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FISHERIES CO-MANAGEMENT AND THE EVOLUTION TOWARDS COMMUNITY FISHERIES MANAGEMENT IN TONGA

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ABSTRACT

In Tonga the current centralised fisheries management has come under criticism from fishermen. Crises in the inshore fisheries push for changes in the fisheries management system. Fishing is important in Tonga not only for the monetary income it generates to fishing families but also for reasons that have to do with social status, social obligations and institutions. In the last decade the co-management approach has gained momentum, both in academia and practice. The aim of this report is to study the possible introduction and implementation of community fisheries management in Tonga. It starts by giving an overview of the principles of fisheries management in general. Secondly it discusses whether co-management and community management in fisheries in Tonga are feasible and how they could be implemented.

Key words: Co-management, community fisheries management.

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1 INTRODUCTION

The focus of fisheries management in Tonga has shifted somewhat in recent years. One reason is that there has been an increased interest in the decentralisation of governance systems, i.e. a momentum to involve users in the decision making process. This is primarily because people have become disillusioned to a certain extent with top-down management systems. In the case of Tonga and its fisheries this is highly relevant as the Tongan fisheries are important, not only for the monetary income they generate to fishing families but also for reasons that have to do with social obligations and institutions. It is of significant importance for small coastal states such as Tonga to derive sustainable economic benefits from their fisheries given their large exclusive economic zones (EEZ). Therefore, it is important that a well-designed fisheries management system is put in place.

Despite effort limitations, over-fishing and over capacity are still widely observed in most Tongan fisheries. Over the years fisheries managers have struggled with effectively managing the fisheries as they are characterised by common property and open access. This has led to significant losses in economic, social and biological terms. Fundamentally, the benefits can only be realised through the establishment of an effective management system. This involves the rights to use and the rights to manage common resources and clarifying decision making power, i.e. who decides on what. The centralised management of the common resources has been costly to government (Nielsen 1996 and Agrawal 2001).

Community fisheries management is a form of fisheries management regime that provides formal powers and creates opportunities for fishing communities (Arnason 1996). Those opportunities will create economic benefits. This study begins by explaining the general principles of fisheries management. Secondly it looks into whether co-management and community management in fisheries in Tonga are feasible and how they should be implemented.

1.1 The objective of the study

The main objective of the study is to find ways in which the Department of Fisheries (DoF) would benefit in its decision making capacity from an improved fisheries management regime. The ultimate objective is *"to strategically establish co-management institutions to promote broad accountable stakeholder participation to enhance efficient and effective management and conservation of Tonga's fisheries resources"*. The objective would enable effective and efficient policy decisions which would be understood and adhered to by fishers and others in Tonga.

1.2 The goals of the study

The study seeks to achieve its main objective by researching and implementing specific goals as given below:

- To outline the importance of establishing stakeholder consultation and participation in fisheries management in Tonga.To illustrate the problem of the commons by analysing Tonga's experience in coastal resource use in Tonga's coastal waters.
- To strategically analyse the best way to establish the fisheries stakeholders' participation approach for Tonga from a Tongan's perspective.
- To justify why and how Tonga's social, cultural and traditional values and system should be integrated into any fisheries management regime for Tonga.
- To explain property rights and their merits in their application to community fisheries management in Tonga.

1.3 The significance of the study

At present there is a need to improve the fisheries management system in Tonga. This study looks at ways in which it can assist in this task by analysing experiences of co-management through property rights described in the literature. It seeks solutions and where necessary will explain how social and cultural obligations can be integrated into fisheries management. There will be better coerced efforts of responsible fisheries management and effective fisheries management by collective decision making.

- Effective enforcement by having greater cooperation.
- Decision making that is socio-politically more appropriate to all.
- Communities can contribute effectively to welfare through long term sustainable use of resources.

1.4 The organisation of the study

The study begins by providing an introduction which includes the objective, goals and their significance. Section 2 provides a background of Tonga and importantly gives an overview of the fisheries in Tonga and how they have been managed. Section 3 provides an overview of fisheries management and how it is to be used efficiently. It also describes a historical analogy of an open access system and asks whether this has occurred in Tonga's fisheries. Sections 4 and 5 provide discussion on theoretical considerations and some practical experiences of co-management in fisheries around the world. Important concepts, which have been the downfall of development at the community level, are discussed. The social and cultural values of Tonga are regarded in this study as an important concept for community fisheries management. Section 6 provides and proposes structures for co-management approaches for Tonga. Section 7 provides a description as to why Tongan fisheries have evolved into community fisheries management and provides some guidelines for community discussion. The study concludes by providing policy recommendations for Tongan fisheries to implement.

2 BACKGROUND

a) Geographical and statistical information

The Kingdom of Tonga consists of 170 islands of which 36 are inhabited and are located in the South Pacific Ocean. There are three main groups of islands namely Tongatapu, Ha'apai and Vava'u. The islands are scattered and separated by strong currents and unpredicted weather patterns. Most of its islands have limestone bases from uplifting coral formation and others are on underlying volcanic bases. The Royal Proclamation of 24 August 1887 established the Kingdom of Tonga as all islands, reefs, foreshore and waters lying between 15 degrees and 23.3 degrees South Latitude and 173 degrees and 177 degrees West Longitude (Fakahau 1997). A later Royal Proclamation on 15 June 1972 confirmed the rights of the Kingdom of Tonga to the islands of Teleki Tokelau and Teleki Tonga (formerly called Minerva Reefs) and all islands, rocks, reefs, foreshore and waters lying within a radius of 12 miles thereof (Fakahau 1997). The Continental Shelf Act of 1970 was also enacted (Fakahau 1997). Under these Acts, the country has a total territorial area of approximately 700,000 km^2 (Figure 1). The total land area is estimated at 747 km^2 with a coastline of 419 km. The most important natural resources of Tonga are fertile soil for farming and the fisheries resources. Tonga's ocean floor contains the second deepest ocean in the world, known as the Tonga Trench (c.a 10,000 m). Tonga has not declared an exclusive economic zone (EEZ), although she ratified the United Nations Convention on the Law of the Sea (UNCLOS) in 1995. Tonga's constitution 1875 provided a new platform for the country and its modernisation. As it followed the most "revolutionary provision in the formulation of the constitution was the Edict of Emancipation, freeing all the people from the traditional absolute powers of the chiefs" (Latukefu 1992:1). With respect to fishing, this has resulted in two consequences: (1) all Tongans have equal fishing access rights to all Tongan waters and (2) any traditional claim of local control or rights for management over fishing areas was abolished.

The population was estimated in November 2006 to be 101,134 (Department of Statistics 2006). with an estimated population annual growth of 0.34%. The literacy level is 98.9%. In the past two decades consumption per capita of fish has gradually decreased from 50 kg to below 20 kg (Fakahau personal communication). This is believed to be due to import of cheaper substitution goods and the over-exploitation of fisheries resources in the inshore reefs and lagoons.

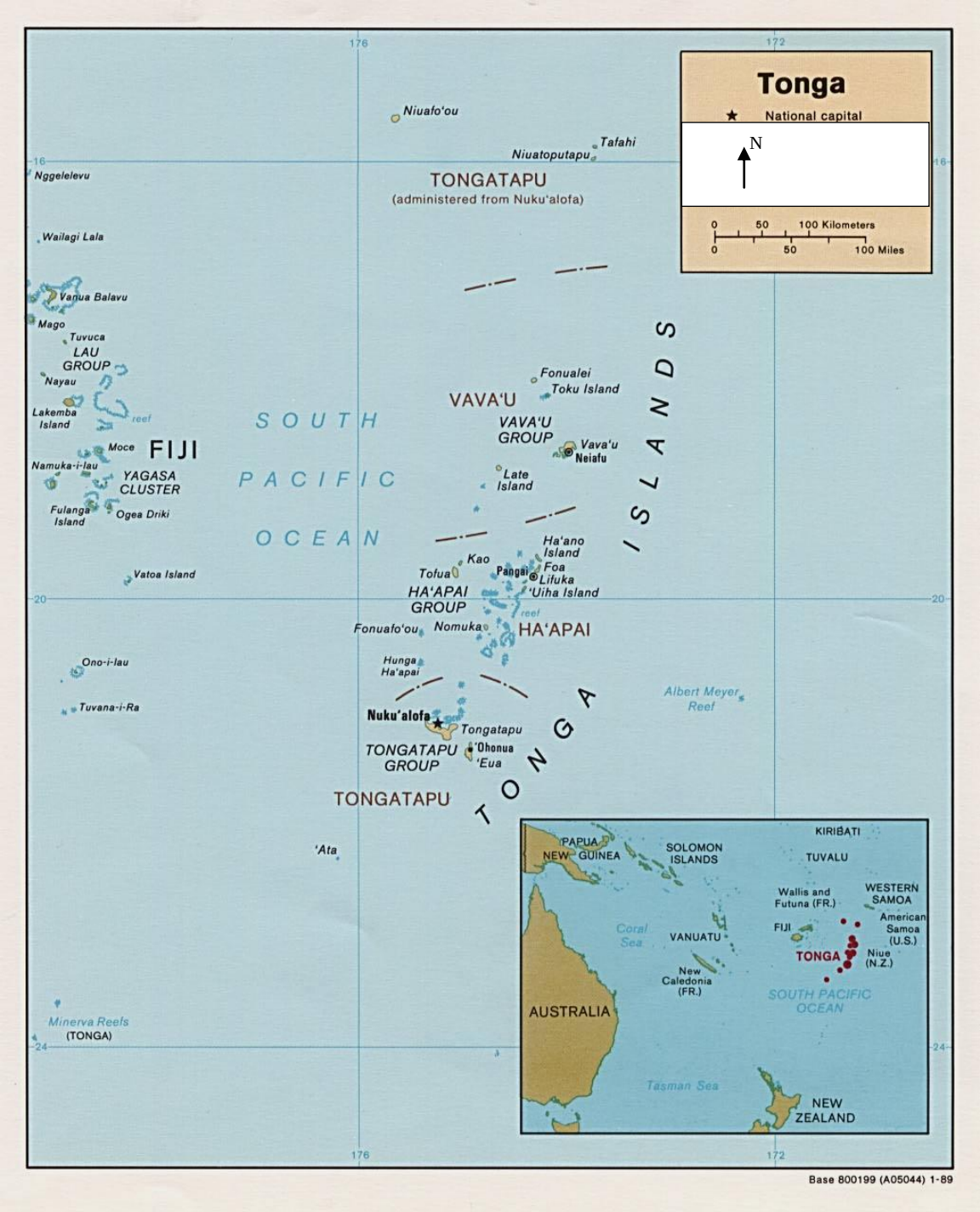


Figure 1: Map of the Kingdom of Tonga.

Note: The map shows the three main island groups: Tongatapu, Ha'apai and Vava'u. (Tonga Visitors' Bureau 2006. http://www.fikco.com/kingdom.) The Kingdom of Tonga stretches from Ata in the south to Niua Fo'ou in the North.

2.1 History of fisheries management in Tonga

The Tongan people have been harvesting their marine resources for over 3000 years. Harvesting levels were low relative to the resource base due to low gear technology, non-commercialisation, and a sharing network among early settlers as it is believed that not all Tongans were fishermen. The adoption of the constitution in 1875 provided open access to fishing grounds for the Tongan people. The population increased, the families monetary needs increased, and gear technology improved. The following section gives an overview of the history of fisheries and fisheries management in Tonga. How it has been implemented and in particular the highlights of fisheries management activities are discussed. Moreover, outlining how the development of fisheries management has evolved into the current fisheries management system.

2.1.1 An overview of the evolution of fisheries management in Tonga

In 1973, the very first Fisheries Division (FD) was established by the government as part of the Ministry of Agriculture and mandated to manage, conserve and promote fisheries development. Fundamentally all tuna commercial fishing was conducted by the FD from 1973 until the early 1990s when a government owned private fishing company was established to operate the tuna long line vessels on full commercial basis. Aquaculture activities have been of great importance since the early 1970s supported by the New Zealand and Japanese governments (Fakahau 1997). In 1986, the FD established the first fishermen's association. The aim was to encourage fishermen to participate in the decision making and management of fisheries. The association was short lived. Evidently the difficulty lay in how individual needs versus group needs were to be resolved. The association was broadly based with different interests and fishing with different fishing gears. Members with less needs or powers were often neglected and not involved in discussions (Fakahau 1997). No other attempt was made to resolve those issues. From 1991, with a new Ministry of Fisheries, renewed efforts were directed at developing industrial scale fishing industries such as the tuna long line fishery, pearl farming and aquaculture rearing. The latest legislation framework such as the Fisheries Management Act of 2002 and the Aquaculture Act of 2003 provides the groundwork for future management of fisheries. In early 2007, the Ministry of Fisheries was merged with the Ministry of Agriculture. The old Fisheries Division is currently operated as the Department of Fisheries (DoF) with the same mandate as in 1973 but with a different view of management strategies under a new government structure.

2.1.2 Fisheries management with community involvement

It is the responsibility of the Fisheries Division to provide assistance and services to fishing communities such as fixing outboard motors, introducing new fishing gear, providing fisheries management advise, giving advise on post harvest techniques, providing ice making machines and deploying fish aggregating devices (FADs), constructed to attract schools of fish. Historically, extension activities, i.e. extending and increasing the industry have been, and still largely are, input based, relying on the transfer of technical solutions to achieve nationally determined goals of development (Wilson personal communication). The "Clamp Circle" was an initiative to promote community management in the late 1980s. This project encouraged villagers in the island group of Vava'u to establish a sanctuary for endangered species of giant clam.

The Giant Clam Community Sanctuaries circles were initiated by the government but were managed by local communities (Chesher 1993). However, some of the sanctuaries were short lived and lasted no more than five years. It is clear that legal arrangement of this effort was disputed and doubted by many fishermen. Two sanctuaries have worked very well to date namely ‘Atata and ‘Eueiki Islands off the northern coast of Tongatapu. An aquaculture activity run by the DoF continually assists with the building up of depleted aquatic resources such as giant clams, trochus (mollusc which is cone shaped and its shell is used commercially) and green snail.

In the past, much of the stakeholder input has been obtained by informal consultations with the participants in the fishery. The stakeholders are generally selected fishers and representatives of non-government organisations and government agencies. Usually most of the fishers are represented by town officers. The legislative framework has received little enforcement due to lack of funds. The activities have been focused on developing offshore and deepwater fisheries as the commercial value of offshore activities provides new incentives. The idea for this move is to reduce the fishing effort and reliance on inshore resources.

2.2 Current state of fisheries management in Tonga

Since the 1990s the approach in fisheries management has focused on developing commercial fisheries for the export market. Consultants have been hired to expand the marine export industry. Meanwhile there has been less priority on the inshore fisheries which remain open access. Enforcement is difficult because of lack of financial support coupled with the small size and geographical isolation of the islands. Fisheries management plans have been difficult to implement due to many other factors such as the prevailing culture, which will be discussed further in this study.

2.2.1 Overview of the strategic plans

The Department of Fisheries (DoF) works according to a strategic and corporate plan 2004-2007: “*A blueprint for the sustainable development of Tonga’s aquatic resources”* (DoF Strategic Plan 2004-2007*)*

Goals:
The development of Tonga’s living aquatic resource industries to the highest level of use compatible with ecological sustainability with structures of ownership, participation and technology that maximise the benefits to the people of Tonga.” (DoF Strategic Plan 2004-2007)

The Government of Tonga’s Strategic Development Plan Eight 2006/7-2008/9: *Looking to the Future, Building on the Past*. According to it the strategy is to:

“*Continue to support, and where feasible extend the geographic coverage of, community-based management and development plans for inshore fisheries”*” (Ministry of Finance 2006:96).

The two plans have signalled the fundamental needs for greater participation, ownership and establishing of communities fishing rights. The overall goal is to enable the people of Tonga to draw long term economic benefits from the fisheries resources.

2.2.2 The main fisheries of Tonga

Tonga's fisheries are broadly divided into offshore, deepwater and inshore fisheries. Another fishery, which is drawing a lot of attention because it needs to be managed, is game fishing. Game fishing typically occurs between inshore to offshore waters. In what follows is a brief discussion on each fishery. Table 1 provides some data on the major commercial fisheries in Tonga from the year 2004-05.

Table 1: Summary of major marine fisheries in Tonga 2004-2005.

Marine Resources	**Years**	**Landing (MT)**	**Value, fob ($TOP)**	**Number of vessels**
Tuna	2004	135.3	473873.00	16
	2005	316.3	11307270.00	13
Snapper & grouper	2004	227.4	795942.00	25
	2005	187.4	656222.00	25
Aquarium rocks	2004	495.1	1485316.20	5
	2005	498.9	1496772.00	5
Aquarium organisms	2004	359,660(pieces)	1368953.00	
	2005	361,270(pieces)	534926.00	
Seaweed	2004	754.5	478012.00	3
	2005	565	2225662.00	3

Value is provided in Tongan pa'anga (TOP$1.00 = US$0.50). Some products are not accounted for by weight but are counted as pieces. (DoF Annual Report 2004, 2005 and Draft Deepwater Fisheries Management Plan 2006) Each fishery is discussed in the text.

a) *Offshore Fishing*: All vessels participating in this fishery have to be registered and licensed by the Department of Fisheries (DoF) to fish outside the 12 nm zone and within the EEZ (Fisheries Management Act 2002). Fishing in the high seas also requires a special license. The offshore fishery targets highly migratory species such as tuna. The tuna species caught in Tongan waters are yellow fin (*Thunnus albacares)*, big eye (*Thunnus obesus*), and albacore (*Thunnus alalunga*). In addition billfish and marlin species are caught. Fresh yellow fin and big eye tuna are sold to the Japanese market for sashimi and sushi. Albacore of 10 kg and over are sold frozen to Fiji and US canneries either as loins or as whole fish. One percent of the tuna catches in the Western Central Pacific comes from Tonga (Langley 2004). Traditionally there has been some pole and line fishing. Mid water trawling and purse seine gears have never been used for this fishing in Tongan waters (Latu personal communication). The catch composition from Tonga is generally 65-70% albacore caught using long line gear.

In 2000-2003 the total fleet of 33 fishing vessels was a mix of foreign and local fishing vessels. The length of a typical tuna long liner ranges from 15 m to 30 m (Langley 2004). Due to prolonged periods of El Nino, catches have decreased considerably in recent years. At present the fleet counts 12 locally owned vessels and catches have improved (Table 1 above).

The institutional framework for management is provided for by a National Monitoring, Control and Surveillance (MCS) Committee established under the tuna management plan. The team is made up of personnel from the Department of Fisheries, Customs Services, Tongan Navy, Police and Crown Law (public prosecution office). The actual measures involve the use of a vessel monitoring

system (VMS) on all tuna vessels in Tongan waters, carrying observers, and are subject to aerial and surface patrols. The mechanism for stakeholder input is through the Tuna Management Committee and the Tonga Export Fisher's Association (TEFA).

The Department of Fisheries works in cooperation with a regional agency, the Secretariat of the Pacific Community (SPC), in coordinating a port sampling program aimed at collecting data, for the purposes of logbook data validation, stock assessment and research. In 1988, a unique form of international arrangement known as the "*Multilateral Treaty between Forum Fisheries Agency (FFA) member countries of the Pacific with the Government of the United States on fishing tuna from the Pacific waters"* (known as the US Treaty) was signed. Currently the US government pays US$ 21 million which member countries share annually to an agreed formula. Members[1] whose fisheries waters are currently being fished benefit from the arrangements, Tonga's benefits from being a member although no US purse seines have fished in its waters. Tuna species migrate sporadically south of the equator and are sensitive to El Nino conditions. Typically tuna species are abundant between 10° N and 10° S, i.e. just around the equator and are surface swimming fish (Langley 2004).

b) *Deepwater fishing* is listed as "restricted" to Tongan nationals only. It has evolved over the years from 8 m wooden type vessels into bigger vessels of fibre, wood or steel, with 15 m as management length limitation. Those vessels have better ice holding capacities and more modern navigational equipment than before. Fishing is restricted to inside the 12 nm zone (Fisheries Management Act 2002). The depth of this fishery is typically from 150 – 700 m. Past stock assessments and draft management plans have been recommending a limit on the number of licenses (Likiliki *et al.* 2006). The number of licenses has steadily increased in the past years. Snapper and grouper are covered by the fisheries management system *(Pristipomoides filamentosus*, *Pristipomoides flavipinnis*, *Etelis coruscans*, *Etelis carbunculus*, *Epinephelus morrhua*, *Epinephelus morrhua*, *Lethrinus chrysostomus).*

The major strategy for the management of the deepwater fisheries is to provide sound management which includes licensing a limited number and/or types of vessels, length and gross tonnage and restrictions on the types and number of manual reels (six) used. Data are collected frequently upon arrival of vessels by the Stock Assessment Section. The section is responsible for collecting data and cooperates with SPC. The fish are typically exported fresh or in loins to Hawaii, NZ and Australia. The monitoring/surveillance requirements are as of the offshore fisheries. Considerable efforts in the past years have been made to provide a draft management plan and it currently awaits ministerial approval. The plans encourage that the fishermen and firms should be coerced into forming an organisation.

c) *Inshore fisheries* can be divided into three classes: subsistence, artisanal and inshore commercial fishers.

[1] Australia, Cook Island, Federated States of Micronesia, Fiji, Kiribati, Nauru, Marshal Island, New Zealand, Niue, Palau, Papua New Guinea, Samoa, Solomon, Tokelau, Tonga, Tuvalu, Vanuatu.

- Subsistence fisheries are defined as those that only fish for self-consumption. Women and children are mainly fishers and gleaners of nearby reefs and inter-tidal zones.
- Artisanal fisheries use limited technology (spear, hand-line, nets, traps or small boat engines 25-60 hp). They are not easily identified. In essence there isn't any clear distinction between these fishers and those of the next class. However, catches are mostly shared amongst fishing family members and friends. An unquantifiable amount may be sold.
- Inshore commercial fishermen aim at selling all of their catch in the local markets or to roadside vendors. Catch data have not been collected from those fisheries for the past 10 years. Previously data were collected with the assistance of the Japanese International Cooperation Agency (JICA). Consultation and enforcement is costly due to how scattered the islands are and therefore client identification is problematic. The existing legislative framework provides certain requirements of limitation of certain fishing activities for licensed commercial operators (Fisheries Regulation 1994). Such as aquarium fish operators and seaweed collectors where both export their products. They are required to be registered and licensed.

The government, with the assistance of the Australian International Aid (AusAID), has recently established the first community fisheries management program on the island of 'O'ua in the Ha'apai Group. Management responsibilities are to be shared between government and fishing communities. The inshore fisheries include a multitude of species.

d) *Game Fishing*: Game fishing is one of the most important fisheries in Tonga. It is typically an activity for tourists and expatriates in Tonga. There are annual and seasonal fishing tournaments. The main management efforts for game fishing and whale watching have to do with licensing and providing safety requirements and provision of data collection. Game fishing targets include black marlin, blue marlin, striped marlin, yellow fin tuna, mahi mahi (dolphin fish) and wahoo. Fishing mostly takes place in areas close to fish aggregation devices (FADs). These devices are constructed to attract schools of fish. The fish typically aggregate around the devices. Game fishing is increasing every year. Tonga also allows swimming with whales which is getting more and more popular among tourists. Managing and conserving this fishery and industry are important issues.

3 OVERVIEW OF FISHERIES MANAGEMENT THEORY

To set the stage for our later discussion, an overview of the theory is useful when we later compare different fisheries management systems. First of all it is important to define what we mean by fisheries management and why fisheries management is needed. To be able to evaluate their merits and flaws it is also necessary to understand both the social and economic purpose of fisheries and their management. All fishing activities should provide and produce benefits that may raise standards of living. Fundamentally it should aim at all times to maximise the net value of production and increase the contribution of fisheries to the gross domestic product (GDP) (Arnason 2006b). Fishing is a production activity. It is also social and economic activity. The fisheries management has to satisfy a number of social and economic requirements. Therefore we will look at different systems used in fisheries.

3.1 Open access

Open access is a management system where every interested economic agent may take part in the fishing activity if he/she so wishes. Open access has historically tended to reduce output and resulted in loss of economic benefits over time. The reason is to be found in the nature of common resources such as fish stocks (Arnason 1995). Fisheries resources as natural resources are fundamentally bounded by nature. Access is free. Exploitations are excessive. Under certain general circumstances a tragedy might follow.

Figure 2 illustrates a typical scenario; the horizontal axis measures the aggregated fishing effort while costs, revenue and biomass are measured on the vertical axis. To begin with the stock remains abundant and catches are high. Consequently, fishers are able to obtain high returns for their investments and their efforts. As more fishers become aware of the returns being gained, new fishermen will enter this fishery. With no fisheries management in place to limit entries or activities the fish stock is about to decline due to increased catch and effort. It does so beyond the maximum sustainable yield (MSY) and the sustainable revenues also will experience a decline due to the biomass level being reduced (Arnarson 1995, Arnason 2006b). As long as the individual fisherman hopes that he can catch more than the others, the fishers will continue to increase their efforts. As there are no mechanisms in place, there are no indications to government that the stock is at a critical level. The fishermen may be left with huge debts due to their investments and a biological loss due to the diminution of the stock.

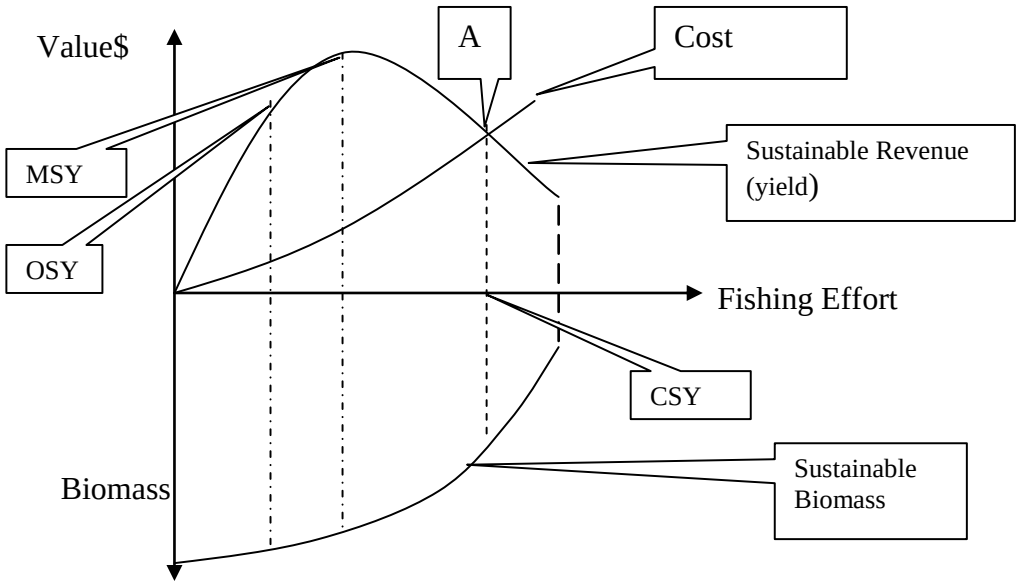


Figure 2: Graph of open access fisheries.

Note: Refer to text for explanation (Arnason 2006b).

The open access system illustrated in Figure 2 is sometimes referred to as a competitive fishery. The fishery, if it was managed well, should be harvested at the point of where it would yield the optimum sustainable yield (OSY). This provides fishermen with the maximum economic benefits and at a higher biomass and is socially optimal. However, according to Arnason (2006b), the open access fishing effort converges (due to the rationale explained above) to a point where there are:

- No profits (equilibrium point "*A*")
- Biomass is low (below OSY level) corresponds to CSY (critical sustainable level)
- There is a risk of a stock collapse (shown by the heavy dotted line)
- Harvests are often less than at OSY
- Unnecessarily low contribution of the fishing industry to the GDP (provided that all prices are true market prices)

It is important to note that the bottom part of Figure 2 illustrates the effects on sustainable biomass as efforts are being continuously increased. The biomass level is indicated in the lower part of the graph. This is done so that the components are clearly matched for ease of comparison between revenue and biomass (Arnason 2006b). It is not to be mistaken as measured values. It follows that the sustainable biomass is being reduced as fishing efforts are increased. Fundamentally, in this way, the fish stock size poses significant problems, as it would be too small to regenerate sufficiently in time. And the stock will most probably collapse.

The tragedy of the commons is also known as the fisheries problem. It is a result of what has been explained above. For the tragedy to occur according to Stillman (1975), O'Riordan (1976), and Berkes (1990) three assumptions have to occur. Firstly, the resource must be free for access to anyone, secondly, it must be harvested selfishly for

private gains and thirdly, the rate of exploitation must be higher than the rate at which the organisms can regenerate or reproduce.

3.2 Has Tonga experienced the "tragedy of the commons"?

Fisheries in Tonga, especially the inshore fisheries, have been known to be open access for over a century. As commercial fishing has steadily increased and there has been a lack of fisheries management the most important stocks are showing signs of being fully exploited, while some species have already been fished to commercial extinction. Examples of these will be given below. Some small scale commercial fishermen have to sail more than 50 km to the fishing grounds well outside the safety of inshore waters. Also over-exploitation of inshore resources is widely known to occur (Fakahau 1997, Malm 2001). In the middle of Tongatapu lies a lagoon, which used to provide the major source of food for families. Today the lagoon stands almost empty of marine life, a silent testimony to pollution and careless fishing practices (Akauola 2003).

In most cases, species which are easily caught are vulnerable to extinction. One species of giant clam (*Hippous sp.)* has been fished to extinction. The ease of harvesting led to the near extinction of some sessile species like, *Tridacna derasa, Tridacna squamosa* (Chesher 1993). The sea cucumber species (*Holothuria sp*) have been fished to near extinction because of high demand and high commercial value in Asian markets. Consequently, a 10 year moratorium for those species was issued in 1997. Stocks have recovered slowly according to fisheries officers who have conducted a preliminary survey of the stocks.

Two fisheries are of particular interest for this study, the deepwater line fisheries and the inshore fisheries. Significant decline of fish stocks caught in deepwater fishing and the increased catches of small immature fish might lead to a collapse. The deepwater fish are believed to be non-migratory and slow growing. In Tonga the open access regime is of concern due to increased fishing efforts (Gillet and Moy 2006).

3.3 Taxonomy of fisheries management systems

The discussion will now focus on the different types systems that can be employed to deal with the fisheries problem described above. Fundamentally, the mechanism aims at providing incentives for fishermen to avoid the open access tragedy. Fisheries management basically aims at controlling fishing efforts so that they coincide with the socially optimal level. There are mainly two different well studied fisheries management systems. Those are biological fisheries management and economic fisheries management (Figure 3). The economic fisheries management measures can further be divided into (a) direct restrictions and (b) indirect economic restrictions.

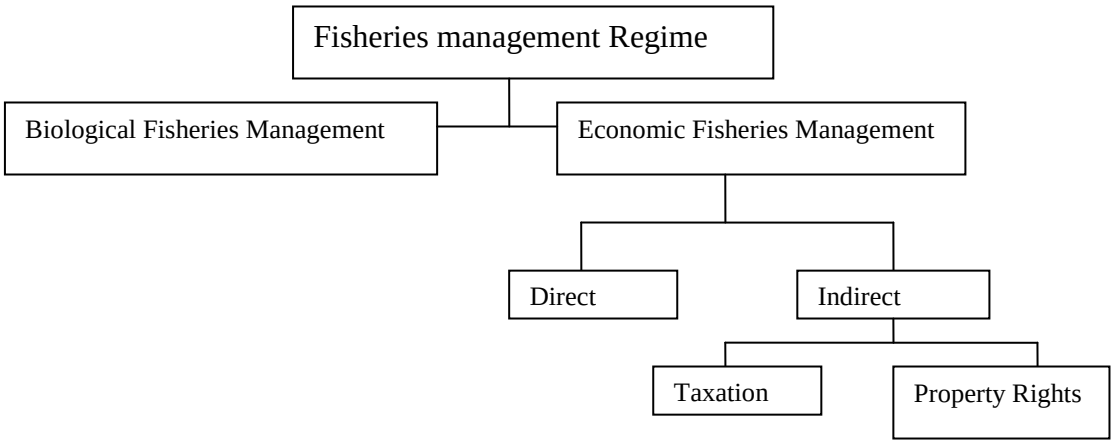


Figure 3: The taxonomy of fisheries management synthesis
Note: A detail explanation of some of the taxonomy is given in the tax (Arnason 2006b).

The study will not discuss the biological fisheries management in detail as it is generally applied in every fishery and only touches upon the subject indirectly but rather it will focus on the economic fisheries management aspect. It should be kept in mind that an appropriate fisheries management regime should provide economic efficiency to fishers.

a) Biological fisheries management aims at imposing restrictions on factors such as total allowable catch (TAC), using area closures, seasonal closures and gear restrictions (Arnason 1996). It is put in place so as to protect and conserve the fish stocks. The concept is to allow sufficient time, nutrition, peace and place for the stocks to reproduce and grow. However, it does not aim at controlling the economic forces that favourably provide fishers with the incentive to fish. This may actually have been the case in Tonga's deepwater line fishery. Therefore, it is not constructive and effective from an economic standpoint although biologically it may conserve stocks.

b) Economic fisheries management looks at the problem from a somewhat different perspective. It is important that fishers obtain sustainable maximum economic benefit from fishing (Arnason 2006b). After all that is why they fish and usually the fundamental policy objective of government.

As noted, economic fisheries management measures can be broadly divided into two groups:

(i) *Direct Restrictions* are aimed at controlling fishing effort and also put limits on investments by fishermen usually by affecting or controlling/limiting days at sea, engine size, length of vessels, holding capacity on gear type. Then the objective is usually not fully achieved, i.e., to maximise the economic benefits of fishers (Arnason 2006b). Fishing efforts are usually a combination of many variables. If the length of vessels is limited, the fisher may invest in a vessel with greater gross tonnage and similarly if the days at sea are limited it might result in fishers using vessels that are bigger and faster.

(ii) Indirect Measures: There are two known indirect economic management measures namely (a) corrective taxes and (b) property rights-based management. It seems that these two measures are currently the most successful management systems used.

3.3.1 Taxation

Taxation is a tool used in fisheries management to enable changes for economic conditions of the fishers so as to be socially optimal. It is beneficial to the welfare of society. If successful it achieves the purpose of maximising social benefits. Most taxes are either on inputs or on catches (landings), value of landings and often on exports (Arnason 1996). For Tonga it would hardly be wise to impose a tax on inputs. Tongan commercial fisheries were for a long time controlled using such a tax system. Such taxation is not recommendable because of substitution effects. The fisher will not receive desired benefits. Although, it might be possible to collect economic rents through this tax by government the implementation seems to be aimed at generating revenues for the government rather than maximising social welfare. Therefore, this study will not provide further discussion on this management measure.

3.3.2 Property rights

The term "property" is commonly referred to an object that a person or group owns. As such it relates to a possession and often gives owners the intentions of performing what they want to do with his or her property (Kaufmann *et al.* 1999). For this study the property is the fish. Rights are the legal responsibilities provided to the owner of the property. It is recognised by the legal system of the country (Scott 1989, Kaufmann *et al.* 1999). The study defines property rights as the rights and obligations of an individual or groups to use resources. It represents entitlements of owner's rights, duties and obligations for benefit. Property rights have stature in society because they generate incentives for people to behave optimally (Neher *et al.* 1989, Arnason 1996 and 2006b). In the case of fisheries, property rights give incentives to the fishers, to behave economically. The term generally applies to physical objects such as land, terrestrial animals, houses or vehicles which generates a value relationship between people. But essentially to ensure economic value, one must have interests and generally have rights so as to protect these interests. The characteristics makes up the quality of the rights. Further legal consultation has provided clarification that "property" is a "description of a legal relationship with a thing" and that it has a "bundle of rights and responsibilities" (FAO 1999).

a) Property rights as a bundle of rights

Firstly and fundamentally, the relationship linking the property with the individual can be seen as a bundle of rights. It represents entitlements of owner's rights, duties and obligations for benefit. From this concept it is important to understand that the property is not just the physical appearance of a thing or of the object but rather it is fundamentally the rights (bundles) which provide the value into that relationship and brings about the interests. The property is determined by the characteristics of the rights. Those characteristics, *inter alia* are security of the title, exclusivity of use, duration of property rights and transferability. From these characteristics the quality of the property rights may be judged (Arnason 1996). The property rights regime is a subset of institutions, bundle of entitlements that define owner's rights and duties.

b) Property rights as a bundle of characteristics

The quality of the rights will be determined by their characteristics. Security is related to quality of ownership. If rights can easily be taken away, reluctantly under certain conditions, then the ownership quality is low quality. Exclusivity defines the right to exclude others from using the property. Duration is the right that allows the holder a time span to use the rights provided. Transferability deals with constraints which limit the ability of the owner to reassign those rights to someone else. This means that perfect property rights will be the maximum combination of all characteristics. They will be characterised by complete exclusivity, being infinite in duration, perfectly divisible, and perfectly transferable. Figure 4, illustrates what constitutes perfect property rights and measures the effect of these characteristics on a scale of zero to unity, as [0, 1], with unity meaning the fullest extent of a property. The mathematic calculation is not provided here, however it is a non-linear equation (Appendix 4), Figure 4 illustrates a model of the attributes.

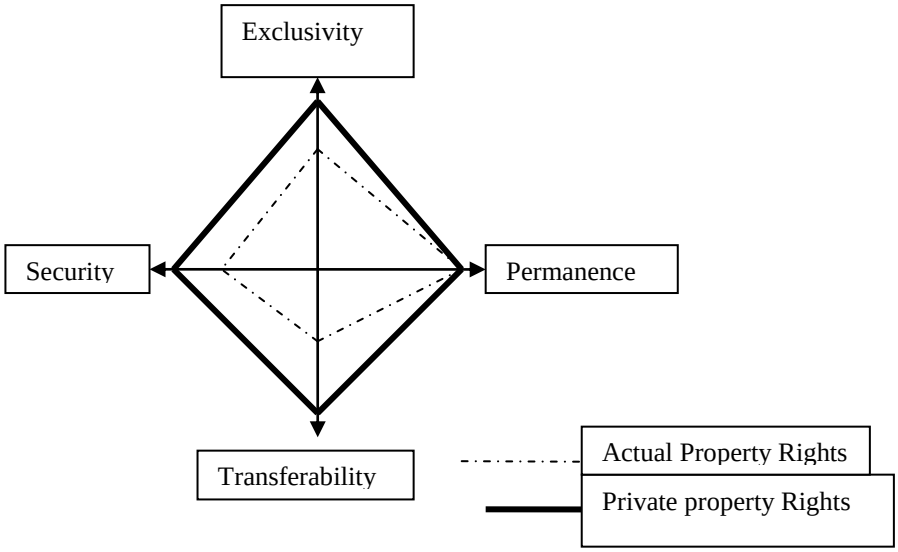


Figure 4: Property rights attributes representation (Arnason 2006b)

The most popular forms of property rights used by fishing nations are access licenses, and some kind of quota systems. Among smaller fishing nations such as in the Pacific islands collective user rights are popular in coastal communities (this is discussed in the next section of this chapter). Tonga may not be able to establish such a general property rights regime at present but it may be possible to provide some property rights to manage specific fisheries. Types of property rights are sole ownership, territorial use rights in fisheries (TURF), access licenses, individual transferable quotas (ITQ), collective user rights (community rights or common property rights). TURF's (territorial user rights in fisheries) are mostly implemented close to shore on sedentary species (Arnason 1996 and 2006b). It may be useful to adopt TURF as a management tool for deepwater fisheries which depend on species living in seamounts.

3.3.3 Collective rights

Collective rights are a type of property rights. Fisheries managers and academics have attempted various forms of systems to counter the problem of common pool resources from over-exploitation. These common pool resources refer to natural resources used by individuals in common (Ostrom 1990). The two fundamental issues to be resolved under common pool resources so as to establish property rights are:

i) How to control access to resources such as fisheries.
ii) How to provide rules amongst fishers, to solve potential problems between individuals and the group.

The question poses two problems to be considered: who is to be included and who is to be excluded. Moreover, to manage a common pool resource we must effectively look beyond the conditions which have led to the tragedy (Berkes 1990). The study looks at some important conditions which will be used elsewhere in this study. It is sufficient to say that collective rights must be explicitly agreed upon and are a set of rules and objectives which provide socio-economic benefits to the group. Therefore decisions for the two problems must be made collectively. Community property rights can also be called collective property rights and the rights within the collective rights must be strong so as to be economically efficient. Furthermore, it should be emphasised that cooperative institutions must be designed appropriately so that they are organised and governed by the resouce users themselves (Ostrom 1990).

Many traditional coastal fishing communities in the Pacific have managed their fishing activities collectively (Ruddle 1998). But importantly it has never been aimed at generating economic efficiency. The group is usually well defined, relatively small and has a common purpose or aim. The rights given to them make it possible to exclude others which are not of the user rights group within a well define area. Moreover, common property rights provide shared responsibilities in the community and assistance to government.

Collective rights are not to be confused with open access. Simply because open access does not entail property rights. That is to say it provides no rights, is free for all and could rightly lead to the tragedy of the commons depicted by Hardin (1968). It is very difficult to obtain true community based fisheries management without some input from government.

4 MECHANISM OF CO-MANAGEMENT

The purpose of this chapter is to discuss the fundamental assumptions and the concept asking questions such as what is co-management and why have fisheries managers and scholars come to regard it as a way forward in managing fisheries resources in recent years? The main point is that all centralised fisheries management efforts have not reached and obtained desired outcomes and therefore people have become disillusioned with the idea that a benevolent central government can solve the problem (Nielsen *et al.* 2002). This chapter discusses the importance of including the fishers in the decision making process and having their support in ensuring that the resources are exploited in a sustainable way. We then discuss whether and how establishing collective rights might be beneficial in Tonga.

4.1 What is co-management?

Co-management is an organisational arrangement between a state body and user groups, such as fishers, to ensure effective management of their activities. Co-management is a dynamic relationship between the users, who have social and economic incentives to fish, and government, which provides the legal framework and the necessary administration.

The concept is widely used but often not clearly understood and experts and scholars on the subject are often reluctant to provide an agreed definition for co-management. Sen and Nielsen (1996:406) define co-management in relation to the concept of shared responsibilities as "an arrangement where responsibility for resource management is shared between government and user groups". Figure 6 shows an interpretation of partnership between different groups to a well defined area. Identifying the right balance is often complex but if it is carefully worked out some benefits may be realised (FAO 1999).

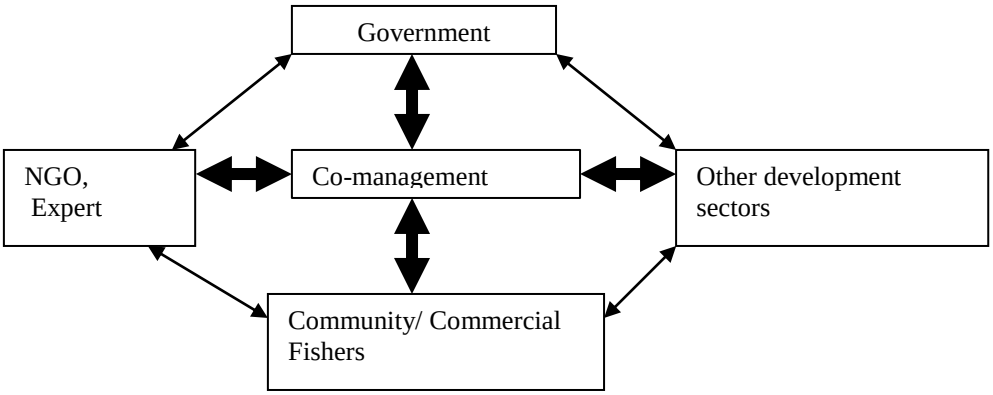


Figure 5: Schematic presentation of a co-management of sharing information and issues

Note: An explanation is given in the following text.

Figure 5 presents a birds eye view, as everyone is cooperating as is shown by the arrows. The bold arrows signify the co-management while realising the independence (as they each have their own economic objectives) of each party as will be explained in detail in the sections that follow. These groups contribute to the decision making. It provides accountability and transparency of decision making. It enables fishers and other related sectors to assist one another. The arrows indicate the flow of information from all sectors. Information is the key element for successful management. In such co-management, fishers and government share knowledge and experience. The feel of acknowledging their importance gives fishers and other sectors a sense of pride to exchange their practical knowledge freely amongst members of the groups (Arnason 2003). Importantly, attention must be given to specific histories and the incorporation of cultural and political factors in order to understand when people will cooperate and when opportunists take over and cooperation breaks down (Agrawal 2001). The capability and the ability of the user groups are of high importance to enable them to participate effectively.

4.2 Why co-management?

There are three fundamental reasons as to why a co-management approach is generally being accepted as a way to manage fisheries resources. Firstly, there is a need to involve users, such as fishers, as the decisions to be made will undoubtedly affect them collectively or individually. Secondly, effective fisheries management relies on good information. Exchange of information between the groups is very important. And, thirdly, the costs involved in a centralised system can be substantially reduced (Arnason 2006a).

It is important to understand that all previous management models have based their conclusions on what is known as the "free-rider" concept (Hara 2001). The importance of this concept will become clear later when the discussion talks of information, incentives and other cost factors. The game theory result known as the *Prisoners dilemma* focuses on co-operative and non-co-operative assumptions. The outline of the game is as follows: Two different individuals who have probably committed a crime together without proper information would behave irrationally, given that it would be in both of their interests to cooperate. Hardin's *Tragedy of the commons* is one manifestation of this setting. Individuals behave rationally, when looked at in isolation, but by cooperating they could do better. The Rational Choice Theory is based on logic through collective benefits. Evidently this was the problem faced by the original fishers association established in Tonga in the 1980s. According to Hara group theory simply points out that voluntarily, individuals will pursue their benefits when working to achieve the common interests (Hara 2001). Generally an individual who does not achieve a benefit from a collective right will lack the incentive to stay with the group.

4.3 Stakeholder participation in co-management

Depending on the established stakeholders' institutional bodies and their capabilities, different management issues may be suitable at different levels. The role that government and resource users play is typified in the spectrum of co-management arrangements (Figure 6). The co-management structure depends on the representation of users. There are of two types of inputs: *functional*, which are based on gear types and *territorial* which are based on geography. The structure allows management to target a specific group and thereafter easier to allocate, regulate and work with.

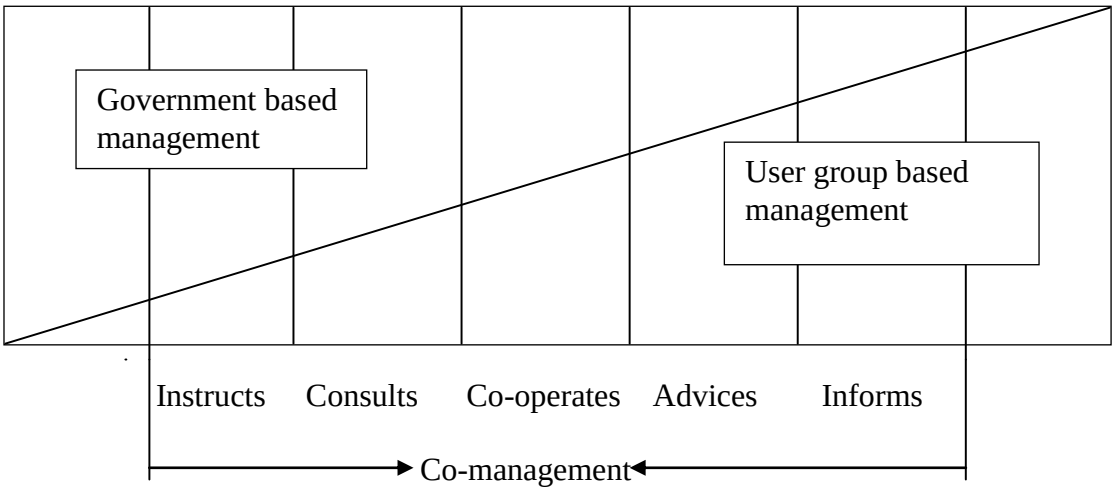


Figure 6: Spectrum of co-management arrangements (Sen and Nielsen 1996).

Note: the spectrum gives a description of an absolute centralised system by government at one end and at the other end of the spectrum is an absolute community based management system. In between the two extremes are different levels of co-management assumptions. Explanation of the spectrum is provided in the following text.

The participation in a co-management framework as depicted in Figure 6 may need some further explanation. Its main features are:

Instructive: There is only minimal exchange of information. It is slightly different from top-down management as there is a mechanism for dialogue (Hara 2001). One can find typical examples of this regarding most fisheries matters in the Tongan fisheries.

Consultative: Decisions are made by government but there is a consultative process on the way (Sen and Nielsen 1996). Active participation is often absent and decisions may already have been taken. The concept is more of a public awareness. This is another mechanism which is also used in management of fisheries in Tonga.

Cooperative: Government and fishers are equal partners in the management and decision making process (Sen and Nielsen 1996, Hara 2001, Arnason 2006b). The representation is clear. The fishers' representatives are involved from the start. This is true of the Customary Fishing Rights in the Pacific countries of Fiji and Vanuatu. The rights are recognised by government and important information is shared. Enforcement is also shared.

Advisory: The fishers advise government on the decisions to be made (Sen and Nielsen 1996). The government therefore endorses those decisions. Most countries (Australia, Denmark, and Tonga) have fisheries advisory councils. Their views are respected by the appropriate minister.

Informative: Authority has been delegated to fishers to make decisions and then to inform government. These groups are responsible for enforcement management of

their rights. Government enforces the overall national interests. The groups are homogeneous. Community fisheries management can typically be of this nature.

The sharing of management responsibilities will greatly dependent on the scale, scope, timing, level and representation of fishers in the decisions on how to deal with and solve management issues as in the ladder provided by Sen and Nielsen represented in Figure 6. In Tonga the fisheries management can be seen to be at the consultative and instructive stages illustrated in Figure 6, with limited community participation.

4.4 Can co-management assist in Tonga's fisheries?

Co-management must be presented as an alternative coinciding with dynamic fisheries management strategies, and under certain circumstances, to deal with fisheries problems. For Tonga this could be a formal recognition of the co-management structures which are already in place such as the functional association, Tonga Export Fishers Association (TEFA). But it may also need to be clarified if it is to help in establishing new structures.

The institutional arrangements are important for the future of Tonga's fisheries. The co-management spectrum is a simplified version of the actual realities. But one might ask which aspects or modifications are the most important to the Tongans. The following are clearly of importance:

- It follows that certain issues may need extensive government involvement because of the seriousness that surrounds certain issues (Sen and Nielsen 1996). For example policy formulation may need to be co-managed whilst for other tasks such as giving access rights is better to be left for the government to decide, perhaps with some consultation with fishers.
- The stage of the management process is important where the fishers should be involved. Fundamentally at which stage should they be involved, planning, implementation or evaluation. A whole range of issues regarding fisheries that affects fishers must be transparent. It provides ownership to resolving issues. But there are certain stages at which the fishers lack the technical know-how to participate (Sen and Nielsen 1996, Hara 2001). The planning stage may generally show that the fishers will have more information than government has.
- Essentially all parties should be consulted as early as possible. They need to be involved right from the beginning.
- Fundamentally, the different types of fishers must be represented. Later the study presents a thorough discussion of how this must be done.

The extent of authority must be determined by a government institution. The political cultures where traditional values may exclude certain aspects of co-management are also important. To take an example from Fiji the Customary Fishing Rights have recently dictated the development of other sectors and can easily pose a political crisis. The necessary information for management of fisheries in Tonga is provided in chapters 5 and 7. This information must be easily extractable from the fishers themselves, and having them take part in the management decision making process might help in this matter.

5 SOCIAL AND CULTURAL STRUCTURE OF TONGA

This chapter provides an overview into the social and cultural structure of Tonga. For later discussion on community fisheries management in chapter 7, this provides important background information. The fundamental role that aquatic animals play in Tonga's social obligations is essential and has to be included into fisheries management for Tonga if it is to be successful. It shows why a shared network of social obligations will significantly assist in the formulation and selection of a fisheries management system.

5.1 Can the social structure assist in fisheries co-management in Tonga?

Traditionally what the catch fishers brought in abundance was freely shared with neighbours and amongst villagers. Fishers fish in groups. There are no rules of sharing. This social sharing demands nothing in return. "Tonga coastal fishers, marketing generally follow the traditional social rather than a profit-seeking enterprise controlled by organisation" (Kronen 2004:130).

In the inshore fisheries this sharing network can support fisheries management. A study has been conducted in the island of Lofanga and Uiha (Ha'apai Group) where social values were compared to commercial fishing respectively (Bender *et al.* 2002). The study concluded that sustainability in Lofanga's fishing activities is brought about by its social norms compared to the excessive commercial fishing that was evident in Uiha. Social sharing is seen as substituting direct rules to governing the resource exploitation (Bender *et al*. 2002). The fishing methods used are generally spear fishing at night or hand lining.

For fisheries management to work in the community a committee should be selected. The members of a committee should be members of that community. Its own informal conventions and meetings should be used to provide a base for co-management. Therefore the approach is to acknowledge the system and work within that system.

5.1.1 The social and cultural structure: rank and status

The Tongan social structure is characterised by rank and status. A Tongan receives his status from his father. Importantly, status does not place you in the Tongan society; rather this is based on *rank*. A Tongan obtains his/her rank from his/her mother, and that determines his/her place in the social order. Women are held in higher rank than men in the Tongan structure of society. Tongans developed a complex family ranking system whereby the oldest female (and her descendants) held higher rank known as *fahu* within the family than brothers. Women generally have been expert fishers in the intertidal flats. Because of their high status and rank in the society their participation in fisheries limits them to be gleaners. Traditionally women are not expected to carry out demanding physical work. Men dominate the more difficult fin fish fishing.

Another important factor is the sharing of food. In Tonga, food is readily available it primarily signifies the institution of food sharing under social obligations and cooperation (Halapua 1982). In a way the sharing system in Tonga creates solidarity which protects users from individual shortfalls. Neighbours always share food especially Sunday lunches, which is one of the family functions, birthdays, weddings and funerals.

Sharing of food, amongst other things, defines the concerns and functions of people and is meant to be a sign of many things such as kindness, caring for others, generosity, sharing and love (Bender *et al*. 2002). Another social obligation includes the responsibility to serve others. It is fundamentally co-operation to assist based on caring. "*It is not a barter system, rather it is a sharing system based on love, which probably contributed to our survival in the islands over the last two thousand years. The difference is that one is not expected to reciprocate because everyone does it. The adoption of Christianity further strengthened the sharing systems"* (Fakahau personal communication). Tongans are taught and are raised to serve one another. In a newly establish fishing company it follows that essentially the first catch of the vessels are normally not sold under certain circumstances. It is shared amongst families, church ministers, communities and friends. The culture of sharing also characterises other parts of the society and is similar for farmers as fishers. It is the general belief that in giving you will be continued to be blessed and it thus indirectly further strengthens the sharing network. It is interesting to compare the sharing of fisheries catches by the Cree Native Indians of Canada and Tongans (Berkes 1990). There are rules of sharing in the Cree fishing community whereas in Tonga it is not rule based but giving out of respect, caring for friends, neighbours and family.

Furthermore, the influence set by the Christian missionaries in the late1870s set the motion of lifting the status of agriculture growers. The result was a slow decline of the social status of Tongan fishers (Bataille-Benguigui 1988). Fish resources are of great importance and are significant to many cultural functions. Certain fish are used by fishers to present to the king or high ranking nobles. Fish such as tuna (*atu, valu*), long tail snapper (*Palukula lave'itavake*), shark (*anga*), mullet (*fua)* and sea turtle (*fonu*), are regarded as fit for a king (*ika 'eiki*). This does not mean that commoners are not allowed to enjoy the nourishment of these aquatic animals. It is difficult to imagine what would happen if these species were over fished and became extinct as it would have severe cultural consequences.

5.2 How can co-management provide benefits in fisheries?

The importance of family and subsequently the community provides a potential support for fisheries management. The basis of the community is the family group. One of the outstanding characteristics of the Tongan culture is the sense of collectivism, in which the individual benefit is inferior to the group's interests. Youths form groups of farm workers, fishers fish as a group of four to six and maybe more. Entertainers perform as a group of more than 50, all moving in unison. Like other cultures at times it may need leadership and encouragement. In general, Tongans' priorities are central to communal, cultural and religious activities. A recent assessment of the socio economics of Tonga's artisanal fishery stated that "while net profit value (NPV) proved to be a useful instrument to compare fisheries and alternative sources of income, it failed to assess social and traditional values that determine the rather non-economical and non-rational subsistence and small-scale fisheries systems in the Tongan and South Pacific context" (Kronen 2004:121).

Traditionally in "small island communities profit does not motivate, capitalism is not the main engine of production and wealth does not pay dividends; rather it attracts considerable social costs to anyone in society" (Fakahau 1997:12). Traditionally, Tongan fishermen are able to provide and survive without the need to respond to market systems (Halapua 1982). These two views provide the realities that surround

community fishers in Tonga. Although it collides with economic theory, it nevertheless represents the behaviour of fishers in Tonga. And management is about people's behaviour. It provides essential challenges and must be acknowledged as a need to educate fishers.

5.2.1 Extended family, community and religion and sharing system

Fundamentally the conventional fisheries economics of property rights are based on the performances of a firm where there are organisational structures, values, goals, which motivate its employees to achieve profitability. Similarly, a Tongan community behaves much in the same way as a firm. The community has social and cultural structures, values and goals which motive collectivism. This still does not mean that all problems will be solved. For Tongan community fishers, fishing has not been a profit seeking priority. For the future, community has to play an important part in any discussion and awareness. Often members only speak outside the boundaries of the platform being provided by government. Traditional informal meetings should be explored.

Religion plays an important part in the everyday life of families in Tonga. Each and every day family prayers are conducted before the family members leave the home. In the work place at the beginning of a month or week it generally begins with prayer. Activities are opened and closed with prayers. Christianity has had the greatest influence on the lives of individuals and on the communities as a whole.

This is important for our analysis. Generally, the fundamental problem has been to promote collective fishing rights for communities and to establish co-management systems. The social and cultural system can thus be integrated into a fisheries management. If this is not considered, then a western type management can be costly to implement and may simply not work. The sharing and collective nature of the Tongans should be recognised as a tool for fisheries management. Workshops should aim to ensure that the community understands that economic benefit can be derived out of their collective sharing system. Decisions are to be made by the community and it must decide on its course. Government must act as a facilitator to guide discussions and provide technical input. Foreign donors who fund projects often have time limitations for implementation they usually ignore these important issues. Understandably the social and cultural are often complicated and are simply pushed aside as constraints rather than the most essential elements to success. And while there are economic reasons for families to fish commercially in the inshore fisheries their behaviour is still largely and strongly influenced by family, social and cultural values and strong Christian beliefs and morals (Fakahau 1997).

6 STRATEGY TO IMPROVE CO-MANAGEMENT IN TONGA

The following sections will focus on a presentation and analysis of a specific co-management model and how it may be implemented in Tonga's fisheries. The strategic approach here is to integrate the existing structures into a new set-up which will be beneficial to fisheries. This will formally recognise the co-management arrangement already in place and extend its capacity. We start by giving an overview of the current infrastructure, i.e. the main "players" in the Tongan fisheries and who plays which role and how it will look.

6.1 Existing associations

The Tonga Export Fisheries Association (TEFA) has been the lone advocate of fisheries issues outside the Department of Fisheries. It was established in the mid 1990s and is so far the most recognised fisheries association. However its effectiveness is limited. Commercial export fishers are synonymous with foreigners. As such most government sectors and community fishers do not recognise their existence. Its establishment came about when there was an increased emphasis on the importance of fisheries for export and the development of the tuna industry. The members are mainly foreigners who were investing in fishing. Its members are mainly the tuna long line boat owners. Two separate advisory committees for fisheries and aquaculture have been established very recently.

6.1.1 Harvest and export associations

The following harvest and export based fishers association are currently operating in Tonga:

- Tonga Export Fisheries Association (TEFA) consists mainly of tuna long line operators.
- Tonga International Game Fishing Association (TIGFA) consists of mainly tourists and expatriates.Deepwater Line Fishers Association (DLFA) consists only of licensed deepwater line fishers.
- The seaweed processors and exporter have also established the Limutanga'u Exporters Association (LEA) and the Marine Aquarium Exporter Association (MAEA)

The formation of each association means that they have their own simple constitution regarding e.g. decisions for choosing a president and the executive members. They must be registered within the requirements of Tongan laws so as to be recognised by the fisheries authorities.

6.1.2 Advisory committees

Broad co-management bodies between government and fishers and other stakeholders have also been established:

(a) The Fisheries Management Advisory Committee (FMAC) was established to provide advice to the minister before decisions are made. Although this function is important there is a considerable weakness in its role. Its tasks are too narrowly defined and members are broadly based because the FMAC has been established

before the fishers can organise themselves into specific groups ideal for co-management. Members are selected by the Department of Fisheries and thus the decision making is not independent of the DoF. The rules for selection of members are in the Appendix 1.

The FMAC meets to discuss limited matters such as assisting the decision making of the minister in relation to approving any request for a Coastal Community designation for fishing rights. If it is placed in the spectrum of co-management (Figure 6), it suggests that the advisory role is to advise the minister on every important fisheries matter that has direct effect on fishers' efficiency. FMAC's decision capacity as a new management body has not yet been fully utilised. Their advising capacity is still limited and members need to be fully aware of what it is expected of them. Fisheries management plans, limitations on licenses and permits, rights of allocations, closing and opening of fisheries and export matters should be forwarded to the FMAC for discussion. Fundamentally it should only be discussing matters where it needs the minister's approval. For general matters of decisions that require the approval of the Secretary for Fisheries, FMAC it is not needed. Accountability and transparency of decisions of management is important.

b) *Aquaculture Advisory Committee (AAC*). The role of AAC is clear and specified in the Aquaculture Management Act 2003. All aquaculture activities such as licenses, permits, aquaculture management plans and aquaculture policies are referred to this committee for discussion and advice for implementation.

6.2 Legislative framework

There are mechanisms in the legislative framework which encourage stakeholder participation. This will lead to establishing a co-management structure of fisheries for Tonga. The main components of fisheries laws are:

- Fisheries Management Act 2002 (FMA2002) specifically Section 3, Part II subsections 3;4(l);5;7(1),(2),(3a) (3b)(3c)(3d), (4a) (4b), (5); 8(1), 8(2), 8(3). The details are Appendix 1.
- Aquaculture Management Act 2003 (AMA2003) specifically Section 10(1), 10(2), 10(3); 11(1), 11(2). The details are in Appendix 2.

Provisions in the FM Act 2002, AM Act 2003 and Strategic Plans are meant to encourage the participation of fishers and other stakeholders in the decision making. Accountability and transparency can only be achieved if the fishers and stakeholders are involved in a dialogue about the management of fisheries. International donor agencies provide further assistance if users such as fishers are seen by government as partners in development.

6.3 Proposal for new structures of co-management

The co-management model provided here is not just an instrumental co-management approach where the bodies are simply used in the implementation process. Fundamentally the new structure implies an institutional co-management approach where the fishers are involved in defining management objectives, and identifying the knowledge to be used as basis for management decisions (Nielsen *et al.* 2002). The institutional approach is to provide an option for which the mechanism of influence will impact the lives of fishers directly. The concept used here is that the groups are defined in terms of functional attributes, i.e. by gear type or species harvested (Figure 7).

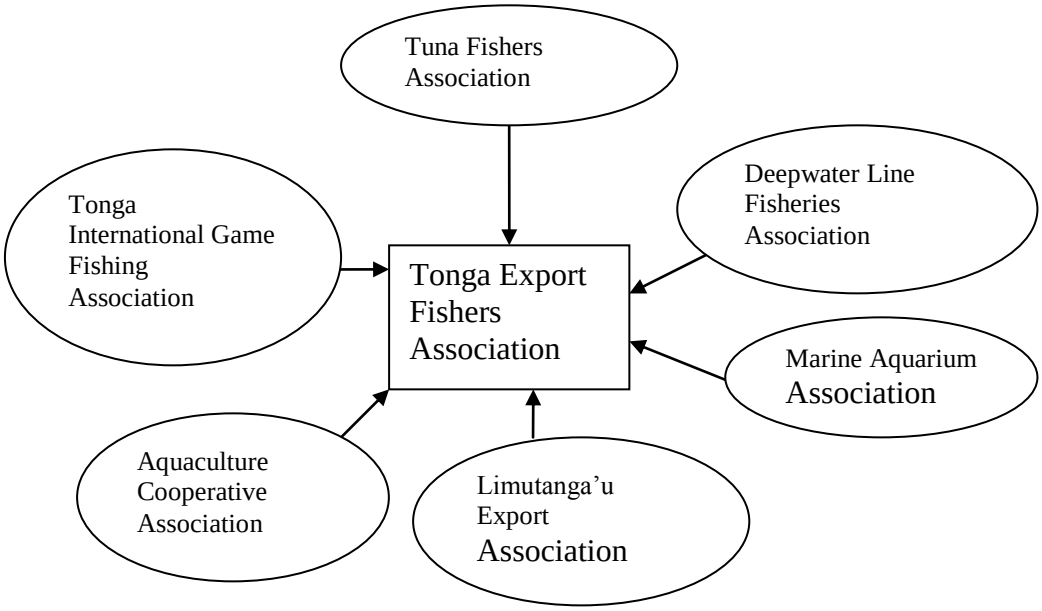


Figure 7: Co-management model for Functional Association.
Note: Each commercial fishery has been licensed by the Department of Fisheries in accordance with legislative requirements. Each circle is a specialised fisheries association. More detailed explanation is provided in the following text.

Figure 7 illustrates what we call the "Functional Association" which will combine all commercial fishers/companies (has been registered and licensed by DoF) into a simple structure. It will enable the fishing industry sector to be more organised and a cohesive influential body. The chosen representative should have the capacity to actively participate in the decision making. Representatives in TEFA should be the presidents of the specific associations. The current constitution of TEFA may need to be changed to accommodate all other fisheries associations and may like to further its current objectives as detailed in Appendix 3. The DoF should make it mandatory for other associations in this model to be part of TEFA. And all associations should be registered in accordance with government regulations.

The second model (Figure 8) reflects the idea for what we call a "Territorial Association" (Regional Community Fishers Association). First we show a general schematic overview of this model (a) and then we show how it might be applied to Tonga (b). This provides options for Tonga to decide on which co-management network it might prefer. Such an approach would provide essential representation by the community of fishers which has often been neglected.

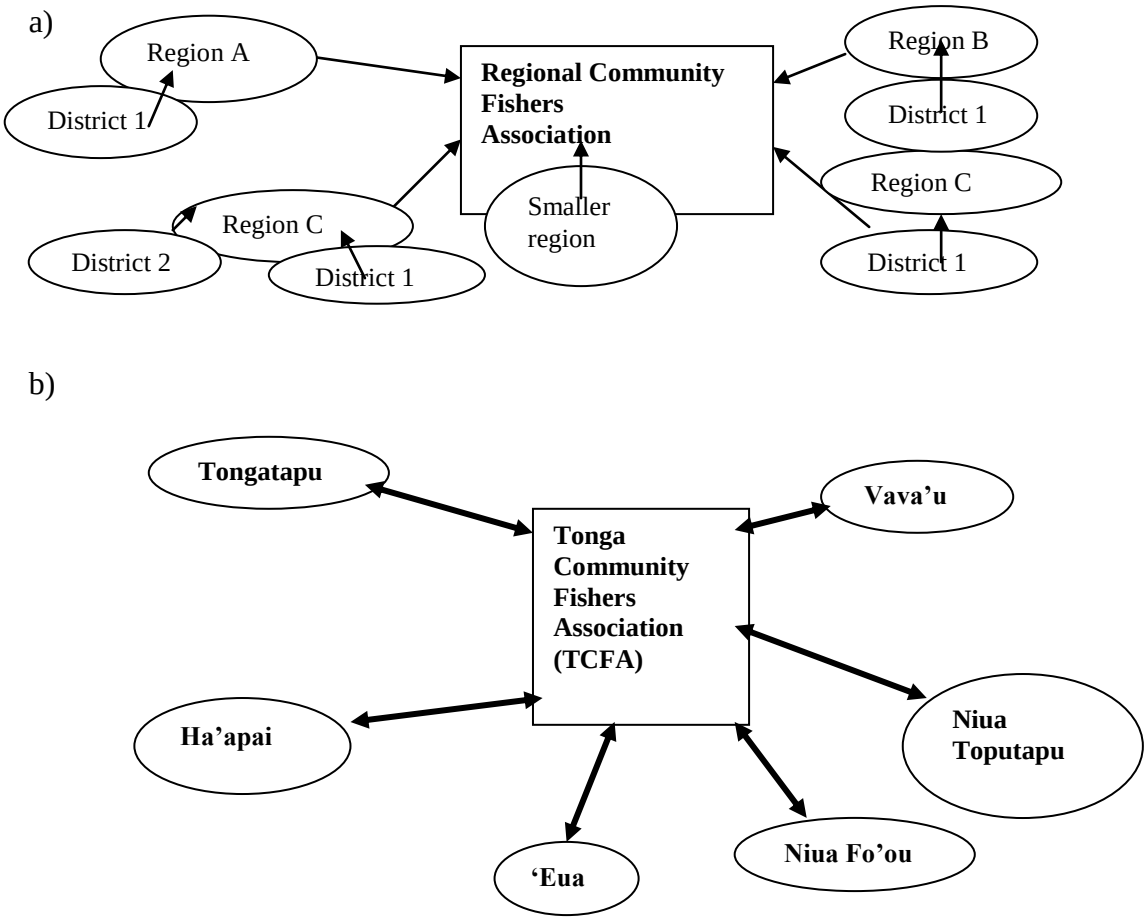


Figure 8: Co-management model for territorial association synthesis (a) and how it applies to Tonga (b).

Note: Explanation is provided in the text below. Arrows represent the passing of information and partnership from community level to regional association.

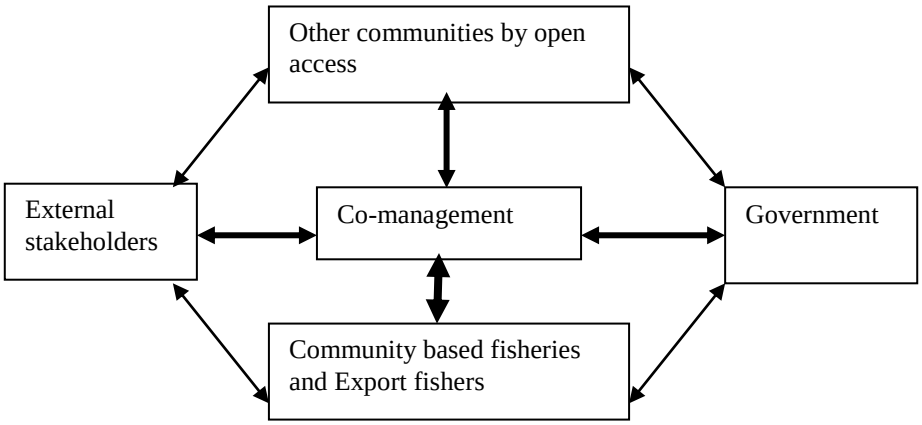
Figure 8(a), illustrates how a territorial association model may look. Each region may have several districts under its authority and many communities within a district. It is a simplistic model. Figure 8(b) reflects how the model is applied to Tonga. Each community representative will be the chairperson of each Coastal Community Management Committee (CCMC). The representative of each coastal fishing community shall represent their communities in a regional association, i.e. from community into the Regional Community Fishers Association. Further details are provided in Appendix 3.

The representatives of the Regional Community Fishers Association and the Tonga Export Fisheries Association will make up the Tonga Fishers Council as is shown in Figure 9(b). According to this model, community fishers are responsible to the community committee (CCMC). Stakeholders are individuals, groups or organisations. Other participants such as NGOs, the tourism sector, expert advisors,

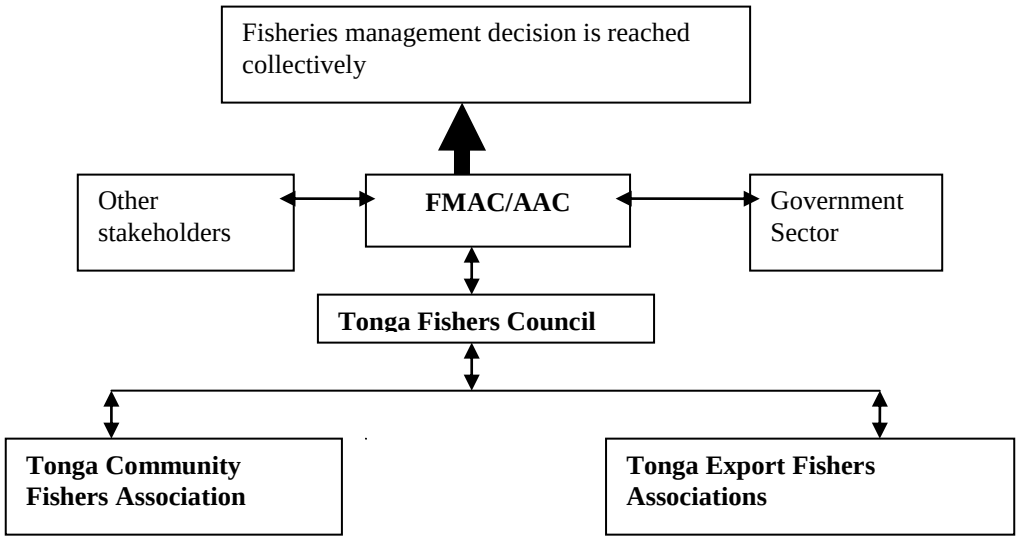
financial institutions and other business interests such as private fish market etc will be in the category "External (other) stakeholders". The government sector should include the Department of Fisheries, Ministry of Lands, Natural Resources and Environment, Department of Marine & Ports, Tourism Bureau, Ministry of Labour, Commerce and Industries, Ministry of Finance. The Secretary for Fisheries as Chairperson of the co-management bodies such as the Advisory and Management Committee has the authority to co-opt other members as may be deemed fit under the Fisheries Management Act 2002 (section 9) stakeholder from outside and inside government may be chosen depending on what the issue at hand is to be.

There are three options provided below. Figure 9(a) is a model of the structures. The first option which is not provided here, status quo, provides government with the easiest options which is in fact the current system it has. This current approach does not benefit the community fishers. With lack of information opportunities have been lost to further promote and market the Tongan fisheries industry locally, regionally and internationally. The government selects whom it wants to consult with and decisions are made by the government and often have been predetermined. The second option, as in 9(b), is to adopt a Fishers Council. In this approach the arrows represent the flow of information and the cooperation needed. The Council is made up of members and representatives from the RCFA and TEFA. Thirdly as in 9(c) above, communities (RCFA) and commercial associations (TEFA) are separated. The decisions in both the second and third options are made collectively in the fisheries advisory. The differences from the current approached are that the members selected are responsible to their own associations which they represent. There is a clear representation, dialogue and disclosure of important information. In any case of selection of "b" or "c" the community (TCFA) may still be established under the same principles as described in Appendix 3. The DoFs can further facilitate its formation. The island groups will each have different community associations, e.g. Ha'apai Community Fishers Association, Vava'u Community Fishers Association and so forth to other islands. Together they will form the Tonga Community Fishers Association (TCFA).

(a)



(b)



c)

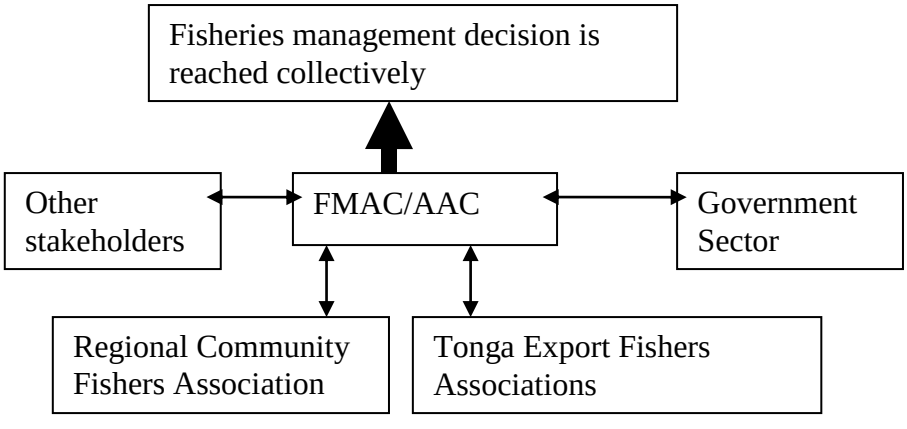


Figure 9: (a) The model for Tonga, (b) Tonga Fishers Council, (c) Independent Associations

Note: Explanation of the model and structures are provided in the text. Arrows represent the passing of information, representing of groups and associations in to the co-management body.

One question is how the Fishers Council is to be organised under an effective administration? The terms of reference of the Council should be chosen by its members. Furthermore some guidelines are provided in Appendix 3.

7 POSSIBLE EVOLUTION TOWARDS COMMUNITY FISHERIES MANAGEMENT

The purpose of this chapter is to explain how Tongan inshore open access fisheries have evolved into becoming community fisheries. And importantly, in this early stage of the change, to provide some useful means of identifying where it is necessary to establish the community fisheries and where it may not be beneficial to move into the new approach for the time being.

7.1 Why it has evolved?

The need for better control of inshore fisheries is essential to many communities and there is really a need for change where it is possible. The experience of community fishers with the open access situation is not good. At the same time government would like to decentralise its management activities. It has been uneconomical for a centralised management to manage fisheries from afar. The economic rationale is to provide communities with rights that will be beneficial to them. It is understood that by doing so it will provide communities with appropriate benefits, both socially and economically. The society and its institutions evolve and this evolution is affected by many factors such as information, incentives and responsibilities in the society.

7.1.1 What makes it evolve?

The fishers themselves have demanded new management arrangements in which their resources will be able to achieve sustainable economic efficiency. It has already been explained that the fundamental reason for this demand has been the decline in fisheries resources in the open access fishery. It follows that fishers have sailed further than before to get a better catch. Most communities have realised the increased value of some local fisheries species. In some small island communities in Tonga, commercial seaweed (brown algae known as "*mozuku*", commonly known as angel hair, which is a delicacy in Japan) operators have requested their need for exclusive rights to their adjacent waters. This is so that they are able to exclude and provide economic efficiency of their resources to themselves. The department does not have the human resources and financial capabilities to effectively enforce management measures.

7.1.2 The important information for management from the community

It is often acknowledged that a community knows and understands its environment better than a central authority. Although it lacks financial resources to carry out formal and systematic research, the community's traditional knowledge is often neglected by a centralised authority. Community developments are often kick-started by international donors. Although they encourage community involvement, little attention has been given to the social institutions and specific culture of the community. Often foreign donor organisations expect the community to change its

behaviour and provide sensible management from the donor's point of view. By ignoring those fundamental traditional values this often leads to unsuccessful management measures.

Generally, it is foreseeable that the community can enforce whatever fisheries management the members agree upon. As such the fisheries management should provide incentives for the fishermen to manage their fisheries more wisely than before. Hopefully this approach reduces further the costs of enforcement to government. The experience in Tonga shows that government controlled fisheries management has been very costly. Community fisheries management is a type of fisheries management that provides opportunity to create property rights. The responsibility for managing the resources should be borne by the communities.

7.1.3 How will the community members benefit?

By creating collecting rights and ensuring the rights have high quality (as explained earlier), understanding social, cultural values and allowing the community to plan their desired destiny one can achieve the desired socio-economic outcomes (Arnason 2006a). Experience has shown that in small islands such as Fiji, communities are aware of the decline in fisheries stocks and those problems can be addressed but somehow it is difficult for them to organise to carry out the necessary tasks (Veitayaki 2006). In Tonga, on the other hand, collectiveness is more important and communities have themselves requested such a change in the management of fisheries. The study stresses here that formal and informal traditional and social meetings must be used such as men's kava[2] clubs, women's working groups and youth development groups. These are outside the more formal *Fono* (formal village meetings where rank and status are paramount). Fundamentally in creating a neutral plan through consultations that realise the importance of community/village elders, respecting the rank of women and most importantly not condoning voices of the youths (as has been discussed in Chapter 5). They should not be made to confess that the decline is due to their own doing. In this case the community will negatively impact the efforts to be made. Exclusivity will be difficult in most communities (Hara 2001). Providing them with a feeling of ownership will lead to greater benefits. Government will have to assist in designing and implementing the legal structures which support the management regime.

7.1.4 Possible evolution towards community fisheries management in Tonga

The evolution of Tonga's inshore fisheries has to be carefully planned. It is the negative experience of an open access system which has caused government to seriously consider the shift to community fisheries management. Some communities may not be suitable for community fisheries management as exclusivity will be difficult and costly to implement and enforce. Communities such as those of the main centres will find it difficult to establish community fisheries management because boundaries are difficult to set up. Other development sectors are more important in those areas than fisheries. Fundamentally the important issues are for inshore fisheries; information, the incentives to make community fisheries management

[2] The Tongan community kava circle is similar to a men's club in the western society. Sharing a kava bowl allows for socialisation and friendship to occur. Fears are allayed and friendships cemented

happen and the collective responsibility to act on management decisions. For good fisheries management to work information is critical such as:

- Stock assessment for the most important species
- Fishing effortNumber of active fishermenTiming of fishingDistance to the fishing groundsPrice informationMarket information
- Distance to markets

Much of this information is something that the fishermen and the communities possess, but which may be difficult to obtain for the government. The study has discussed various factors which may help or hinder the introduction of community fisheries management in Tonga. Table 2 provides a simple outline of the main factors and whether they are positive or negative.

Table 2: Matrix of indicators for a successful introduction of community fisheries management.

Variables	**Description**	**Positive**	**Negative**
Geographical location	Isolated	√	
Exclusivity	Boundaries are easily identified	√	
Social obligation	Strong	√	
Resource dependency	Strong	√	
Commercial species	Strong	√	
Other sector prominent, e.g. tourism etc.	These areas would be the main centres in all the main groups.		√
Willingness to cooperate	Strong	√	

This table provides a fairly simple matrix which provides positive and negative factors to be considered in this regard. The matrix simply states that where it is positive an approach to community based fisheries management will be highly favourable. On the other hand, the negative concept forewarns that such an approach may be futile and may take years to implement. If it is pursued, it is likely that it will be very difficult to establish exclusivity. But the negative aspects may not mean that it cannot be established rather it will need more effort by fisheries authorities to educate communities.

Fundamentally any selection process should consider the matrix provided in Table 2. Another table (Table 3 below) is an attempt to locate where and in which communities community management may be feasible or not. Table 3 below provides fairly precise information which should pave the way forward in deciding whether certain communities might be able to establish community fisheries management or not. The “No” states that community fisheries management will not work as major conflict will definitely be the outcome. Therefore the study advises that management should remain under the government by using special management areas and closed seasons etc. The enforcement capabilities of the Department can be used to focus on

these areas. The "Yes" means that establishment of a community fishery management is highly favourable. Some concepts to which the above can be further progressed:

- Capacity of community to cooperate
- Provide a holistic approach so as to realise the social hierarchy of community members
- Rules for management of fisheries resources should be borne out of the community awareness discussion i.e. let them decide
- Department of Fisheries personnel to facilitate only
- Ensure the community members are committed to the process
- Provide community regulations and legal responsibilities
- Seek other stakeholders' support such as NGOs, commercial fishers and other government agencies

Table 3: Areas suggested for community fisheries management of fisheries in Tonga.

Islands/communities	**YES/NO**	**Explanation**
Main centres:- Nuku'alofa Pangai, Neiafu	No	Exclusivity is difficult. Effective cooperation is difficult. Other commercial activities are essential. Management will be enforced by DoF and government. Areas in front of DoF offices can be protected under Special Management Areas.
Tongatapu Group		
Hihifo (western) District		
Resorts, tourist attraction sites and traditional common picnic areas	No	Exclusivity is difficult. Overly demands by landowners are sensitive issues. Experiences in other pacific countries is not ideal.
Areas facing Nuku'alofa	Yes	Exclusivity can be mutually assigned.
Fo'ui to Utulau	Yes	Exclusivity is possible. Boundaries of communities may easily be identified.
Vahe loto (Central) District		
Pea to Vaini including Folaha and its surrounding neigbours	Yes	Fanga'uta and Fangakakau lagoon area can be further managed by these communities.
Southern waters	No	Naturally controlled and most are common public picnic areas.
Hahake (eastern) District		
Tourist sites and common picnic areas	No	Same reason as in western district.
From Malapo to Niutoua	Yes	Each community can easily establish community fisheries management either collectively or individually by villages.
From Haveluliku to Fua'amotu	Yes	As above.
Islands off Tongatapu if inhabited	Yes	They must be encouraged to close their fishing waters from outsiders.
Islands off Tongatapu not inhabited but owned by individuals	Yes	These areas can be declared as Marine Protected Areas only as far as their fringing reefs but are open from after certain years for fishing and fishing rights to be paid to owner.
Ha'apai Group		
Far South islands ('Otu Mu'omu'a) Frontier Islands	Yes	Exclusivity main factor, boundaries are easily demarcated, subsistence, semi-commercial fishing important
Southwest islands ('Otu Lulunga) 'O'ua	Yes	As above but also have international commercially valuable marine products which are important for exclusivity.
'Otu Lifuka	Yes	As above

Except for the Pangai Area		The islands which are closer together may need more critical decisions on how best to close their own coastal waters and provide exclusivity. Enforcement can be carried out by them. Certain areas of Pangai, in front of DoF office, may become a special management area enforce by DoF.
		Island communities of typically more than one village may need to decide how to close or by collective closed areas.
Vava'u Group		
Main island	Yes	Area for exclusivity may need to be well defined and not too far out.
Islands to the South	Yes	Exclusivity must be established.
Tourist sites, resorts	No	Depends on the communities.
'Eua	Yes	But may need special consideration with tourist activities.
Niuas	Yes	Exclusivity is fundamental. But may need consideration of its population. The tilapia in its internal waters may need the Department to look at its commercialisation.
Other options		Such as area of Special Management Areas (SMA), Spatial Management or Rotational.

8 CONCLUSIONS AND POLICY RECOMMENDATIONS

The main purpose of fisheries management is to increase economic returns from the fishery. It follows that it must contribute to the nation's gross domestic product (GDP). To be able to provide efficient and effective fisheries management it is fundamentally important to establish co-management institutions between fishers, fishing industry and the government. Co-management is built upon shared partnerships and responsibilities. It is important to involve fishers in the decision making process as the future of their fishing activities lies in the policies that are to be put in place. Information is crucial to fisheries management. The social sharing and collectivism of Tongans provide a way forward for fisheries management and make it feasible to establish co-management institutions.

The evolution to community fisheries management in Tonga has been slowly driven by the continuing poor results experienced by fishers. Those poor results are reflected in their low catches and the poor economic benefits the fishing activity generates. The fundamental idea behind community fisheries management is the strengthening of their rights to its adjacent and surrounding waters. The rights provide the community with ownership so that they are better able to exclude and enforce the management measures they themselves choose. It is essential to remember that political empowerment of ownership can be a double edged sword, i.e. too much power can lead to a political disaster as has been the experience elsewhere in the Pacific. Therefore it is very important to consider that the objective of fisheries management should focus on economic benefits and sustainable resource management. It needs to be acknowledged that some communities in Tonga will have difficulties in establishing community fisheries management. But further studies are necessary.

Studies of co-management and its use have been beneficial in gaining further insides into the fisheries management problem. But there are challenges to be tackled. Those challenges revolve around the willingness of government to let go of its management efforts, the capacity of the users to accept responsibilities and identify who are considered relevant stakeholders, and how it is possible to resolve conflicts. The economic benefits and efficiency objectives for Tonga should be clearly determined. For Tonga this study should provide a way forward and help in the discussion of co-management and may also generate ideas for other fisheries in the Pacific region

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APPENDICES

Appendix 1: Fisheries Management Act 2002 of the Kingdom of Tonga

PART II - FISHERIES CONSERVATION, MANAGEMENT, SUSTAINABLE UTILISATION AND DEVELOPMENT

3 Responsibility of the Minister

The Minister shall, subject to this Act, be responsible for conservation, management, sustainable utilisation and development of fisheries resources in the Kingdom and the fisheries waters.

4 Considerations in the exercise of powers

In any exercise of powers under this Act, the Minister shall ensure that the following are considered:

(a) the need to ensure the long term conservation and sustainable use of fishery resources, and to this end adopt management measures which promote the objective of optimum utilisation and to achieve economic growth, human resource development, employment creation and sound ecological balance;

(b) the need to ensure that management measures are based on the best scientific evidence available;

(c) the application of the precautionary approach at no less standard than set by criteria in the Fish Stocks Agreement or any other fisheries management agreement;

(d) the need to conserve aquatic living resources and protect biodiversity in the marine environment for present and future generations;

(e) the need to protect the ecosystem as a whole and the general aquatic environment and adopt, where necessary, conservation and management measures for species belonging to the same ecosystem or associated with or dependent upon target stocks;

(f) the need to minimise pollution, waste, discards, catch by lost or abandoned gear, catch of non-target species and impacts on associated or dependent species, through measures including, to the extent practicable, the development and use of selective, environmentally safe and cost effective fishing gear and techniques;

(g) the need to take measures to prevent or eliminate over-fishing and access fishing capacity and to ensure that levels of fishing effort do not exceed those commensurate with sustainable use of fishery resources;

(h) the interests of artisanal and subsistence fishers;

(i) the need to collect and share in a timely manner and in accordance with fisheries management agreements and international law, complete and accurate data concerning fishing activities on, inter alia, vessel position, catch of target and non target species and fishing effort, as well as information from national and international research programmes;

(j) the need to promote and conduct scientific research and develop appropriate technologies in support of fishery conservation and management;

(k) the need to implement and enforce conservation and management measures through effective monitoring, control and surveillance;

(l) the need to promote, to the extent practicable, broad and accountable participation in the management and conservation of fisheries resources and understanding for the need for conservation and sustainable development of aquatic living resources;

(m) any relevant obligations of Tonga under applicable rules of international law and international agreements.

5 Determination of total allowable level of fishing

The Minister shall, in consultation with the Fisheries Advisory Committee, determine the total allowable catch or total allowable level of fishing with respect to any stock of fish subject to the provisions of this Act or as provided in a fisheries management agreement.

8 Fisheries Management Advisory Committee

(1) The Minister shall establish a Fisheries Management Advisory Committee which shall advise him on such matters relating to the conservation, management, sustainable utilization and development of fisheries in the Kingdom.

(2) The Committee shall comprise the following members —

(a) the Secretary as the Chairman;

(b) the Secretary for Lands or his nominee;

(c) the Secretary for Labour Commerce and Industries or his nominee;

(d) one member representing commercial fisheries interests nominated by the Tongan Fish Exports Association;

(e) one member representing women's interests nominated by the Minister;

(f) two members representing local fishermen nominated by the Minister;

(g) one member representing Coastal communities nominated by the Prime Minister;

(h) such other persons not exceeding two whom the Secretary may think fit to appoint.

(3) The members other than ex officio members shall be appointed for a period of 3 years.

9 Co-opting members

(1) Where the Secretary refers a matter relating to an application for a licence, permit or authorisation or renewal thereof to the Committee for review, the Committee shall co-opt any person from the community that has responsibility for the subject of the application.

(2) The Committee may co-opt any person representing commercial fisheries interests, women's interests, local fisherman, coastal communities or other such persons as they think fit by reason of any particular expert knowledge or skill, to be a member to assist it for a specific purpose.

Appendix 2: Aquaculture management Act 2003 of the Kingdom of Tonga

11 Aquaculture Advisory Committee

(1) There shall be established an Aquaculture Advisory Committee to advise the Minister in relation to —

(a) any matter on which the Minister or the Secretary is required to consult the Advisory Committee under this Act;

(b) policy, planning and guidelines for the regulation, management and development of aquaculture;

(c) the elaboration or review of the aquaculture plan referred to in section 4 and codes of practices referred to in section 10;

(d) the approval of plans for collaboration on aquaculture management with other foreign or local institutions;

(e) co-operation on the management and development of aquaculture among relevant government agencies and local communities;

(f) appropriate public awareness programmes on the need for proper management and development of aquaculture;

(g) the establishment of aquaculture areas and buffer zones;

(h) any matter relating to aquaculture which the Minister refers to the Advisory Committee for investigation, deliberation and advice.

(2) The Advisory Committee shall comprise the following members:

(a) the Secretary who shall be Chairman;

(b) an officer of the Department of the Environment;

(c) an officer of the Ministry of Labour, Commerce and Industries;

(d) an officer of the Ministry of Marine and Ports; and

(e) three representatives of the aquaculture industry appointed by the Secretary in consultation with fish farmers associations and organisations involved in aquaculture affairs.

Appendix 3:

The Proposed Objectives for the Tonga Fishers Council:

- To promote an effective overall voice for the fishers sector to government
- To promote seafood and increase economic benefits for Tonga
- To promote awareness of importance of community fisheries
- To promote collective co-management with government, regional organizations in the pacific.
- To gather information that will be of importance to the sustainability of fishing in Tonga.

The TFC will seek to be effective in obtaining the objectives by:

- Active in lobbying legislation for the betterment of fishing activities
- Liaise with Department of Fisheries on a co-management approached
- To provide better policy conducive to fisheries
- Provide active participation to the Fisheries Management Advisory Committee and Fisheries Management Committees.
- Promote community fisheries management
- Provide assistance to fellow small scale fishers in community fisheries management.
- Working together to enhance quality of seafood locally and internationally
- Assist Department of Fisheries in providing public awareness of importance of fisheries
- Participate in Tonga's Trade Shows
- Providing active participation in conferences, workshop.
- Provide opportunities for youth as career opportunities.
- Encourage its members to always abide by fisheries legislations

The Tonga Fishers Council terms of reference should be agreed on by its members:

- It shall select a President, Vice President and other important positions and must be provided under an agreed constitution.
- An interim President (preferably from the newly organised TEFA) may be required to assume this responsibility before an overall constitution is approved and funds are being received. It may further need the assistance of the DoF to get it implemented.
- The Council must be registered in accordance with the Cooperative Societies Act 1988 so that proper legal documentation for accountability and transparency is adopted. An office should be set up from where certain duties can be operated from for the benefit of all its members.
- Members of the Council are normally too busy to be involved in the everyday running of the office. Experiences in Tonga show that paid staff are necessary to ensure that the work done will benefit the fishers. The office shall collect, organise, record and distribute the council's decisions on all fisheries matters. It is advisable that the office should not be run by volunteers. Fundamentally an executive officer who is of professional qualities is able to prepare submission to government and can provide assistance to members on all its

affairs. There are possibilities of funding for the establishment of this council office which can be sourced from international donor agency and government related activities.

- A certain percentage of the annual US Treaty funds may be required to provide for the membership fees of the Community Fishers representatives. The US Treaty funds is Tonga's share from the multilateral treaty on fishing of Tuna fish from the Pacific under Forum Fisheries Agency (FFA), this is describe in chapter 2. Obligatory annual fees should be required from the TEFA members. The fees should be proportional to license and registration fees as part of the annual renewal of fishing licenses. It ensures their participation and a continuing budget. Further it ascertains salaries for those who work in the office.
- The membership fees of an obligatory annual fee must be first approved and legislated as part of the license fees to be handed over to the Tonga Fishers Council. As it may be difficult to rely on voluntary donations.

Coastal Community Management Committee (CCMC):

Chairperson

Vice chair

Secretary

Vice Secretary

Treasurer

Vice Treasurer

Coordinator

Deputy Coordinator

Youth Representative

District Officer

The committee is responsible for management plan, enforcement, and awareness, provide information to fisheries officers, and consult other nearby communities.

The responsibilities of the Regional Associations are as follows;

- Individuals from the regional centres shall meet and choose an active representative, who has the capacity to be named as a Regional Representative of the Island as whole. e.g. All of the Ha'apai CCMC chairperson gets together and select representative to the Council through the TCFA.
- These selection processes may be facilitated by the Department of Fisheries. A general traditional approached to any selection requirements at this time may be necessary. It can be informal. But this may need to be further elaborated.
- To provide strict terms of selection mechanism at this stage may not be favourable. It is important to provide awareness to provide consensus for mechanism and constitution of the Regional Association for future selections.

- To begin with, no more than two representatives shall be chosen from each Regional Island (Tongatapu, Ha'apai, Vava'u, 'Eua and the Niuas) to be the representatives into the Tonga Community Fishers Association. This should at least provide some confidence to the members.
- The members should meet as when matters arise that require an overall input from the fishing communities. It is paramount that the DoF facilitates and assist in this early establishment until the Tonga Fishers Council is firmly established.
- In areas where community fisheries management is not possible, town officers may be the ideal representatives. In cases where it is a district, the District Officer may be the representative.

Appendix 4

Q measurement of property rights (Arnason 2006b):

$Q = S^{\alpha} E^{\beta} P^{\gamma} (w_1 + w_2 T^{\delta})$
Where $\alpha, \beta, \gamma, \delta, w_1, w_2 > 0$ and $w_1 + w_2 = 1$
S= security, E= Exclusivity, P= permanence(durability), w= weight, T= transferability.