事業戦略）7.栄養の改善～「JICA 栄養宣言」の推進～」において大洋州地域における水産分野の重要性も挙げられている。具体的には、大洋州でたんぱく源として重要性が高い水産分野では、「島嶼国水産ブルーエコノミー」として、漁村住民組織による主体的な水産資源の管理、「里海」の理念に基づく人と自然の共生、水産 FVC の構築等に取り組むとある。本プロジェクトにおける水産資源の管理と栄養改善の活動はグローバル・アジェンダに合致している。

栄養不良には様々な要因があり、取組の内容也多岐にわたることから、以下のように複数の分野（保健、農業・水産・食料、水・衛生、教育等）における介入が必要とされている。

食物（質のいい食物）	栄養価の高い食品（農業、漁業） 世帯内の食料確保
食行動（どう食べるか与えるか）	乳幼児期からの栄養実践 健康的な食環境づくり
サービス（私たちの食を取り巻く環境）	適切な保健サービス

本プロジェクトにおける活動は、マルチセクトラルな取り組みが必要とされている栄養改善において一つのアイデアとなる。

今回の活動は、資源管理への貢献を中心としつつも、栄養改善にも貢献する可能性があることから、以下の点で統合的 CBCRM アプローチの応用性と実用性が強化されたと言える。

- 学校を巻き込んだ点：途上国では、青少年が栄養における社会的弱者になることが多いため、青少年にとって不可欠なカルシウム等栄養素の摂取改善となるこの活動は、地域全体の健康を促進することに寄与できる可能性がある。

上記のように、水産物摂取による栄養改善、健康促進の必要性が給食を提供している学校や病院食を提供している病院で認識された点以外にも、以下の点で統合的 CBCRM の応用性、実用性に間接的に貢献できた。

- 水産物の需要が喚起される可能性が高まったことによる水産バリューチェーン強化に対する貢献
- 上記によるリーフ外の低利用資源の開発の促進によるリーフ内資源に対する漁獲圧力の軽減

プロジェクト目標：プロジェクトで開発された統合的 CB-CRM アプローチが国内・メラネシア域内で実践される。

以下の観点より、栄養改善は、国内はむろん、メラネシア域内でも求められている可能性は高く、統合的 CBCRM の実践する際の一つの活動として貢献できる可能性は高いと考える。

- 栄養改善の他コミュニティでの実践の可能性：一部の学校では週1回、マグロをはじめとする沖合の魚を200kg程度入荷し、学校給食として提供しており、その際、骨は廃棄しているとのことであった。学校に限らず同じような状況である場合（例：病院等）、簡易な方法で製造できる骨粉であるため、他の島の学校や病院の給食としてはむろん、他コミュニティにおいても実践可能と考える。
- 一般家庭や養殖場におけるアプローチの可能性：提案にとどまったが、2つの案を検討している。1つ目は一般家庭におけるもので、リーフフィッシュの骨を素揚げにして摂取することで資源の有効活用とカルシウム等栄養素の摂取増が期待される。2つ目は養殖場におけるもので、成長の悪い個体を間引く際、その個体を素揚げにして摂取することで成長の良い個体の成長促進とカルシウム等栄養素の摂取増が期待される。

上位目標：

- ① 統合的 CBCRM アプローチが、バヌアツ国における沿岸資源管理推進のための標準アプローチとして正式に採用され、普及する。
 - ② 太平洋地域において、住民主体の総合的沿岸資源管理アプローチが推進される。
- 栄養改善は、地域を問わず、コミュニティの住民を統合的 CBCRM 活動への参加を誘発するツールとして適用性が高い。

プロジェクトチームは、太平洋地域における栄養改善の実践は、間接的に統合的 CBCRM アプローチ推進のためのプラットフォーム構築に貢献できる可能性を示唆していると考え。具体的には、栄養改善が、今回のように通常廃棄されている骨を活用することで資源の有効活用と栄養改善の双方へアプローチし、これらの点を学校の生徒に積極的に伝えることで、「資源の持続的な利用」「資源の有効な利用」について意識づけをすることが出来るからである。

適用上の課題と対応策

課題：関係省庁等との連携の必要：小規模な漁業の場合、漁獲される日や量が一定でない場合が多い。この状況は漁業者としては売り先に困る、消費者としてはまとまった量を希望するため水産物は魅力的ではなくなってしまうことがある。今回の活動を通じて、水産局から商工省に地方の漁業者の情報（漁期、水揚げ場、魚種、量等）を提供することで、地産地消を推進している商工省は水産物のまとまった量と安定供給を念頭にコールドチェーン開発に協力する可能性が示唆されたことから、省庁間の連携によって水産物の販路の開拓と安定化を通して、魚食も普及につながる可能性が高まる。そのため、関係機関との連携を促進する必要がある。

対応策：（資源管理にも必要不可欠な）情報収集を推進する。

国民の栄養改善は中長期的な観点から医療にかかる経費の削減、安定的な労働力確保につながる点から、水産局、教育省、商工省、保健省が一体となって水産物の摂取を喚起するキャンペーンを行うことが望ましい。水産局側は、コールドチェーンネットワークの構築による特にリーフ外資源の開発戦略立案のため、これまで推進してきた漁獲データ収集システムの一環として、漁業者側にも情報のフィードバック、販路の安定化、漁業統計情報の提供と融資の一体化などメリットを示す活動を行うことは可能である。

以上