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COMMUNITY FISHERIES MANAGEMENT (CFM): FUTURE CONSIDERATION FOR VANUATU.

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Abstract

Community fisheries management (CFM) has been introduced in fisheries management in Vanuatu almost over a decade ago. Today, most of Vanuatu's coastal zone fisheries are managed under CFM system. However, it appears that the current CFM is inefficient, weak and unsustainable. In this study, the actual form of CFM in Vanuatu is described and compared to the Arnason design principles for an efficient CFM. According to Arnason approach, CFM is a form of property rights regime. It was found that Arnason design principles existed to some certain degree in CFM in Vanuatu. The CFR appeared to exist as moderately strong. However, it was not efficiently utilized because of the set-up and organization of the communities. Nevertheless, there is overall practical applicability in the context of CFM in Vanuatu.

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1 INTRODUCTION

It is now well-established that rights-based fisheries management regimes, where the rights are held by individual operators, are capable of generating substantial rents in fisheries. This applies in particular to sole ownership, TURFs, and ITQs. However, these three rights-based regimes are not applicable to all fisheries. In particular, they are often not applicable to small-scale fisheries. The reasons are primarily (i) very high cost of enforcement and (ii) social and political difficulties (Arnason, 2003).

It has been suggested by (Arnason, 2003) that community fisheries management (CFM) may be viable as an alternative to individually held rights-based regimes in small-scale fisheries. CFM is essentially handing fishing and fisheries management rights to communities. If the rights are sufficiently high quality, the community is then in a position to utilize these rights in an efficient way. Arnason derived certain design principles (which I will refer to in this study as "*Arnason design principles*") for these CFM-regimes which would be conducive to the adoption of economically efficient fisheries management under the CFM regime. Not only that, under CFM, it is also possible that the two major problems of rights-based regimes in small scale fisheries, namely (i) the high cost of management and (ii) socio-political opposition would be much reduced.

This paper is concern with community fisheries management in Vanuatu. CFM was re-introduced in Vanuatu fisheries in 1990. However, more than ten years later, for some reason, it appeared weak, inefficient and biologically unsustainable. Therefore, the main objective of this study is to describe and compare the actual form of CFM system in Vanuatu with the Arnason design principles to identify where the deviations reside and on that basis suggest future improvements in the Vanuatu CFM.

1.2 Significance of study

Long before the first European settlers came to the Vanuatu archipelago; fisheries management was practiced at a community level. In other words in those days there was a form of community fisheries management. Following the arrival of the Europeans, fisheries management for a variety of reasons gradually transformed into a more centralized regime. However, this regime was not effective for the coastal zone fisheries due to (i) limited financial and human enforcement resources and (ii) the geographical nature of the country. Both of these reasons contributed to lack of appropriate enforcement of centralized fisheries policies.

Realizing the difficulties, CFM was formally reintroduced in Vanuatu fisheries in 1990. Today most of the coastal zone fisheries in Vanuatu are managed under the CFM system. Of course, under the CFM system, the two major problems faced under the centralized regime were reduced to some certain extend. However, for some reason, as earlier mentioned, it appears that the current CFM-system is not efficient. It's weak in management and it seems to have lead to unsustainable Harvesting levels and is therefore probably not even socially sustainable.

Therefore, the significance of this study is to find practical ways to improve the current system so that it will become efficient, strong and sustainable. This means that it should be capable of generating long lasting economic efficiencies in fisheries.

1.3 Organization of the study

This study consists of five main chapters and is organized in the following manner: A general background information about Vanuatu and her fisheries is provided in Chapter 2. The past and existing fisheries management regimes in Vanuatu are discussed in Chapter 3. Chapter 4 is the core chapter of this study. In this chapter I attempt to provide answers to a few key questions about CFM and its application in Vanuatu: More precisely, I will deal with the following: (i) what is CFM (ii) why is CFM a good idea and; (iii) what are the Arnason design principles for an efficient CFM?. Then, a comparison of the actual form of CFM-system in Vanuatu and the Arnason design principles is made. This will help us to identify the problems with the current CFM in Vanuatu and suggest improvements

Finally, Chapter 5 is the conclusion of the study. In this chapter, I will attempt to provide policy recommendations on the possible improvement of CFM in Vanuatu.

2 BACKGROUND INFORMATION

The main objective of this chapter is to provide general background information about Vanuatu. The chapter is arranged as follows. First, general information on the country is provided; followed by a section on the people; the political structure of the nation and the general overview of fisheries in Vanuatu.

2.1 The country

Vanuatu was first visited by the Europeans in the early 17th century. Later in the year 1774, the famous explorer Captain James Cook explored the islands and gave the group the name "New Hebrides" (Amos, 2004).

Vanuatu is a Y-Shape archipelago comprising more than 80 islands, 67 of which are inhabited, and twelve which are considered major in terms of land area. Stretching approximately 1,300 km from north to south, the archipelago lies between latitudes 13-21°S and longitudes 166-172°E in the western Pacific Ocean in the middle of a triangle formed by Fiji, Solomon Islands and New Caledonia (Figure 1).

Vanuatu islands are mountainous and tectonically very active with several active volcanoes. The archipelago also lies within the cyclone belt and experiences two cyclones annually on average. The climate varies from tropical in the north to subtropical in the south. Vanuatu has two seasons, dry and wet. The dry season lasts from May to October and the wet season last from November to April. The average annual rainfall ranges from 1,700 mm in the south to 3,000 mm in the north. The average temperature ranges from 25 °C in the south to 28 °C in the north. The average sea surface temperature in the open ocean ranges from 24 °C in the south to 27 °C in the north (Vanuatu Meteorological Office, personal communication 2006). During El Nino, and La Nina, there is a sudden rise and fall of sea surface temperature. Over the past five years, occurrences of El Nino and la Nina had drastic bleaching impact on coral reefs of Vanuatu in many areas that resulted in large areas of reefs being wiped out (personal. observation).

Vanuatu's total land area is about 12,190 km^2. Of this, 5,500 km^2 is considered arable land. Total coastline is about 2,528 kilometres. The Exclusive Economic Zone (EEZ) covers an estimated area of 680,000 km^2 and the country shares maritime borders with New Caledonia, Solomon Islands, and Fiji. In contrast to neighbouring Pacific Island countries which are endowed widely extensive with large areas of fringing reefs, barrier reefs and lagoons, Vanuatu's inshore or shallow water areas are quite small. Inner reef areas are limited to narrow fringing reefs with the combined coral reef area covering an approximated 408 km^2. Other biologically important reef associated habitats, which include mangroves, estuaries and lagoons amount to a total area of 25 km^2 (Naviti and Aniston, 2000).

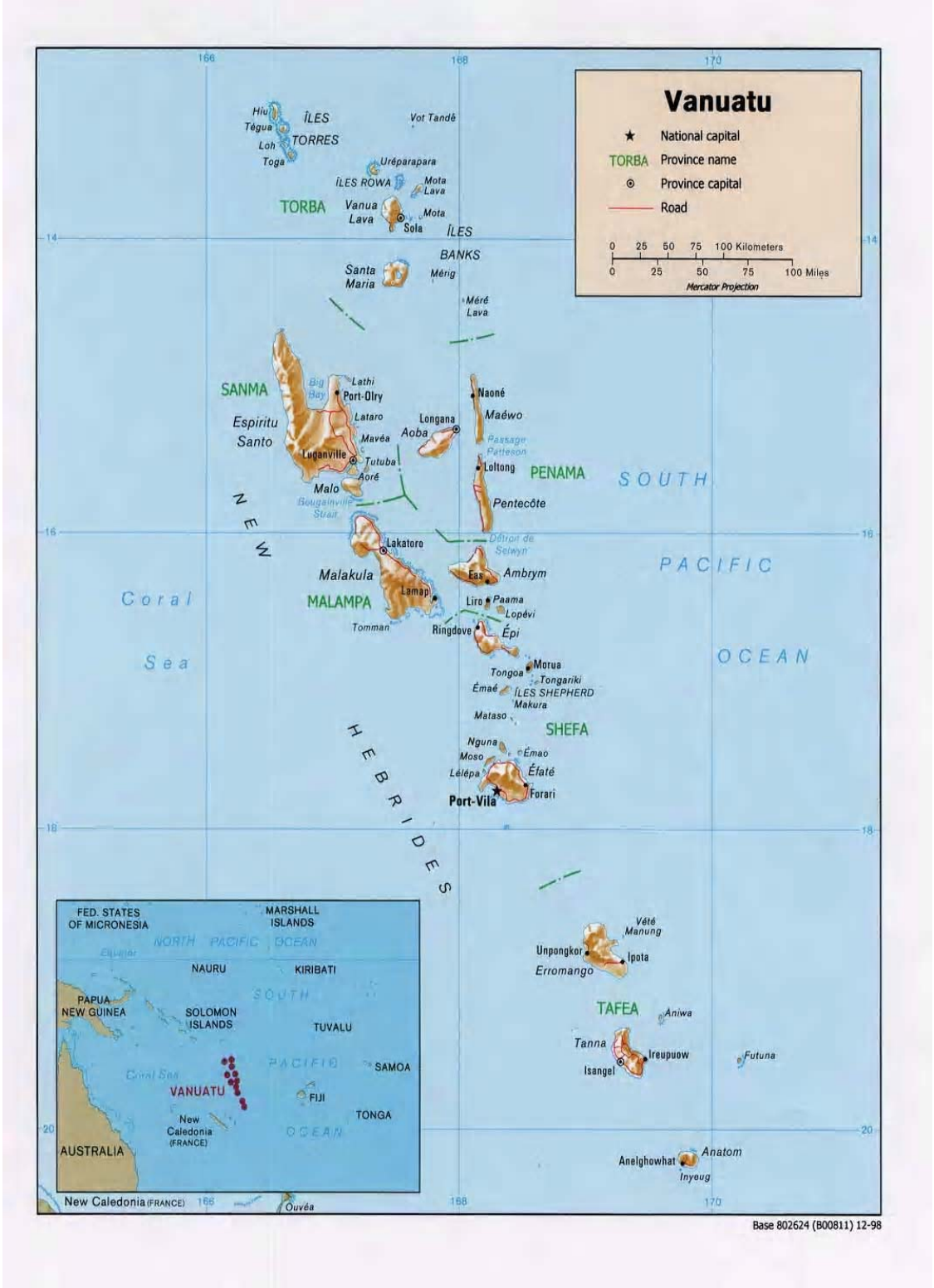

Figure 1: Map of Vanuatu showing all the islands, the six provinces and its location with reference to Australia and other neighboring Pacific island nations.

2.2 The people

The indigenous people of Vanuatu called the "Ni- Vanuatu" are Melanesian in origin. The first people to have settled the islands of Vanuatu are known to have originated from somewhere in South East Asia (Kirck, 1997) some 3,000 years ago (Spriggs, 1997). Ni-Vanuatu are culturally heterogeneous which among other things is reflected in the great diversity of languages spoken throughout the country. According to (Tryon, 1996) there are currently about 113 different languages in Vanuatu. The national language is called "Pidgin-English" or "Bislama". Pidgin is unique among the Melanesian groups and is a language made up of a mix of mainly English and French words (Hickey, in press). The official languages are English and French.

Vanuatu is a Christian country primarily influenced by the Presbyterian, Anglican and Catholic missionaries who first brought Christianity to the islands.

The total population of Vanuatu according to the 1999 national population census was 186,678. From 1989 to 1999 the population growth was recorded at 2.7% per annum. Of the total population, 80% lived in the rural areas depending entirely on agriculture and fisheries. About 98% of the population consists of indigenous Melanesian people. The other segment of the population includes people of different nationalities, such as Australians, New Zealanders, Europeans, Asians and other Pacific Islanders. The population density is about 15.3 people per square kilometres (National Statistics Office, 1999).

During the period 1989 to 1999, the urban population has increased by 4.2% annually. This increase has accounted for over 20% of the total population that lives in the two towns of Port Vila and Luganville. This is equivalent to a total of about 40,000 people. Of the approximated 40,000, more than 30,000 people live in the capital town of Port Vila and another 10,000 in Luganville (National Statistics Office, 1999).

The current population of Vanuatu is now estimated to be more than 200,000 people and the annual population growth of 2.6% (Reserve Bank of Vanuatu, 2006).

2.3 The government

Vanuatu was colonized by both British and France and was under a joint Anglo-French Condominium administration for 74 years from 1906 to 1980. After attaining independence in 1980, New Hebrides became a democratic republic and changed its name from New Hebrides to Vanuatu. Vanuatu means "Our Land" (Hickey, in press).

Vanuatu's political structure consists of legislative, executive and judiciary branch.

The Legislative branch comprises a single chamber, known as parliament. The parliament consists of 52 members voted in by the people for a four year term. The Prime Minister is the head of government chosen by the parliament.

The Executive branch is the cabinet and consists of the council of ministers and the Prime Minister. After his/her election as Prime Minister, the Prime Minister then appoints the members of the executive branch. Currently there are thirteen members of the executive branch responsible to oversee the administration of its thirteen ministries.

The Judiciary branch consists of the Supreme Court, a Magistrates Court and the Village/ Island Courts. The Supreme Court consists of a Chief Justice and three other charges. They are elected by the President. The judiciary is vested with the responsibility to administer justice in Vanuatu. The basic function of the judiciary is to resolve matters of law.

As a democratic republic, Vanuatu has a president. The president is the head of state of the Republic of Vanuatu and symbolizes the unity of the nation. The president is elected for a five year term by an electoral college consisting of parliament and the six Presidents of the six Provincial Governments.

The country is divided into six provinces namely Torba, Sanma, Penama, Malampa, Shefa and Tafea province (Figure 1). The Decentralization and Local Government Act provides for the legal framework under which the provinces are formally established. In addition, the act empowers the provinces to make by-laws with regards to the management of resources within the six miles of provincial waters. Members of the provincial governments are voted in by the people of the respective provinces. Each province is headed by a president who is voted in by the provincial councillors of the respective province. The term of the provincial government is four years after an election (Government of the Republic of Vanuatu, 1997 (b)).

Vanuatu has two towns, Port Vila and Luganville. The towns are administered by the municipalities' act of 1980. The act provides for the formal establishment of the municipalities. Councillors to municipalities are voted in by the people residing in municipal areas. A municipal council is headed by a mayor voted in by the municipal councillors.

From the above, it emerges that Vanuatu has three formal levels of governments. The national government headed by a Prime Minister, is responsible for overseeing the affairs of the whole nation and consists of the parliament and cabinet. Then, there are provincial governments. The provincial governments are responsible for the economical and social welfare of their people. The last level of government is the municipal councils. The municipal council is responsible for the administration of the two towns.

2.4 The economy

Two main sectors form the backbone of Vanuatu's economy. They consist of the agriculture sector which includes fisheries and the service sector. The service sector comprises tourism as well as wholesale and retail trade.

In rural areas, agriculture and fisheries form the mainstay of the economy supporting the bulk of the population (80%). Agriculture and fisheries in the rural areas consist primarily of subsistence fishing and small-scale agricultural activities. These consist of smallholder farming of beef, poultry, piggery and cash crops such as coconut, cocoa and kava.

Agriculture remains the main commodity export contributing about 70% to total exports. The main export products of Vanuatu include copra, coconut oil, beef, cocoa, shells, cowhides, kava and coffee (Table 1).

Table 1: Annual export production of major commodities (*extracted from Amos, 2004*)

Year	Copra (mt)	Coconut oil (mt)	Beef (mt)	Cocoa (mt)	Shells (mt)	Cowhides (mt)	Kava (mt)	Coffee (mt)
1999	27,723	-	1,577	1,104	85	258	334	10
2000	48,337	1,812	1,361	1,536	106	347	555	-
2001	14,258	8,733	815	538	39	272	935	8
2002	7,338	9,856	685	756	19	235	456	81
2003	10,620	7,725	976	1,506	23	289	491	-
Total annual average	21,655	5,625	1,083	1,088	54	280	554	20

The major trading partners of Vanuatu include the European Union, Japan, Australia, New Caledonia, New Zealand and other Pacific island countries (Amos, 2004).

Despite being the leading export industry, agriculture is not the leading contributor to the GDP. Over the past six years, agriculture makes up about 18.3% of the GDP. The service sector dominates the economy with the total contribution of about 70% of the GDP followed by agriculture. Within the service sector, wholesale and retail trade dominates accounting 40%. Tourism which makes up about 16% of the GDP is becoming an important sector of the economy. The GDP growth for 2003 and 2004 ranges from 4-5% and is driven mainly by the two main sectors of the economy, agriculture and the service sector. The GDP per capita estimates by the World Bank for 2003 is about $ 2,900 (Reserve Bank of Vanuatu, 2006).

Fisheries, as a sector makes a relatively small contribution to the overall formal economy contributing an estimated 1% to the overall GDP and 5.5% to the primary production sector. However the domestic fishery, in particular the reef and coastal fishery plays an important role in the rural economy by providing nutrition and income-earning opportunities to some 60% of rural households (National Statistics Office, 1999). The total estimated subsistence fisheries production from the coastal fishery was about 2,400 tons in 1993. The per capita fish consumption in 1993 was estimated at about 15.6 kg per person (National Statistics Office, 1994).

2.6 Fisheries in Vanuatu

Fisheries in Vanuatu can be divided into two main categories, offshore and inshore fisheries (Figure 2).

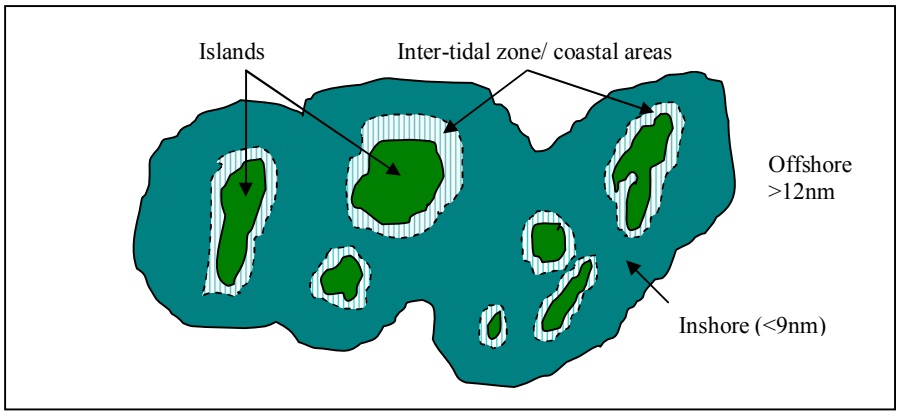

Figure 2: Schematic diagram illustrating the demarcations of the different fishing zones[1]

Overall, the fisheries resources are exploited at the subsistence, artisanal and commercial level.

Subsistence fishery is defined here by the Secretariat of the Pacific Community (SPC) as "*a fishery in which the harvested resource is used directly by the fisher without sale for profit…*" In the context of Vanuatu there maybe sharing and trading taking place between the fisherman and other members of his community. For example, the fisherman can exchange fish for other food crops.

Artisanal fishery is defined by different authors according to the different circumstances in different countries. The definition that is relevant to the case of Vanuatu is provided by (Arnason, 2006) as: "…*fisheries usually characterized by numerous small scale vessels, small locally consumed catches and numerous primitive landing places."* In Vanuatu, most artisanal fishers are part-time fishers who only fish when the need for cash arises.

Commercial fishery is a fishery conducted primarily for commercial purposes, i.e. selling of the products.

In Vanuatu, subsistence and artisanal fisheries are more associated with the coastal/ inshore fisheries. The commercial fishery is more associated with the offshore tuna fishery.

2.6.1 Subsistence fisheries

Life in the rural areas of Vanuatu is centred on subsistence agriculture and fisheries activities. It was reported that 35% of the 22,000 rural household engaged in fishing

[1] The demarcation areas are based on the level of utilization of resource and is just for the purposes of this study

activities 7 days prior to the agriculture census that was held in 1993. This may entail that, subsistence fishing activities occur almost every day throughout the islands (National Statistics Office, 1994).

The subsistence fishing activities mainly take place within the inter-tidal zone and extend just beyond the edge of the fringing reefs. The activities employed include gillnetting, hand line, reef gleaning [*the act of gathering of shellfishes especially within the inter-tidal zone areas*], spear-fishing, traps and various traditional fishing practices such as fishing with bows and arrows. In the subsistence fishery all members of the community including men, women and young adults may participate in the fishing activities. However, usually, women and young adults tend to use the more simple methods with less effort such as reef gleaning and hand lining and are restricted to the reef flats while the male tend to use the methods that are more sophisticated and efficient but require more energy such as spear fishing and gillnetting and tend to go beyond the reef edge using canoes and motor powered skiffs.

The current estimate of the subsistence production is not known, however as earlier mention, the estimated production in 1993 was about 2,400 tones (National Statistics Office, 1994).

2.6.2 Artisanal fishery

The artisanal fishery consists of the deep bottom snapper fishery, grouper fishery and the tuna fishery within the inshore areas.

Catches are sold and consumed locally. There are two main fish markets in Port Vila where fishermen sell their catch. In addition, a number of supermarkets, hotels and restaurants in the two towns of Vanuatu provide regular customers of the fishermen. However, currently there is no systematic data collection system in place to substantiate the volume and value of the catch.

In the rural areas, civil servants such as teachers and health workers are valued customers of artisanal fishermen. At times, members of community may purchase fish from fishermen but this is generally rare as most community members also fish for themselves. It was reported by (Naviti, 2000) that those artisanal fishers scattered throughout the rural areas of the country contribute significantly to the rural economy.

The artisanal fleet consists of canoes and small skiffs. More and more, the fleet is becoming dominated by those skiffs powered by 20-60 hp engines. The skiffs which range from about 5-7 meters in length are made of wood, aluminium or fibre glass. According to the Fisheries Annual report (Kalo, 2003), there are over 70 artisanal fishing boats scattered throughout the country. The boats are designed to go out fishing on a daily basis (leave morning and return the same day in the afternoon). The fishing capacity of the skiffs ranges from 500-1000 kg. But the actual average catch ranges from 40-70 kg per boat per day.

The methods employed in the deep-bottom fisheries include hand line (or drop line) and long line. Those employed in the tuna fishery consist of long line and trolling. As mention above, the artisanal fleet consists of small boats apparently using low tech fishing gears. The fishing lines are operated manually.

Other important fisheries perusal by artisanal fishers includes trochus, green snail, sea cucumber, and the aquarium trade fishery.

Even though trochus, green snail and sea cucumbers are harvested and sold to processing factories, the method of harvesting is labour intensive, a typical characteristic of the artisanal fisheries. Both trochus and green snail are harvested for subsistence and commercial purposes. The meat is eaten and the shells are sold to processing factories. The shells are used mainly for making buttons, jewellery and inlay works. Unlike trochus and green snail, sea cucumber is not a traditionally exploited resource in Vanuatu. Therefore it is solely harvested for commercial purposes. The end product which is dried and locally known in Vanuatu as "beche-de-mer" (BDM) is a food delicacy in some Asian countries.

Trochus, green snail and sea cucumber form the basis of the coastal fisheries. They provide an imperative income opportunity to the rural population. In many rural areas where income generating options are limited, these resources may provide the only option available (Bell and Amos, 1993).

The domestic price offered for trochus shell is about USD 2.9 per kilogram. Those offered for green snail ranges from USD 25 to USD 30 per kg. Sea cucumber prices vary according to the different species and highly fluctuating influenced by the world market prices. The recent prices are therefore not known.

There are limited data on the past and current status of these imperative resources, but due to the increasing demand and the high prices compared to agricultural products, stocks are generally declining as a result of intensified harvesting activities (Bell and Amos, 1993; Jimmy, 1995; Friedman *el at*., 2006 unpublished preliminary report). It appears that there is a direct relationship between prices of fisheries and agricultural products that may contribute to increased pressure on fisheries resources. This relationship is illustrated by a simple fisheries model in Appendix 1.

Export figures also show decline in production (Table 2). It illustrates a general decreasing trend. Trochus and sea cucumber are steadily decreasing while green snail figures showed drastic decline from 44 tonnes in 1991 to 7.35 tonnes in 1992.

Table 2: Total annual export production for trochus, green snail and sea cucumber (*FAO, 2006 and Vanuatu Fisheries Department, 2006*)

Year	Trochus (mt)	Green snail (mt)	Sea cucumber (mt)
1990	170	10	50
1991	130	44	50
1992	150	7,35	39
1993	160	51	40
1994	107	1,1	40
1995	100	0,35	50
1996	100	2,7	50
1997	100	3,9	50
1998	100	1,1	50
1999	90	0,6	50
2000	90	0	26
2001	73	0	38
2002	67	0	8
2003	53	0,7	25
2004	35	0	13
2005	36	0	9

The other important artisanal fishery is the aquarium trade fishery. This fishery is a new and growing industry in Vanuatu (Table 3). Its introduction provides another economic option to rural communities and resource owners especially when other major coastal resources illustrated above appeared to show signs of decline.

The trade targets small ornamental reef fish species, corals (live and dead), giant clams and other invertebrates (Table 3). Prior to the establishment of this fishery in Vanuatu in the early 1990s, most of the aquarium products such as fish (non-food fish), corals (live and dead) and various species of invertebrates were never utilized and had no monetary value. However today, coastal communities and resource owners see them as valuable economic resource.

Of the total 543 reef fish species recorded for Vanuatu (Fishbase, 2004), over 300 species are valuable aquarium species. Surveys conducted on aquarium products showed high potentials for sustainable yield in many areas (Pers. Observation).

Table 3: Export quantity and value of aquarium products (*Vanuatu Fisheries Department, 2006*)

	Aquarium Fish		Live rock		Giant clams		Live corals		Invertebrates	
Year	Quantity (pcs)	Value (USD)	Quantity (pcs)	Value (USD)	Quantity (pcs)	Value (USD)	Quantity (pcs)	value (USD)	Quantity (pcs)	Value (USD)
2000	9,000	-	11,000	15,686	16,000	68,627	-	-	-	-
2001	9,000	-	19,000	22,549	10,000	39,216	6,737	8,824	780	392
2002	21,000	-	27,000	36,275	700	980	780	2,941	50	196
2003	59,000	392,157	53,000	137,255	3,000	32,353	2,185	9,803	20,420	23,529
2004	70,000	490,196	56,000	44,118	600	6,863	30	-	3,791	1,961
2005	117,000	784,314	19,000	24,511	2,000	15,686	763	2,941	14,503	64,706

The economic contributions of the coastal resources described above are given in table 4. On average, exports of trochus brought in a total of about USD 460,000 in foreign exchange per annum during the period from 2001 to 2005. The average annual export value of beche-de-mer per annum over the past five years is about USD 117,

600. The aquarium industry is currently bringing in over USD 500,000 annually in export earnings. In addition, resource users are paying for access of resources to the resource owners. For instance, the aquarium operators have to pay a total of over US 19,000 per year for access of property rights.

Table 4: Export value of artisanal or coastal fisheries products (*Vanuatu Fisheries Department, 2006*)

Year	Trochus (USD)	Green snail (USD)	Sea cucumber (USD)	Aquarium industry (USD)
2000	-	-	-	88,235
2001	500,000	-	127,451	68,627
2002	323,529	-	49,019	431,373
2003	607,843	5,882	117,647	696,078
2004	343,137	5,882	127,451	833,333
2005	509,803	-	166,666	980,392
Total annual average	456,862	5,882	117,647	519,608

Processed trochus, green snail and sea cucumber are exported mainly to the Asian markets in China, Korea and Hong Kong. Trochus and green snail shells are processed into button blanks. Button blanks are semi-processed buttons. Sea cucumber is exported dry (Beche-de-mer). Beche-der-mer is a delicacy and priced very highly in Asian countries. The bulk of the aquarium trade products are exported to the US. The rest are exported to Canada, Europe, Asia and Australia.

2.6.3 Commercial fishery

The commercial fishery is mainly targeting offshore tuna resources. The major targeted species include the albacore tuna (*Thunnus alalunga*), bigeye tuna (*Thunnus obesus*), yellowfin tuna (*Thunnus albacares*) and skipjack tuna (*Katsuwonus pelamis*)

Tuna is the most important marine economic resource of the Pacific islands. The average catch for the Pacific islands over a 30 year period from 1970 to 1999 is estimated to be about 1 million metric tones. The estimated value recorded for 1998 was about 1.9 billion dollars (Gillett *et al.*, 2001).

Vanuatu's involvement in commercial tuna fisheries started in the 1950s when a transhipment base was established in the northern island of Espiritu Santo. The transhipment was established mainly for the long-liner fleets fishing in the South West Pacific (Bell and Amos, 1993; Naviti, 2000; Amos, 2004).

In Vanuatu, tuna resource are a very important resource generating about USD 1 million in access license fees, annually.

Since Vanuatu has limited capacity to exploit its tuna resource at a commercial level, the tuna industry is dominated by foreign vessels consisting mainly long-liner fleets and a few purse-seine and pole and line boats. Table 5 shows the total annual license number allocated for each fishing category. Most of these vessels are from distance water fishing nations like Taiwan, Korea and China. The combined tuna catch from long liners vessel fishing in Vanuatu waters from 2001 to 2005 is given in Table 6. It should be noted that this information does not present the actual catch information.

There are two reasons, first, catch from purse-seine and pole and line boats are not available. Secondly, Fisheries Department has just recently established (early 2006) the offshore database, thus the information input is still progressing. The total allowable catch (TAC) for the different tuna species within Vanuatu's EEZ is illustrated given Table 7.

Table 5: Maximum annual number of licenses that can be issued in each fishing category with tuna or tuna like species as a target species within Vanuatu EEZ (Ministry of Agriculture, Quarantine, Forestry and Fisheries, 2000)

Fishing category	Vessel/ License limit
A. Tuna Long line	100
B. Tuna Purse seine	10
C. Tuna pole and line	10

Table 6: Total annual long line catch of all tuna species within Vanuatu EEZ area (*extracted from Naviti et al, 2006*)

Year	Albacore Tuna (mt)	Bigeye Tuna (mt)	Yellowfin tuna (mt)	Others (mt)
2001	1,510	58	257	108
2002	2,299	162	597	330
2003	2,417	248	935	456
2004	3,207	179	750	514
2005	6,127	248	1,450	1,016

Most of the long line vessels licensed to fish in Vanuatu waters are greater than 100 GRT (Naviti 2000 and 2003; Naviti *el al*. 2006).

Table 7: Current annual Total Allowable Catch (TAC) for major tuna species in Vanuatu (Ministry of Agriculture, Quarantine, Forestry and Fisheries, 2000)

Species	Total Allowable Catch (TAC) per Year (in metric tones)
Albacore tuna	10,000
Yellowfin tuna	3,000
Bigeye tuna	1,000
Skipjack tuna	3,000
Total	17,000

As mention above, Vanuatu's involvement in tuna fisheries started in the 1950s. After the closing down of the transhipment base in Espiritu Santo in 1987, most of the foreign fishing vessels licensed to fish in Vanuatu waters transferred their based to Fiji and American Samoa where they are based and operated (Amos, 2004). I have not been able to find the reasons behind the closing of the transhipment base.

The local offshore fleet is limited to two commercial fishing vessels based in Port Vila. The vessels are about 10- 15 meters in length with average capacity of about 30 tones. The two vessels are multi-purpose employing long line and trolling fishing methods. The catch are sold and consumed locally. However, there are no further usable data on their activities.

2.7 Aquaculture development

As the population is constantly growing, pressure on the limited resources has intensified. Rural people struggle to send their children to school and meet other social commitments, for this they need financial means, ocean resources offer opportunities to generate these funds. While at the same time most of the coastal resources are over-exploited and some are in the brink of extinction. As a result, the Fisheries Department is promoting and encouraging people to venture into other alternative areas within the fisheries sector. One of those areas is the aquaculture sector.

Currently, the aquaculture sector is still at its early stages with a good potential to develop further in future.

The principle focus of aquaculture development in Vanuatu is to increase food security. Also important is the desire to reduce the pressure on wild stocks. By promoting fish farming, it is anticipated that gradually attention will be diverted from the wild stocks to farming. Currently attention is directed on freshwater farming of tilapia. The main target species for mariculture are prawn, trochus, green snail, giant clam, seaweed and corals.

Currently the Fisheries Department is working on small scale pilot farming project of tilapia and prawn with interested individuals and communities. The objective of the project is to assess the commercial viability of the operations. The Department is also promoting large scale commercial farming and so far one company is running a full scale commercial shrimp farm in the vicinity of Port Vila.

2.7 Summary

From the above, different fisheries are presented and discussed according to the different levels of exploitation. It has been found that the major artisanal or coastal fisheries have shown decline in export quantities over the years (Table 2). However, even though quantities are declining, export values are increasing (Table 4). One possible explanation for this is that it maybe due to increase prices in export. In addition, a sharp increase in the tuna catches within the Vanuatu EEZ was recorded for 2005. One possible explanation is that it might be due to the strengthening of data collection system recently by Vanuatu.

3 FISHERIES MANAGEMENT REGIMES

Fisheries management in Vanuatu is based on a combination of modern and traditional management practices. The traditional fisheries management system is informal and based on customs passed down from generation to generation. The modern fisheries management system is formally based on written laws.

Presented below is a brief summary on (i) the history of fisheries management in Vanuatu (ii) the traditional fisheries management practices, (iii) the legislations that contribute to fisheries management in Vanuatu and (iv) the actual form of community fisheries management system in Vanuatu.

The main objectives of this chapter are to i) describe and establish the formal fisheries management system in Vanuatu and; ii) ascertain the practices of fisheries management in Vanuatu.

3.1 History

Prior to the arrival of the first European settlers into the Vanuatu archipelago, fisheries management was purely based on custom and practiced at a community level. Following the arrival and settling of the islands around the mid 18th century, along came Christianity. Christianity was highly intolerant to the custom beliefs that were a fundamental part of the taboo system in resource management. The early missionaries regarded custom beliefs as wicked and associated it as the works of the devil. They continuously preached against these beliefs and gradually succeeded to some certain extend to outlaw some of the custom beliefs (Paton, 1911).

Over time, in light of the ongoing erosion of the custom beliefs at the hands of the early missionaries, there was increased western influence. Consequently, the fisheries management regime was slowly transformed from a community level, traditional fisheries management system into a more formal centralized regime administered by a centralized authority. However, many of the islanders managed to retain some of their custom beliefs during this transitional period and continue to practice them within the coastal zone fisheries (Hickey, in press; Johannes, 2002).

But since gaining independence in 1980, Vanuatu re-enforced the idea of centralized management regime by enacting the Fisheries Act in parliament as the supreme law in the country for the management and development of its fisheries resources. Under the act, policy formulation, implementation, enforcement and conservation initiative is the responsibility of the state.

It soon turned out that in a country of limited financial and manpower resources and where the geographical nature of the country makes it difficult and expensive to implement and enforce national fisheries policies, fisheries management on a centralized basis was not very effective particularly for the coastal zone fisheries. Realizing this difficulty, in 1990, CFM was suggested as the viable option to the centralized regime for the coastal zone fisheries. Further discussion on the actual form of CFM in Vanuatu will be provided in detailed in section 3.4.

3.2 Traditional Fisheries management

Fisheries Management as a set of rules on how fishing may be conducted has existed in Vanuatu since time immemorial. In Vanuatu, like many other Pacific Island nations in earlier days (Johannes, 2002), fisheries management was carried out at the community level based on traditional knowledge and a system enshrined in local custom and respect for the rules passed down from generation to generation (Hickey, in press).

Presented below are some examples of traditional fisheries management practices in Vanuatu. The examples and information presented here are exclusively based on Hickey (in press).

The traditional management practices are based on traditional taboos and cultural beliefs. They consist of the "*less obvious*" management practices and the "*more obvious*" management practices.

The less obvious management practices are based on behavioural prohibitions that disallow a person from engaging in fishing activities. Such behavioural activities include indulging in sex, when having a pregnant wife, eating certain fruits and not going to certain places when constructing fishing gears.

In addition, eating certain marine resource such as lobster and octopus during yam planting seasons is prohibited. Other clans refrain from eating certain marine species as they may represent their clan (totems).

Even though these practices are not directly seen as resource management tools, it was believed that an aggregated combination of these practices significantly reduce harvesting pressure on resources.

The more obvious management practices are based on "closures" of reef areas as a result of certain important happenings. These happenings may include a death of a "Big Man" (a big chief) or death of any family members, a ranking of a "big man", yam planting seasons and preparation of a big feast. For instance, when a big man dies, his part of a reef will be closed from fishing activities. The period of closure in such event is many years depending on the degree of respect held by the man. In the event where any member of the family dies, the period of closure usually last for one year. During yam planting season, the closure is for six months, basically the time taken until the yams are ready for harvest. During ranking ceremonies, the closure period usually last for 1-4 years.

In addition, large areas in Vanuatu are traditional taboo areas of spiritual significance. These areas can be found both inland and on the coast and can be of biological significance. They command a high spiritual significance. Such areas are associated with cultural beliefs that the spirit will curse people to die or contract some kind of diseases or that terrible things will happen to them if they do not respect these areas. As a result people would not dare to go fishing in these areas.

There is no doubt about the positive effect of closures on biomass and resource sustainability. Reef closure is basically what is referred to in modern term as marine protected areas (MPAs). Studies conducted on the effect of MPAs showed positive spill-over effect to the surrounding areas (CDEH, 2003). Thus it would be legitimate to conclude that closures used as traditional fisheries management practices would certainly have the same effects as MPAs. However, the effects of MPA on aggregate fishing effort remain uncertain. Moreover, MPAs does not provide an efficient option of fisheries management (Arnason, personal communication).

Some of the traditional management practices are still in use today, others have only survived through oral history and others have no doubt been lost. More recently, forces of economic development and globalization have continued the process of demise of the traditional fisheries management practices.

According to (Hickey, personal communication); a number of the traditional management practices are still in practice in areas further from the urban centres which are less subjected to western influence and thus still maintain their values and

beliefs. For instance in Torba province, many areas of Malampa, Penama and Tafea province, people in many villages would still hold onto these practices as they have maintained their values and beliefs to this day.

3.2 Current fisheries management

This section presents the different national legislations, regional and international treaties and conventions currently contributing to fisheries resource management in Vanuatu. The main objective of this section is to ascertain the formal fisheries management system under which fisheries resources are managed in Vanuatu.

3.2.1 Legislations

The main legal instrument for the management, development and conservation of fisheries resources in Vanuatu is the Fisheries Act No. 55 of 2005[2]. The overriding management and development objective is:

"The fisheries management and development in Vanuatu shall be to ensure the long-term conservation and the sustainable utilisation of the fisheries resources of Vanuatu for the maximum benefit of the people of Vanuatu."

The Fisheries act also requires vessels flying the Vanuatu flag, fishing outside Vanuatu waters to comply with any regional and international treaties and conventions to which Vanuatu is a member.

Overall the Fisheries act comprises 15 Parts. Basically, the act sets down the formal fisheries management system as a set of rules on how fishing activities should be conducted. It provides for the management, development and conservation of fisheries resources. In addition, it provides for the licensing system and requirements of fishing vessels to comply with the licensing conditions. Furthermore it empowers the minister responsible for fisheries to make regulations concerning the utilization of fisheries resources.

Other relevant instruments that contribute to fisheries management in Vanuatu include the Decentralization and Local Government Regions Act (1997), the Environmental Management and Conservation Act No.12 of 2000, the Maritime Zone Act No. 23 of 1981 and the Vanuatu Foreign Investment Promotion Act No. 15 of 1998.

The Decentralization and Local Government Act empowers the provinces to pass "by-laws" to regulate and issue fishing license within their six miles provincial waters.

The Environmental Management and Conservation Act involves the issuing of export permits for marine species listed under CITES. It also provides for the establishment of community conservation areas.

The Maritime Zone Act establishes a series of zones of the Vanuatu waters from the archipelagic baseline. The archipelagic baseline is the line from which the seaward

[2] Under the Fisheries Act, the Fisheries Department is the responsible authority mandated to oversee the implementation of the act and the overall fisheries resource management and development in Vanuatu.

limits of a State's territorial sea, contiguous zone and the EEZ are measured. The zones include:

- Internal waters- all waters contained within the baseline. It consists of waters being enclosed such inland waterways and harbours.
- Archipelagic waters- all waters other than internal waters within the archipelagic baseline.
- Territorial waters- all waters having their innermost limits the baseline (12 nautical miles)
- Contiguous zone- all waters from the baseline measured outward and extending 24 nautical miles.
- Exclusive Economic Zone (EEZ) - all waters from the baseline and extending outward 200 nautical miles.

These zones are defined and are used in the fisheries act to restrict fishing vessel activities. For instance, foreign long line vessels are restricted to fish outside the 24 nautical miles zone (Tuna Management Plan, 2000).

The Vanuatu Foreign Investment Promotion Act provides for the activities and industries reserved exclusively for citizens of Vanuatu. For instance, in the fisheries sector, fishing within the archipelagic waters within the meaning of the Maritime Zone Act is reserved for Ni- Vanuatu.

Vanuatu not only depends on its national legislations for the management of its fisheries resources, but recognizes the importance of a concerted effort on the regional and international level.

Vanuatu is a party to a number of relevant regional and international conventions, including the Western Central Pacific Fisheries Commission (WCPFC), the 1982 United Nations Convention on the Law of the Sea and the 1992 Convention on Biological Diversity and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

It should be noted that regional and international treaties and conventions do not necessarily constitute a fisheries management system, however they are expected to be incorporated under the framework of national fisheries management system.

3.2.1 Formal fisheries management system

The main objective here is to describe the formal fisheries management rules applied in the (i) inshore and (ii) offshore fisheries.

Inshore fisheries

The formal fisheries management rules applied on inshore fisheries consist of licensing, quota allocation (export and TAC), gear restriction, closed season and size limits. The licensing rules require that all exporters of inshore resources must possess a commercial license. The quota applied is an annual total quota. For each fishery, an annual quota is set where companies all compete to get their share of the quota. Gear restrictions applied include the prohibition of the use of scuba in commercial fishing and the mesh size restriction on gillnets and cast nets. Closed seasons are applied on

fisheries during breeding season and size limits are applied on fisheries to protect the breeding stocks.

Offshore fisheries

The formal fisheries management rules applied on the offshore fisheries include licensing, TAC and gear restrictions. The licensing rules obliges that all vessels wishing to conduct commercial fishing activities in Vanuatu waters be required to possess a commercial fishing license. The quota applied is TAC. An annual TAC is set for each tuna species where all vessels compete to get a share of the annual TAC. Gear restriction is applied on the destructive fishing gears such as driftnets.

From the above, the overall formal fisheries management rules in Vanuatu consist of licensing, quota allocation, gear restrictions, closed seasons and size limits. It appears that all these management rules contribute to limiting the fishing effort. It follows then that the overall formal fisheries management system is based on effort control.

3.3 Actual fisheries management practices

The fisheries management practices described here is based primarily on the centralized system and the formal fisheries management system discussed above. Practices of CFM will be discussed later in subsection 3.4.3.

As mentioned earlier, CFM was introduced in Vanuatu fundamentally because the centralized regime was not effective for the coastal fisheries. Given that, it suffices that practices of fisheries management under the centralised regime within the coastal zone fisheries appears to be far from according to law. For instance, the most obvious formal management rules less adhered to is size limits applied on resources.

Consider for instance, the size limit regulation applied on trochus shell. The regulation prohibits the harvesting of trochus which are less than 9 cm in length. This particular regulation is continuously violated for the simple reason, lack of appropriate enforcement under the centralized regime.

Even though the licensing system is usually adhered to, violation of some of the license conditions is common. For other management rules, there are unsubstantiated reports of violation that often occurred throughout the islands.

With regards to the offshore fisheries, violation of license conditions is usually common. This is evident when over the past five years, a total of five fishing vessels were arrested in Vanuatu waters for breaching their license conditions. It follows that in the offshore fishery, the formal management rules usually violated is licensing.

To summarise: Overall, it appears that under the centralised regime, practices of fisheries management in the offshore fisheries are slightly better than the coastal zone fisheries.

Over the past five years, there have been two controversial issues about fisheries management and development policies in Vanuatu. The first was on a development policy to license long line vessels and grant access to fish up to the 9 nautical miles zone. This development policy has raised a lot of concerns among the local fishermen and the general population as a whole. Due to the concerns raised, the Fisheries

Department has aborted this policy. The second was about the introduction and expansion of the aquarium trade industry in the country. Tourism operators and environmental advocacy groups in Vanuatu as well as outside Vanuatu have raised concern that Vanuatu was not ready for this development as its has no appropriate monitoring system in place to effectively monitor this fishery. Today, following wide consultations, measures have been put in place. As a result, the aquarium industry continues to operate in Vanuatu. It has now become one of the major fisheries export products both in terms of quantity and value.

Drawing a conclusion based on the above two controversial policies, would not really reflect the general consensus on the overall fisheries laws and development initiatives in Vanuatu. However, my view is that, there is a general consensus regarding fisheries laws and development in Vanuatu.

3.4 Community fisheries management in Vanuatu

There is little written information on CFM in Vanuatu. Much of the available literature is descriptive and anthropological. It basically provides information on social structures, customs and values that influence the use of marine resources (Amos, 1993; Johannes, 1998; Johannes, 2002; Hickey and Johannes, 2002; and; Hickey, in press).

Thus to accomplish the main objective of this study, which is to compare CFM in Vanuatu to the design principles for an efficient CFM, much of what is provided hereafter is based on the authors own knowledge and experience. Also to the extent possible, examples from the literature that relate to specific situations in Vanuatu are used.

3.4.1 When, why and how CFM started in Vanuatu

As earlier mentioned, CFM was formally introduced in Vanuatu in 1990 (Johannes, 1998). Currently there is no legislation under which CFM is established. However since CFM in Vanuatu is based on customary marine tenure system (CMT), there are number of legislations which supports CFM in Vanuatu. These legislation include the constitution of the Republic of Vanuatu, the Island Court Act, the Land Reform Act (1988), the Decentralization and Local Government Regions Act (1997) and the Environmental Management and Conservation Act (2000) (Kuemlangan, 2004).

Basically, the legislations recognize the rights of communities over the foreshore areas including the fringing reefs. But as earlier mentioned the fisheries act is the overall supreme national law for managing fisheries resources in Vanuatu waters including the foreshore areas. It emerges that there is a clear violation of the community rights by the fisheries act. However, it should be noted here that, Fisheries Department recognizes this right and is continuously working with communities for them to take responsibility in managing their own fisheries especially in the inter-tidal zone areas. The question then is whether communities are ready to take on this effectively. This will be looked at in chapter 4.

The fundamental rationale for introducing CFM in Vanuatu was twofold. First was the growing difficulty of managing the coastal fisheries under the centralized management regime. Second, since communities had pro forma property rights to their coastal fisheries, it appeared sensible and logical to delegate some of the

management responsibilities to them (Amos, 1993). Today, most of the coastal zone fisheries are manage under CFM. Even though CFM seems to reduce some of the problems faced under the centralized regime, it appears that its introduction in Vanuatu fisheries had no significant impact on the overall coastal zone fisheries. Possible reasons as to why CFM appeared weak and inefficient are provided in subsection 3.4.3.

CFM started in Vanuatu as part of a trochus rehabilitation and management program. The instigator was Moses Amos, former Director of Vanuatu Fisheries Department, then a trochus specialist with the Department. It started basically with an announcement made over radio Vanuatu to interested communities about a trochus management program. The announcement was essentially that the Department would be willing to work with interested communities to supply trochus juvenile and provide technical advice on trochus management (Johannes, 1998).

Because trochus is a protein source as well as a valuable economic resource, a lot of communities responded positively to the announcement. However, Mr. Amos and his team could only select the communities they thought possessed key elements for the success of CFM. The major key elements according to (Johannes, 1998) include:

- Communities must be willing to accept CFM as a package (ownership of resource and responsibility of managing the resource)
- Communities must have a strong customary marine tenure system in place
- Communities must be cohesive

To verify these key elements against the applications of the communities, Amos and his team visited the communities to assess them. During the visits, a lot of awareness and exchange of information between the communities and the team took place. This was for the communities to really understand the concept of CFM. Not only that, it was also a chance for the team to gain knowledge into the social structure and the traditional fisheries management practices that existed within the communities. This is crucial as this information will help form the basis of a balanced management program.

The fundamental element in CFM in Vanuatu is customary marine tenure system (CMT) (Amos, 1993). CMT is a traditional system in which particular groups of people (kinship or clans) have rights (informal and formal) over coastal areas under what is often refer to as customary law. The rights are in principles allow them the use of the resources as well as exercising control over the areas (Aswani, 2006).

For an effective CFM, the initiators of CFM wanted to involve communities that are cohesive. This means that for communities to qualify, they have to be unified under one leadership (the chief). In addition they would want to see a community with no major social issues that will contribute to undermine the social structure of the community such as disputes over land ownership or chiefly titles.

These are some of the major aspects Amos and his team believed that if met would greatly contribute to the success of CFM in Vanuatu.

The management program that was drawn and adopted by the communities was basically to impose harvest controls. Communities would close part of their reefs for at least three years after juvenile trochus were put on their reefs. The closures would

be followed by short harvest periods (1-2 weeks). During harvesting periods, communities must also observe the size restrictions impose by the Fisheries regulation.

Overall the program became a success with the communities that were engaged. Other communities through their own initiatives soon followed suit but started to widen the management to include other resources such as sea cucumber, green snail, lobsters and even reef fishes (Johannes, 1998).

Once the communities have adopted the management strategies; the responsibility of management and enforcement of the management strategies rest upon the communities themselves with little but continued assistance from the Fisheries Department.

The CFM system that was started in Vanuatu in 1990 was described as a cooperative arrangement between the government and the communities and based mainly on a combination of local and research-based knowledge in fisheries management (Johannes, 1998).

3.4.2 Structure of CFM in Vanuatu

There is no information available currently on literatures on the structure of CFM in Vanuatu. Therefore what is provided here is based on the author's observation and knowledge.

Before proceeding into describing the structure of CFM, it is important that a brief account on the social structure of a typical rural community in Vanuatu is provided. This is important since the composition and structure of CFM will basically reflect the overall structure of that community.

For simplicity, let's consider a community consisting of a single village. Generally, a typical rural community in Vanuatu would consist of a high chief (paramount chief), few smaller chiefs, and the general members of the community. The smaller chiefs may represent different clans within the community. Both the paramount chief and the smaller chiefs gain their status either through heredity or by being elected by the community members. If it's through heredity, the term of the chiefs are almost infinite, until they die. If on the other hand they are being voted in, then the term is indefinite and depends on how well and effective they serve their people. In other communities, the term of reign maybe more clearly define.

The chief may govern his community alone or may opt to form a village council. The council may consist of leaders of other social groups such as youth, women, church or even an environmental advocacy group. Usually, the paramount chief is the head of the council or he may opt to choose another person.

The function of the council varies with different communities but fundamentally it is to deliberate over matters affecting the community socially and economically. One of the roles is to assign important task that the community is engaged in to community members. Such task may include CFM. In some cases, the council may collaborate with government agencies such as Fisheries Department and Environment Unit in choosing the members.

In most cases, members assigned to the committee of CFM of fishermen/ fisherwomen, farmers and even environmental representatives. Once chosen, the term of the committee is indefinite. The committee's main role is to ensure that whatever management program is drawn for their CFM is adhered to by all members of the community. They also deal with matters relating to breaches and report to the council or the paramount chief for possible punishment. Note that in most cases, this responsibility is free of charge and is regarded as part of your service to the community.

3.4.3 Practices of CFM in Vanuatu

From the above information, the conclusion is that for the inshore fisheries, CFM may have certain advantages over the centralized fisheries management regime. However, as earlier mentioned, it appeared that since CFM was introduced in fisheries management in Vanuatu more ten years ago, for some reasons, it appeared weak with very little significant impact. Since, there are no studies done on the practices of CFM, presented below are some observations that may lead to the weak practices of CFM in Vanuatu.

Observation 1: Property rights are not managed efficiently

In a community, not all members of the community hold ownership to land. However, due to custom and tradition that tie the community together, all members of the community have access to CFR. In such condition, it is not likely to apply the Closed Shop theory (Arnason, 2003) which means exclusivity becomes very weak within the community. Also, community members in most rural areas do not have the capacity to make effective decision on the management of the CFR. Given these conditions, most certainly an effective CFM is not easily forthcoming.

Observation 2: Communities or members of a community disagree on landownership rights and boundaries.

CFM in Vanuatu is fundamentally based on customary marine tenure system where virtually all community members have access. Usually, communities disagree on land boundaries separating the rights of community A from community B. Moreover, members of a community usually disagree on who is the traditional rightful owner of the land. Therefore, under these circumstances, CFM is destined to be weak.

Observation 3: Communities share a common pool resource.

To a certain extent, different communities share marine resource stocks such as trochus and sea cucumber. This occurs in particular on islands where different communities are closer together. It's also possible in other settings, e.g. neighbouring islands. For example, consider figure 3. The schematic diagram shows an island with two communities (A and B) located next to each other and the flow of the current that influence the distribution of the trochus and sea cucumber larvae. If community A opts to establish in theory an efficient CFM system for their trochus and sea cucumber fishery but the neighbouring community B does not choose to manage their fisheries well, the CFM system in community A may not meet its full objectives. Under these conditions, an efficient trochus or sea cucumber fishery management system may not be worthwhile to maintain.

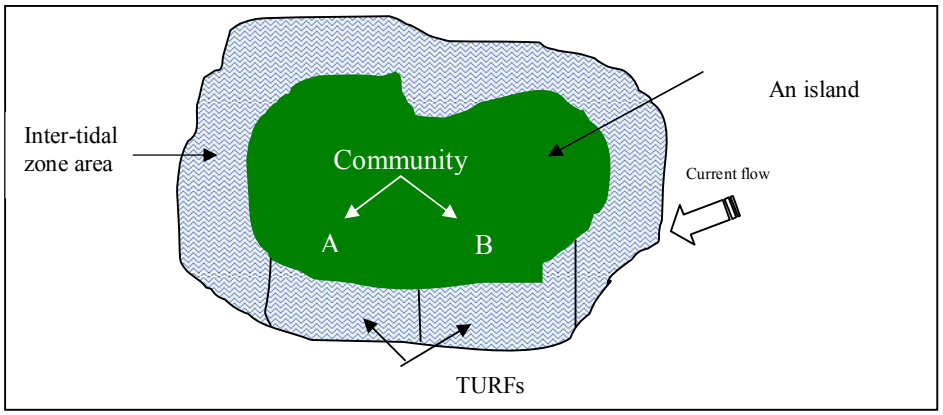

Figure 3: Diagram illustrating the scenario of shared stocks of resource by communities.

Observation 4: Some communities are less cohesive and less well organized.

Some communities are less cohesive than others. In such communities, members do not show respect to the chief and the community leaders. This shows that they do not necessarily want to be part of the community. Moreover they do not want to be told what to do i.e. abide to community rules.

Not surprisingly, in some of such communities, the social structure is also not well established. In such circumstances, effective decision- making is not forthcoming. Under this situation, pursuing CFM or even considering it is not worthwhile.

Observation 5: Members of communities do not always discuss among themselves or with other neighbouring communities on how to manage or utilize their fisheries resources efficiently.

Many, if not most communities do not see the necessity to sit down to discuss how to effectively utilize and manage their fisheries. It is also the case between communities. Under these conditions, a concerted and an effective fisheries management decision is not forthcoming. Given this circumstances, CFM is destine to be weak and inefficient.

Observation 6: There are limited economic activities in the rural areas

In most of the rural areas of Vanuatu economic activities are limited to just agriculture and fisheries. Community members will tend to the option that maximizes the benefits of their efforts. As earlier mentioned, prices of fisheries products are generally higher than agricultural products, therefore community members will flock into fisheries and vice versa. Under such condition, it is difficult to establish effective CFM, unless communal authority is very strong.

Observation 7: CFM measures are geared more towards restricting full access such as closures and MPAs rather than efficient utilization.

Most communities tend to use management measures that are generally geared more towards restricting full access thus depriving themselves of their resources. This strategy will not be efficient where economic options are limited. Such measures may result in conflict among the community members. Under such condition, a long term efficient CFM is not easily maintained.

In summary: It appeared that despite that the current fisheries management was predominantly based on modern practices, traditional fisheries management practices continued to exist to some certain extend, as a result, the current fisheries management practices in Vanuatu is based on a combination of modern and traditional fisheries management practices.

In addition, since there is no appropriate data to illustrate the extend of impact of CFM if any on the overall coastal zone fisheries management, the feeling is that stocks continue to decline. However, there are few cases where CFM does have significant impact on improving resource stocks (pers. observation).

4 COMMUNITY FISHERIES MANAGEMENT (CFM)

More and more, CFM has become seen as a viable alternative to the centralized fisheries management regime.

(Arnason, 2003) has derived certain design principles, the "*Arnason design principles*". He argues that under these design principles, CFM is capable of generating economic efficiency in fisheries. In his approach, CFM is seen as one mode of property rights-based fisheries management. The others being; sole ownership, TURFs, IQ and ITQ. It is well established that property rights based fisheries management regimes, in particular, sole ownership, TURFs and ITQ are well suited for generating sustainable economic benefits in fisheries.

But what is CFM, why CFM and what are the Arnason design principles under which CFM could efficiently generate economic efficiencies in fisheries? As a summary, a comparison of the actual form of CFM in Vanuatu will be made to the Arnason design principles based on two important questions. First, what is the likelihood that under Arnason design principles, CFM in Vanuatu is capable of generating economic efficiency in coastal fisheries? Moreover, is it possible to implement the Arnason design principles to the existing CFM systems in Vanuatu?

4.1 What is community fisheries management

CFM is simply the arrangement where the community has the power to manage its own fishery.

Figure 4 illustrates power and responsibility sharing between the government and the communities in resource management.

Any power-sharing arrangement apart from the extremes in the diagram is co-management. It shows a situation where power and responsibilities are shared between the government and communities. To the left of the diagram is where government commands more power and responsibility. The end section at the end of the diagram in the left is where government has full power and management responsibilities. This would depict a centralized fisheries management regime applied in Vanuatu and many other Pacific island countries.

To the right of the diagram beyond co-management is where communities have more power and responsibilities in the overall management decision. As you move further right to the end, you have a situation of 100% self- management.

From the above it would seem reasonable to take CFM to lie on the right hand side of the scale between the equal sharing and self-management.

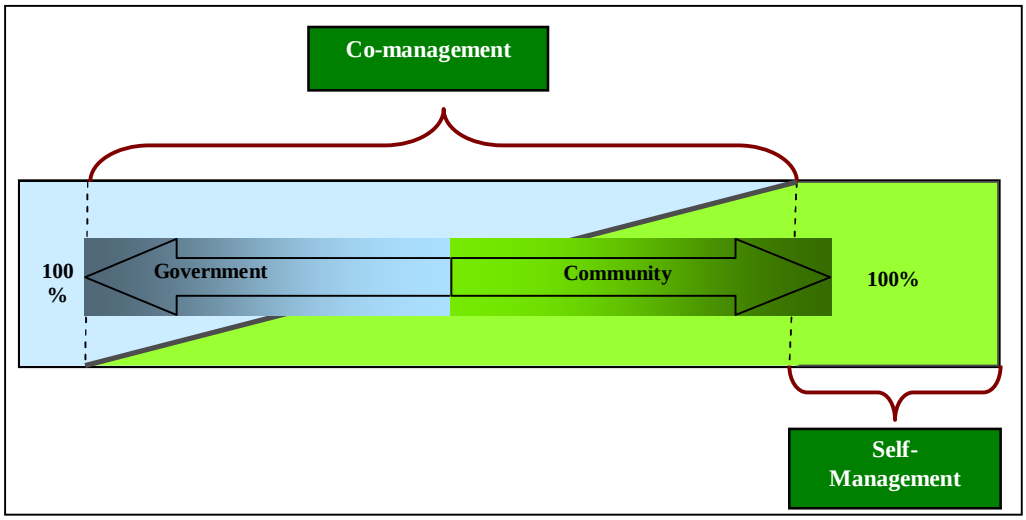

Figure 4: Diagram shows power sharing responsibility between the government and communities in resource management (*Arnason, personal communication).*

4.2 Why Community fisheries management

In light of the shortfall of the centralized fisheries management regime in Vanuatu in achieving resource sustainability and economic efficiency, CFM has been suggested as an alternative management regime for the coastal fisheries. Indeed, CFM has become the main management interest of many small scale artisanal fisheries management as governments are facing immense difficulties imposing any effective management on these fisheries.

Therefore, the fundamental rationale for CFM is that it is the only option available in Vanuatu that would possibly increase efficient coastal fisheries management with reduces cost of enforcement. In addition, CFM could substantially reduce social and political problems in fisheries.

It appears that CFM has other advantages over centralized management in three main areas, (i) Information gathering and processing (ii) Incentives (iii) Responsibilities

Information sharing

Information is the basis of effective fisheries management. It is now widely accepted that fishers and their local communities possess probably the most complete information concerning their fisheries. Certainly they know more than anybody else about their own operations. They also know a great deal about the fish stocks and the other biological and economic conditions of the fishery and are generally the first to know when conditions change. This is not to reject the importance of biological and economic scientific information but to point out that there is a wealth of other information equally important for the fishery and most easily accessible by the fishers themselves. Therefore the fishers' involvement in the management process would provide valuable wealth of local or indigenous knowledge to supplement research based scientific knowledge to improve fisheries management decision (Pomeroy, 1995; Arnason, 2003).

Incentives

In a CFM, effective data collection, processing and making sense of the information is an incentive to the fishermen. If the fishermen don't collect appropriate data, moreover draw accurate conclusion from the information, they risk loosing their own money. This is in contrast to the centralized authority. First of all, its difficult to collect the data, and secondly, remuneration of the centralize authority does not directly affected by the inappropriate information collected and incorrect or wrong inference of the information (Arnason, 2003).

Responsibilities

In a CFM, communities come to realized that they own the fisheries and most importantly they are the direct beneficiary of the streams of benefit from utilizing the fisheries, therefore, they and not anybody else have the primary responsibility to ensure that the fisheries is sustainably managed. In his words (Arnason, 2003: pp 79) said "…….. *community fisheries management puts the responsibility for the management squarely on the shoulders of the fisheries community itself. If a community fails in this management, it is unlikely that social safety nets will be as easily forthcoming as when the central authority fails in its fisheries management function. Hence, this added responsibility contributes to even greater effort by the community members to conduct their fisheries management effectively*"

4.3 Design principles for an efficient CFM

CFM is not a fisheries management system. It only devolves the right to manage the fishery to a group of people, the community (Arnason, 2003). Whether this right is used to install an effective fisheries management regime or not depends on the circumstances.

Basically, the members of the fishing community find themselves in a game situation. The game is a co-operative game in the sense that the members can communicate and, we will assume, form binding agreements. The game, moreover, is a positive sum game in the sense that everyone playing can be better off depending on the collective decisions made. Nevertheless, it is well known that the outcome of this kind of a game can be far from optimal.

The Arnason design principles attempts to increase the likelihood that the community fisheries management game will lead to an efficient outcome. These principles may be regarded as design principles for setting up the community fishing rights (CFR) and they will be referred to as such:

i. The community fishing rights (property right) should be as high quality as possible
ii. Communities should consist of as homogeneous a group as possible
iii. Community decision making rules should be clear and effective.
iv. Communities should, if possible, be set-up so that each member's pay-offs is an increasing function of the aggregate pay-off.

4.3.1 Property rights

Property rights are the fundamental prerequisites for economic progress (Arnason, 1996). In fisheries, property rights solve the fisheries problems of common property (Scott 1955, Scott 2000, Arnason 2000). Property rights entail privilege regarding resource use and the rules under which those privileges are exercised (Hara, 2001).

Thus, by allocating communities the property rights to their fisheries, communities will be in a position to maximize their benefits from the fisheries thus, consequently, improving the overall fisheries management.

In contrast to other property rights in fisheries which are individual rights, community property right is a collective right allocated to a group of resource users. This arrangement of allocating collective rights can be generally referred to as community fishing rights (Arnason, 2003).

The fundamental rationale for allocating community fishing rights is provided by (Arnason, 2003). He claims that if communities have fishing rights the notion is that communities will better improve the efficiency of the fisheries than the centralized government. This notion is based on three fundamental reasons. First, given that the communities own and derive substantial benefits from the resources, the communities will tend to manage the fisheries better than the centralized authority. Secondly, since communities choose their own fisheries management policies it is possible that the communities will better enforce these management policies effectively and less expensively than the centralized government. Lastly, allocating community fishing rights is decentralizing the fisheries management responsibilities. By so doing, the government is streamlining its responsibilities. Thus the effort that is usually allocated to managing the particular fisheries could be allocated to promoting other economic activities. This will contribute to the overall economic efficiency of the country.

Note that community fishing rights does not constitute a fisheries management regime in itself. It simply provides the communities with a formal opportunity to establish a fisheries management regime (Arnason, 2003). To ensure efficient CFM, the allocated property rights should be of high quality, meaning, the right must be secure, exclusive, permanent, and be transferable. The higher the quality of the property rights, the higher the efficiency of the CFM. On the other hand, if the property rights are of low quality, achieving efficient CFM is difficult and usually leads to low efficiency (Scott, 1996).

The quality of the property rights has the following characteristics:

- Security
- Exclusivity
- Permanence
- Transferability

Security

Security means that the rights cannot be challenged. If it is challenge, the rights holder must have the ability to withstand the challenges to maintain his property. It can be thought of as the probability of the rights holder to maintain his property. The probability can be measured from 0 to 1. A measure of 0 means that there is no security and the rights holder will certainly loose his property. Alternatively, a measure of 1 means security is very high and the rights holders will certainly maintain his property (Arnason, 2000; 2003).

Exclusivity

Exclusivity means that others cannot infringe the right of the holder. It also means that the rights holder is free to utilize the right in anyway they wish. Thus exclusivity is the ability of the rights holder to keep others away and utilize the right without being infringed. It is important to note that enforcement plays a critical part to exclusivity. This means that for total exclusivity, the rights holder must ensure an effective enforcement (Arnason, 2000; 2003).

Permanence

Permanence means the rights holder has permanency to the property right. It refers to the time span the rights holder can hold onto the rights. This duration ranges from zero to infinite. Zero means the right is worth nothing. If possible, the right should be protected by law. If the right is withdrawn or transferred, the rights holder has to be compensated (Arnason, 2000; 2003).

Transferability

Transferability simply means the ability of the rights holder to transfer the right to other communities or anyone they wish. This is vital to ensure higher economic efficiencies. For instance, the rights holder is not capable to utilize the rights to achieve higher economic efficiencies due to technological reason; they may wish to transfer the rights to others that could utilize this right to ensure maximum economic benefits (Arnason, 2000; 2003).

According to (Scott, 1988), it's easy to visualize the perfect characteristics of property rights measured along a four dimensional axes (Figure 5). A property right can exhibit all four characteristics to a greater or lesser extend. It can be measured on a scale of 0 to 1. A measure of zero means a property right does not have all four characteristics. Alternatively, a measure of 1 means a property right has all four characteristics and is perfect.

Of course, in a real world a perfect property right does not always present all four characteristics of 1. According to (Arnason, personal communication), the actual real

world situation of the four characteristics in fisheries exhibit to a much lesser extend as illustrated in Figure 5.

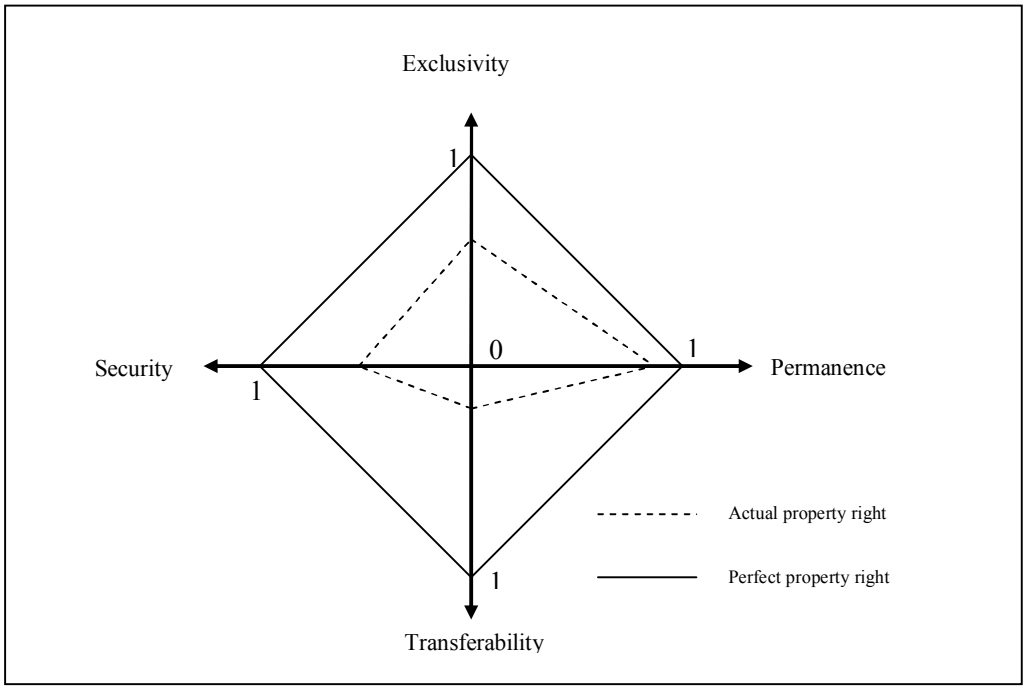

Figure 5: A four dimensional axes diagram mapping a footprint of a perfect characteristic of property rights and a real world situation (*Arnason, pers. com*).

In addition to allocating high property rights to communities, community set-up and organization are also vital to an efficient CFM. As earlier mentioned, they includes: (i) communities should consist of as homogenous a group as possible, (ii) Communities decision making rules should be clear and effective and; (iii) Communities should, if possible, be set-up so that each member's pay-offs is an increasing function of the aggregate pay-off.

4.3.2 Communities should consist of as homogeneous a group as possible

Communities consisting of a homogenous group are a crucial aspect for an efficient CFM. For instance, those who share a common interest in fisheries, preferably, the fishermen. It does not of course necessarily mean all members of the community, but those who are responsible for making the decisions.

This is important for bargaining towards an efficient fisheries policy. Consider for example, if the community is homogeneous consisting of only fishermen, they would want to see a fisheries policy that maximizes their profits. Therefore the bargaining game will result in a fisheries policy that would converge to a point that ensures maximum profits, most certainly at the OSY (Arnason, 2003).

4.3.3 Communities decision making rules should be clear and effective

Another important aspect to ensure an efficient CFM is that communities should be set-up according to certain pre-assigned rules for decision making within the

communities. Under this condition, transaction costs will be reduced as the process of attaining a path towards bargaining equilibrium is increased (Arnason, 2003).

4.3.4 Communities should, if possible, be set-up so that each member's pay-offs is an increasing function of the aggregate pay-off.

For an effective CFM, it is crucial that the communities should, if at all possible, be set-up so that each member's pay-off is an increasing function of the aggregate pay-off. There are two ways to do this. First is to allocate quota (ITQ) within the community. This is to ensure that all members of the communities have their share of the property rights. Another is to organize the community as a limited company with members as shareholders (Arnason, 2003).

From the above, it implies that CFM would only be capable of generating full efficiencies in fisheries if the characteristics of the collective property rights are perfect. That means the property right must be secure, it must to be exclusive, it must be permanent and it must be transferable. Not only that, it is imperative that communities are well set-up and organized. But would the Arnason design principles be applicable in the existing CFM in Vanuatu? The sections that follow will attempt to answer this question.

4.4 CFM in Vanuatu compared to the Arnason design principles for an efficient CFM.

In chapter 3, the actual form of CFM system in Vanuatu is described, and then in section 4.3, the Arnason design principles for an efficient CFM were described. In this section the actual form of the CFM in Vanuatu will be compared to these design principles to examine to what extent the CFM-system in Vanuatu satisfies these principles.

1. The community property rights must be high quality ones

In Vanuatu, land ownership defines ocean resource use rights out to the fringing reefs. Thus, this land ownership forms the basis of the property rights on which CFM in these inshore areas is based.

Land in Vanuatu is owned by the indigenous people of Vanuatu through kinship groups and clans. It follows that land is a communal property in the context of kinship groups and clans. A land owner could be a clan consisting of a single household or many households in a community. In other cases, it may include clan members residing in other communities. The landownership rights by indigenous people are provided for under article 73 of the constitution of the Republic of Vanuatu. It states that: "*all land belongs to the indigenous customs owners [custom owners' means those clans whose rights to land ownership are recognize by the customary laws] and their descendants*".

Land in Vanuatu is defined as including the foreshore including the fringing reefs (Land Reform Act, 1988). It follows that, clans who hold property rights to land that extends to the coastline automatically own or have property rights out to the fringing reef and the resources that are found within the fringing reef.

Article 74 of the constitution upholds the rights of the landowners to determine the use of the land and its resources. It states that: "*the rules of custom [this is clearly open to the interpretation that use shall be as was customary] shall form the basis of ownership and use of land in the Republic of Vanuatu*".

It follows then that in Vanuatu, generally, communities have property rights in fisheries. The question then is, are these rights of high quality. As earlier mentioned, the quality of the property rights are determined by (i) the security of the right, (ii) its exclusivity, (iii) its permanence and (iv) the transferability of the right (Arnason, 2003).

Security

Security means the ability of the rights holder to withstand the challenges to maintain his property. Following article 73 and 74, the property right attains high legal status which means security is high. However, even with article 73 and 74, (Nari, 2000) points out that government has yet to design a land registration system that will strengthen articles 73 and 74 by formally recognizing the established customary land boundaries[3] as well as the customary owners. Until this is done, there are always chances of disputes arising with regards to boundaries of land rights and owners.

The question then is can the rights holder maintains his rights when others challenge the rights. It appears that security between communities i.e. external security is generally fairly good. Within the communities, because of custom and tradition, the CFR seem to be accessible to every members of the community. Hence, security within the community (internal) is weak.

Therefore it maybe concluded that security is fairly strong especially between communities (external) but is weak within the communities (internal).

Exclusivity

Exclusivity means others cannot infringe on the right and that the rights holder is free to utilize the rights as he wishes (Arnason, 2003). Thus a property right is exclusive if others respect the right.

In the context of the Vanuatu CFR there are two aspects to exclusivity. As earlier mentioned, the rights stem from land ownership rights. Each community may comprise several such land owners. The first question is whether members of other communities respect these rights, i.e. do not violate them. This may be referred to as external or community exclusivity. It seems that this exclusivity is generally fairly good. The second question is whether the land-owners have exclusive rights to their ocean property. The answer to that question is different. It appears that by custom many perhaps all community members may make use of these rights by harvesting from the marine property. Thus, internal exclusivity of these ocean rights is quite limited. As regards the community, one may say that the communal rights are of most intent and purposes the common property of all community members. The land owners have very little if any exclusivity for the ocean property.

[3] Customary land boundaries are land boundaries recognized by the customary laws. Customary laws are laws based on custom.

The situation is even more difficult. One of the key elements of communal exclusivity is the ability to restrict the entry of new members (Closed shop, Arnason 2003). It appears that new community members automatically receive the customary ocean use rights. Thus, if only because of community population growth, there is a high degree of open entry to this common community ocean property.

Once the right is recognized under article 73 or 74 or under the customary land boundaries, the rights become exclusive. However the question is whether others respect this right. Generally, if the land (fishing ground) is immediately next to where the community is, others will not infringe this right. However, some communities own fishing grounds that are not necessarily close to where they live. Given this situation, enforcement is usually weak and in most cases others will tend to violate this right.

From all this we deduce that exclusivity is not that strong. In particular, within the community, the ocean harvesting rights are largely held in common.

Permanence

Permanence means that the rights holder holds the right forever. And if the rights are withdrawn or cancelled, the rights holder must be compensated (Arnason, 2003). In Vanuatu, right to landownership is permanent. It is recognized formally under the constitution of the Republic of Vanuatu as earlier stated in article 73.

Thus from the above paragraph, permanence in property rights is very strong, almost certainly perfect.

Transferability

Transferability means that the holder of a property right can transfer his right to someone else as he wishes. Transferability is crucial for economic efficiency as transfers tend to occur towards more efficient operators.

In the Vanuatu CFR context, two questions rise. First can the land-owner sell his rights freely? Second, can the community sell and buy these rights?

If by property rights we refer to rights of landownership, then legally, transferability is possible. This is given under article 79 of the constitution. It states: "…..*land transactions between an indigenous citizen and either a non-indigenous or a non-citizen shall be permitted….*"

In fisheries the current practice with the aquarium trade fishery is that landowners allow access to their resource to aquarium operators for collection. In return, the aquarium operators have to pay the landowners. This means that landowners still have the rights but are willing to transfer this right to the aquarium operators. Most likely this is an economically efficient transaction.

On this basis, it would seem that if the community somehow was the legal owner of the land, e.g. via a community consortium, it could also buy and sell land and with it the associated fishing rights.

However, since internal security and exclusivity are weak, transferability within the community would also be weak. This is because virtually the CFR purposes a common use.

Thus from the above, we can conclude that transferability exists and is fairly strong between communities (external) but is very weak within the communities (internal).

Overall quality
It follows from the above that the quality of the property rights that exist for the communities in Vanuatu is considerable but not perfect. External Security, external exclusivity, permanence and external transferability are all fairly strong. However, internal security, exclusivity and transferability are very weak, in the sense that all community members can utilize the ocean resources. Basically, within the community, there is a typical common property situation. This analysis is summarized in table 8.

Table 8: Table illustrating the characteristics of property rights summarized as perfect, strong, moderate and weak

Characteristics of the property rights	Perfect	Strong	Moderate	Weak
Security				
External: Viz a viz other communities		X		
Internal: Within communities				X
Exclusivity				
External: Viz a viz other communities		X		
Internal. Within communities				X
Permanence		X		
Transferability				
External: Viz a viz other communities		X		
Internal: Within communities				X

To present this in a four dimensional- axes from (Scot, 1988), it would appear as in figure 6. The diagram illustrates a perfect property rights and the internal and external property rights of the CFR in Vanuatu. Internal property rights means, the quality of the property rights within a community. The external property rights mean the quality of the property rights between communities or anybody outside a community.

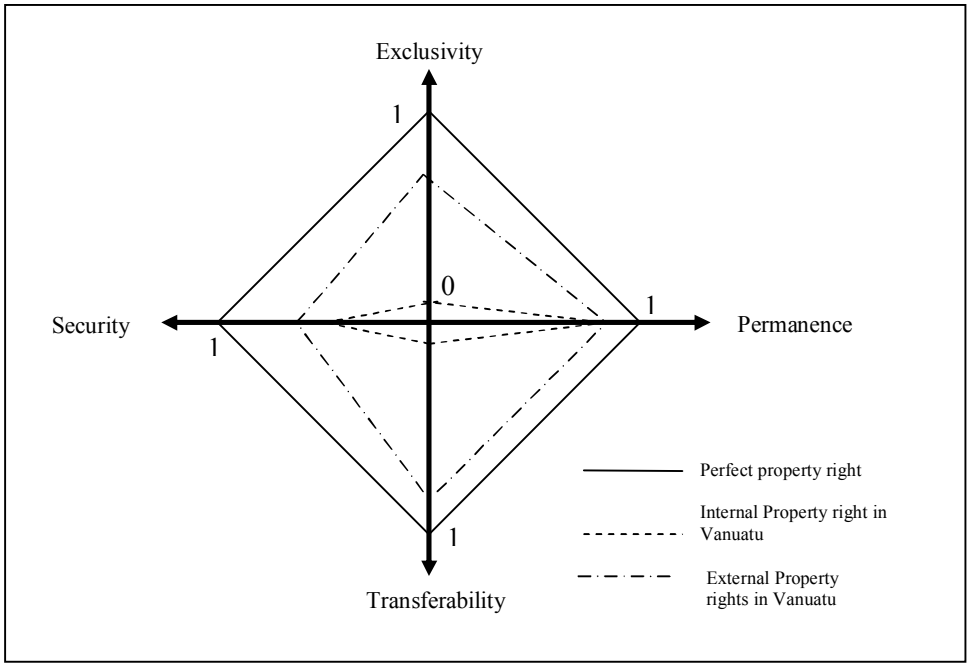

Figure 6: Map illustrating the characteristics footprint of the perfect property right and the internal and external property rights of the CFR in Vanuatu.

Q-measure

Since the quality of the property rights exist in a four dimensional nature, understanding the measure of the property right is not easy. Therefore it is important to have an aggregate numerical measure. The aggregate measure can serve two purposes (i) to compare the quality of a given property rights to others and (ii) to know the efficiency of the institutional structure of the activity in question (Arnason 2000).

The Q-measure is calculated using this equation:

$$Q = S^{\alpha}.\ E^{\beta}.\ P^{\gamma}.\ (w_1 + w_2.T^{\delta})$$

where S denotes Security, E exclusivity, P Permanence and T Transferability. Using the example from Arnason (2000) where he calculated the Q-value of the property rights of the quota rights in Iceland, New Zealand and Norway, the following parameters are given as $\alpha = 0.43$; $\beta = 0.33$; $\gamma = 0.33$, $\delta = 1$, $w_1 = 0.6$ and $w_2 = 0.4$. The Q-value of the property rights in the quota rights in Iceland (ITQ), New Zealand (ITQ) and Norway (IQ) are 0.86, 0.96 and 0.44 respectively. The Q-values of the CFR in Vanuatu are calculated as internal and external property rights. For the internal property rights, the Q-value is 0.22, and for the external property rights, the Q-value 0.68. It follows that the quality of the internal property rights of the CFR is very low, even lower than the quota rights of the IQ rights in Norway. The external property right of the CFR is higher than the IQ rights in Norway but still comparatively lower than the ITQ rights in Iceland and New Zealand. The estimated quality of the property rights in CFR in Vanuatu are given in Table 9.

Table 9: Estimated Q-value of the internal and external CFR in CFM in Vanuatu

Characteristics	Internal Property right 1	External Property right 2
Security	0,45	0,65
Exclusivity	0,10	0,70
Permanence	0,90	0,90
Transferability	0,10	0,80
Q-measure	0,22	0,68

Thus, in summary, it seems that the overall Vanuatu inshore fishing property rights are moderately strong with regard to other communities but fairly weak within the community where basically the common property/pool arrangement applies. In this sense the fishing rights appear as typical CFR, where the problem is for the community to agree on a fisheries management regime (FMR) that maximizes overall benefits.

2. Communities should consist of as homogeneous a group as possible

To increase the probability that a CFR be sensibly used, it is important that communities be set up of as a homogenous group with respect to interests as possible. It does not necessarily mean that the whole community be homogeneous but simply imply that those with the overall responsibility for CFM (i.e. the decision makers) should be homogeneous, preferably fishers. Homogeneity of the group would increase the probability that bargaining will lead to most efficient fisheries. If on the hand, homogeneity is low, the interest of the various community members will range widely and there will be a wide range of fisheries policies proposed. Thus the community bargaining game will become very difficult to handle and the most likely outcome is an inefficient fisheries policy (Arnason, 2003).

To understand this concept, let's consider a simple heterogeneous community used by (Arnason, 2006) consisting of fishers and fish workers. Even in such community, members will have different benefit function as well as opportunity sets. The fish workers will get their benefits from remuneration for processing the fish and that the remuneration increases with the volume of fish processed. On the other hand, the fishermen get their remuneration from the profits of the fishing operation. Given this, the fishermen would want to see a fisheries policy that will maximize the present value of profit. On the other hand, the fish workers will want a policy that will maximize the present value of volume. This will create a conflict because the policies do not coincide with each other. As a result, the two groups will find themselves in a game situation, a bargaining game. The outcome of this bargaining game will certainly result in less efficient fisheries since the combination of the two policies will converge at a point that will not ensure maximization of profits for both parties. Most likely it will converge to a point between the optimal sustainable yield (OSY) and the maximum sustainable yield (MSY).

It is obvious that homogeneity of the communities in Vanuatu is generally quite low. Virtually, all members of the community are involved in decision making which will result in an inefficient policy.

3. Communities decision making rules should be clear and effective.

Most communities in Vanuatu are well set-up in terms of their social structures. However, for some reason, the decision making rules are not clear. In some cases, the decision making rules are clear but lack the capacity for effective decision-making. There are two possible reasons for this. First, most communities lack the knowledge and capacity to make such effective decisions. Second, due to custom and tradition, making such effective economic decision may result in the destabilization of the community.

4. Communities should be organized in such a way that each member's benefits increase with aggregate benefits

For an effective CFM, it is imperative that communities are set-up so that each member's benefits increase with aggregate benefits. If that is the case, each one of them has an interest in maximizing aggregate benefits and the likelihood that the efficient policy is selected becomes very high (Arnason 2003)

There are at least two ways to achieving this. First, allocate harvest quotas to community members and secondly to organize the CFR within a limited company with members as shareholders.

Under the former, each quota holder gets all his benefits from sustainable extraction. Moreover, the value of his quota right is maximized at the most efficient level of fishing. Thus, each quota holder has a strong incentive to go for the most efficient fisheries policy.

Under the latter, every member of the community is a shareholder in the limited fishing company. Thus, provided his benefits are restricted to his share in the profits of this company, his benefits will be maximized at the efficient fisheries policy.

There are a few communities in Vanuatu who have adopted this idea, but not necessarily in fisheries. It's more prevalent in land dealings where a communal land is leased and the leaser pay the money to a trust fund set-up by the landowners. The trust fund is then shared equally among its members (pers. observation).

If this idea is felt to work in land dealings, there may be a social awareness that it may also work in the fisheries. Today, landowners in few communities around Efate are applying this concept in fisheries; a particular example is the aquarium fisheries where landowners lease out their reefs to aquarium operators. However, monitoring and surveillance remains the responsibility of the central authority. This really in itself does not fully exhibit the whole objective of this idea under the context of CFM.

It follows then from the above that much of the communities in Vanuatu are far from reaching this idea and therefore it is very low.

4.5 Summary

From the above it appears that the Arnason design principles for an efficient CFM exist to a certain degree in Vanuatu. The community fishing property rights are of sufficient quality to make reasonable fisheries management possible. However, this potential is not utilized as community set up and organization is generally weak. Table 10 summarizes my assessment as to what extent the actual CFM in Vanuatu meets the efficient CFM design principles.

So, the CFM system in Vanuatu meets the Arnason design principles only to a quite limited extent. As a result, there is no particular reason for the Vanuatu CFM to be economically efficient. In fact, there is no particular reason for it to produce a sustainable fishery.

Table 10: The Arnason design principles for an efficient CFM and how they would be rated in the case of Vanuatu

Design principles for an efficient CFM	Strong	Moderate	Weak
1. Property rights		X	
2. Community set-up and organization:			
i. Communities should consist of as homogeneous a group as possible			X
ii. Communities decision making rules should be clear and effective			X
iii. Communities should, if possible, be set-up so that each member's pay-offs is an increasing function of the aggregate pay-off			X

5 CONCLUSIONS & RECOMMENDATIONS

The Arnason design principles for an efficient CFM are quite likely to result in fisheries management that will produce long lasting economic efficiencies in fisheries. In broad terms, the Arnason design principles include (i) communities should have high quality property rights in fisheries and (ii) communities should be well set-up and organized.

In this study, the actual form of CFM in Vanuatu is compared to the Arnason design principles. It was found that the Arnason design principles exist to some certain extend in CFM in Vanuatu. The CFR exhibit a moderate to fairly strong form of property rights as regards to other communities (external property rights), but fairly weak within the communities (internal property rights). It appears that even though the external property is strong, it is not efficiently utilized because of the set-up and organization of the communities which are found to be very weak. Despite that, there is a practical potential applicability that an efficient fisheries management regime can be established.

It follows that under such conditions, efficient CFM in Vanuatu is not easily forthcoming. One way to simultaneously remedy many aspects of the situation is to

adopt the Arnason design principles and translate the fishing rights of community members into permanent share quotas in the overall CFR. The practical steps to undertake this approach is suggested here.

Step 1: Awareness in Ministry (Government)
One possible approach is to hold workshops and meetings. At these workshops/meetings, a decision has to be reach on whether to adopt this concept or not. If the decision is to adopt, then proceed to next step.

Step 2: Obtain funds

Step 3: Pilot project
It is important to implement this concept as a pilot project. This step will involve two major activities.

i. Select potential communities (5-10 communities)
ii. Conduct awareness on potential communities

After the selection and awareness to potential communities, potential communities have to make a decision whether to accept this concept or not. If the decision is to accept, then proceed to next step.

Step 4: Prepare and sign contract (2-3 communities)

Step 5: Implementation
The implementation process will involve three major steps.

i. Apply Arnason design principles for efficient CFM
ii. Design Fisheries management system (FMS), Monitoring control surveillance (MCS) & Fisheries judicial system (FJS)
iii. Co-operate in implementation and running of pilot project

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APPENDICES

Appendix 1: A sustainable fisheries model illustrating a relationship between fluctuating prices of fisheries products and agricultural products.

The figure illustrates the yield, biomass and cost curves of a typical fishery as a function of harvesting effort. The shifting of the cost curve is due to changing prices.

Bionomic equilibrium under open access occurs at point B where the sustainable revenue curve and the sustainable cost curve intersect. If the cost of harvest shifts upward, the new bionomic equilibrium is at point A and effort shifts to point F. This means increase in cost of harvest or drop in price per unit of marine products tends to reduce fishing effort. Under such circumstances, fishermen resort to other alternatives for example agriculture where cost maximizes benefits.

If, on the other hand cost of harvest drops, the new bionomic equilibrium point will be at point C, and effort will increase to point D. Higher prices per unit of marine products has the same effect. In this situation, obviously, the fishery is in danger as the biomass decrease towards a point of collapse.