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MANAGEMENT OF INSHORE ARTISANAL FISHERIES IN GUYANA: A CO-MANAGEMENT APROACH

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ABSTRACT

Government intervention into fisheries management is mostly to prevent the over exploitation of stocks and ensure economic benefits from the fisheries. In order to achieve this goal the government has to have an effective management system in place that will ensure that all decisions have the desired effects. In most of these cases fishers are not involved in the management process and decisions are made without consulting them. This is one of the reasons why fishers often ignore the decisions and since they are aware that the government is in many cases incapable of enforcing these decisions they get away with it. This situation eventually leads to the decline of the resources and decreasing profits from the fisheries.

One way out of this dilemma is by getting the fishers involved in the management of the resources through empowerment. Since the government is unable to manage the resources centrally it has become necessary to decentralise power so that some of the management can be given to the fishers.

In order for this to occur the government may need to form partnerships with communities for them to assist in managing the resources. At the same time the fishermen gain but have to be responsible for their decisions and actions. In Guyana through the fishing co-operative societies that are already established, the government has an opportunity to share in the management of the resources. This can be achieved by using TURFs as a special variety of property rights based systems of fisheries management.

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AFAC	Artisanal Fisheries Advisory Committee
AFIP	Artisanal Fisheries Infrastructural Programme
CFRAMP	Caribbean Fisheries Resource Assessment and Management Programme
CIDA	Canadian International Development Agency
CPUE	Catch per unit of effort
CRFM	Caribbean Regional Fisheries Mechanism
CARICOM	Caribbean Community
CTA	Technical Centre for Agricultural and Rural Co-operation
CARDI	Caribbean Agricultural Research and Development Institute
DOF	Department of Fisheries
EC	European Community
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GNN	Gillnet nylon
GNP	Gillnet polyethylene
GATOSP	Guyana Association of Trawler Owners and Seafood Processors
FJS	Fisheries Judicial System
FMS	Fisheries Management System
IQ	Individual Quota
ITQ	Individual Transferable Quota
IUCN	International Union for the Conservation of Nature and Natural Resources
MCS	Monitoring Control and Surveillance
MOA	Ministry of Agriculture
MOA	Ministry of Agriculture
Mt	Metric tonnes
m	metres
NRDDB	North Rupununi District Development Board
NAAG	National Aquaculture Association of Guyana
TAC	Total Allowable Catch
TURFs	Territorial User Rights in Fisheries
UNCLOS	United Nations Law of the Sea Convention
USD	United States Dollars

1 INTRODUCTION

The need for governments to get involved in fisheries management is to prevent the biological and economic over-exploitation of resources that happens in open access fisheries. In Guyana the fisheries management system is affected by a number of constraints that can be summed up as inadequate decision-making mechanisms, lack of conflict resolution and enforcement, insufficient knowledge of the resources and resource users, insufficient use of scientific and related information in the decision-making process and inadequate human and financial resources (CRFM 2004). As such, there is a need to address these constraints as well as find more innovative ways to manage the fisheries resources in order to optimise the benefits to stakeholders.

The fisheries problem is well known and expresses itself as excessive fishing capital and fishing effort, reduced fish stocks and loss of economic rents to the point where the fishery is economically hardly worth pursuing (Arnason 1999a). This can be referred to as the common property problem where the resources are not exclusive to anyone and the use of the resource by one person takes away from the welfare of the other users (Bhim 2001). Fishers therefore rush to fish as much as they can and for as long as possible depleting the resources. There is therefore a need to find and enforce systems where the stocks can be replenished; fishing and capital effort are reduced and the economic rents are restored.

The open access system described by (Bromley 1992) is where users have mutual privileges and no rights and where no user has the right to exclude any other user from the resource. This system comes from the absence or breakdown of regulations put in place by the authorities, whose very responsibility it was to have enforced these rules among the resource users. If these rules and regulations are not in place this can lead to over-exploitation of the resource and total depletion

In Guyana the artisanal fishery is open access where access to the resources is constrained by licenses granted by the government. The government has, however, failed to effectively implement fisheries management plans due to inadequate resources both financial and personnel. Monitoring, control and surveillance activities have taken a back seat to other activities such as narcotics trade and fuel smuggling which the government is trying to eradicate. Also, over the years fishing has been viewed as an activity of last resort. However, the government is currently working on revised management plans for the fisheries sector and the recommendations from this report can be used in developing the new management plans.

Fishers through their co-operative societies have been trying to become more active in the management of the resources. They have asked for some assessment of grey snapper and banga mary (Appendix 1) and have indicated that they would be willing to collect the necessary data for such assessments. They have also requested training for some of their fishers to obtain licenses to operate vessels and have shown keen interest in working with the Fisheries Department and other agencies to address other fisheries issues. Two such issues are the zoning of the fishing areas so as to reduce gear conflicts, and the banning of pin seines from the fisheries.

A solution needs to be found that could serve the needs of the fishers and the government in management of the fisheries resources. The government lacks the capabilities to implement management plans and enforce and monitor regulations within the industry. The fishers need more involvement in the management of the resources that they harvest and more participation with the government with regards to decision-making in the industry.

The objectives of this study are to identify and describe the best fisheries management system for the artisanal fishery within the framework of the fisheries co-operative societies and their fishing communities. This will include the recommendation of an appropriate type and level of co-management between government and the co-operatives and the development of an implementation plan for the chosen management system.

In order to achieve these objectives the study will look at the issues associated with the common property and try to set out the solutions in a management system specific to the artisanal fishery of Guyana. The various fisheries management systems will be examined through a literature review and then the appropriate system will be recommended for Guyana.

2 THEORETICAL REVIEW OF FISHERIES MANAGEMENT SYSTEMS

The common property problem (Hardin 1968 and Arnason 2002) is characterised by biological over-exploitation and economic waste. These problems manifest themselves in a number of ways which include excessive fishing effort in the form of too many vessels, small fish stocks, and low personal incomes for fishers, little or no profitability, and low contribution to the GDP from the industry.

These problems can be addressed by implementing an appropriate management regime for the common property, and thus making it an optimal fishery where increased profits can be had and the resources managed in an efficient way. In cases where the resources have been depleted necessary measures such as reduced effort need to be taken to rebuild the resources and ensure that they are not depleted again. This calls for measures that involve a combination of management tools, which can be both biological and economical, that would constitute a management system. New regulations may have to be developed and enforced so as to effect the change.

2.1 Theoretical considerations for fisheries management

Under the open access fishery there is rivalry in exploitation of the resources by anyone who has the capability and desire to harvest the resource this can eventually lead to common property problems. The common property problem in the competitive fishery is illustrated in Figure 1 below (Arnason 2002).

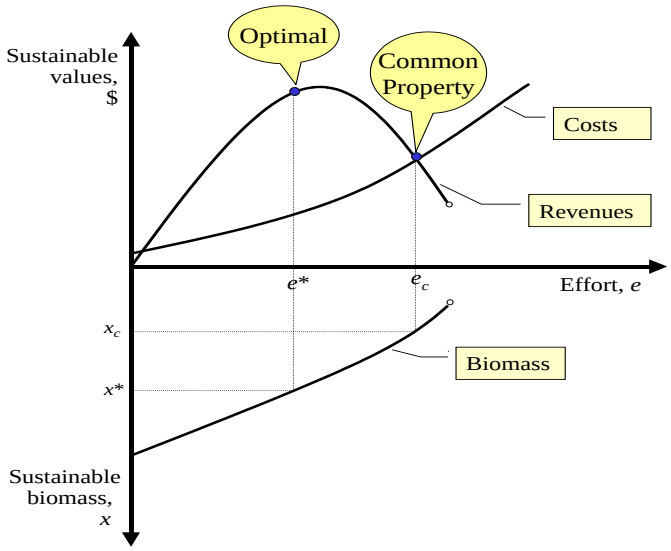

Figure 1: The sustainable fishery model where sustainability is measured against effort (Arnason 2002)

The figure shows a typical fishery with revenues, biomass and cost curves as a function of effort. The lower part of the curve shows the biomass as the fishing effort increases. Effort is demonstrated as the number of vessels, so as the number of vessels (effort) increases the biomass decreases and so do the revenues.

The competitive fishery is an unmanaged fishery that has no limitations and restrictions on such things as harvesting levels, fishing areas, etc. Anyone can enter the fishery and choose whatever harvesting methods they prefer. At its early developmental stage the fish stock is large, resulting in good catches and high profits on investments. The high profits encourage the fishers to invest more in the fishery and attract new entrants. This increase in effort over time will cause the fish stocks to be depleted until the profits are reduced. However, the fishery will continue to expand until there are no more profits to be made. Eventually, the less efficient fishers will leave the fishery because there is no more economic gain to be had. The reduction in effort can lead to the rebuilding of the stocks, but since the stocks are common property there will be expansion again in the number of fishers until the stocks collapse and so the losses will continue in the fishery (Arnason 1993).

Most fisheries around the world have some form of management system in place. But management systems are of little or no consequence if they are not properly implemented. Penalties must be handed out to alleged transgressors of the regulations, when the management rules are not followed or are circumvented. If this is not done it can lead to an outcome of a competitive fishery (Arnason 2001)..

Therefore competitive fisheries are ones in which the profits are zero, fishing effort is greater than the optimal sustainable effort and the biomass is lower than the optimal sustainable biomass.

The need to have these fisheries managed in a manner that is beneficial to all is therefore quite necessary. In order for this to occur the necessary fisheries management tools in the right combination have to be put in place and observed by all stakeholders.

2.2 Fisheries management regime

Any fishery whether managed or unmanaged has some form of social institutional framework that constitutes a fisheries management regime. This is considered to be a set of rules and regulations that control the fishing activities. In some cases these regimes can be quite complex as in developed countries with a set of institutions that regulate the fishery or it may be a simple regime that consist of social traditions and customs. In either cases the management regime consists of three components; fisheries management system, monitoring control and surveillance and fisheries judicial system Figure 2.

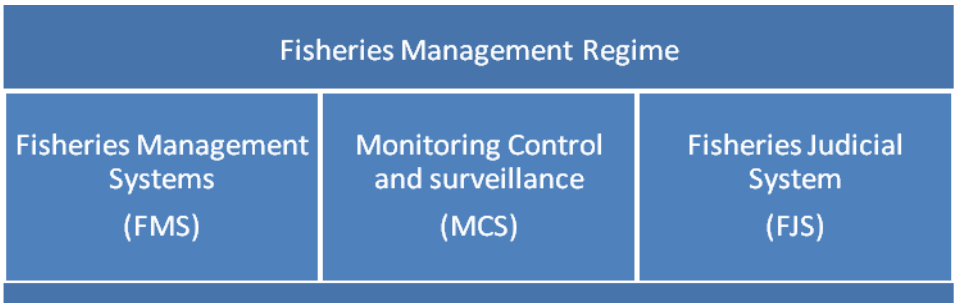

Figure 2: Fisheries management regime (adapted from Arnason 2000).

An FMS consists of a set a rules and regulations regarding the fishery. In most countries, this is where the legislation of the fisheries is explicit. The monitoring control and surveillance activities (MCS) are used to enforce the regulations that are in place for the management system and also to collect any relevant data on the fishery for anaylsis and research. The function of the fisheries judicial system (FJS) is to process alleged violations of the rules and issue punishments to the violators of the regulations. These three systems are interlinked and must be effective for any fishery regime to be successful.

The cost of monitoring control and surveillance (MCS) can be quite expensive and can be as high as 20% of the value of the fisheries or more (Arnason 1999a). In most cases due to lack of resources to carry out MCS activities the entire management programme is weakened. Fishers usually take advantage of these weaknesses and do significant damage to the resources. In Guyana less than 2% of the annual fisheries budget is used for MCS activities (Fisheries Department 2006).

The fisheries management system will be discussed in more details later in the report since it is the appropriate management system to be developed and not the management regime that is needed in Guyana.

2.3 Fisheries management systems

A fisheries management system is a set of rules laid down either formally or informally on how a fishery should be managed. This could be either in the form of legislation and regulations or as a part of a social culture. In most cases both of these rules can be applied. The main purpose of fisheries management systems is to generate net economic benefits from the fishery.

The management systems can be grouped into two major categories which are direct and indirect fisheries management (Figure 3).

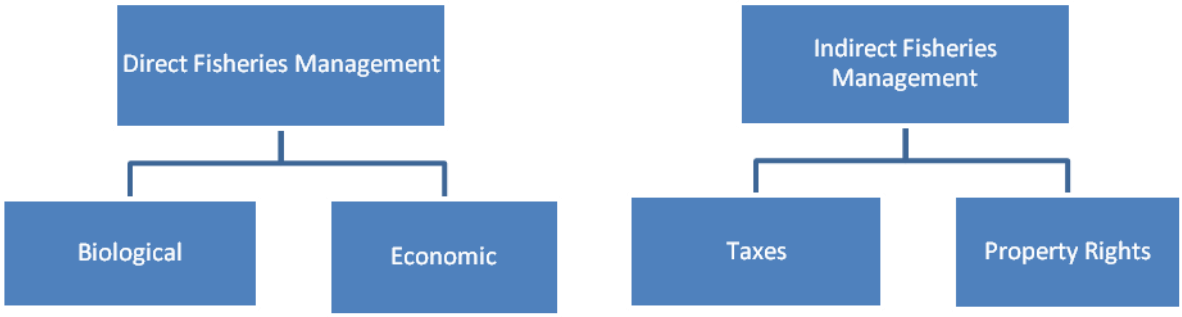

Figure 3: Classification of fisheries management systems (Arnason 2000)

2.3.1 Direct fisheries management systems

Direct fisheries management systems were first used in open access fisheries after the resources around the world started to decline and managers thought it best to regulate the fisheries through restrictions (Scott 1999).

Direct fisheries management considers the growth and the status of the resource and can be either biological or economical. This type of management attempts to control fishing activities directly by restrictions, such as gear restrictions, area closures, time restrictions, total allowable catch, and vessel and effort restrictions.

Biological fisheries management only seeks to enhance the stock and consists of methods to increase biomass growth. These methods may include gear restrictions which regulate such things as mesh sizes and hook sizes so that fishers can only catch a particular size of fish. Area closures which involve closing areas such as spawning grounds and nursery areas to allow for recovery of stock after the stock size has been reduced and also time closures which prohibit fishing at certain times of the year. All of these restrictions can be used separately or in combination to allow for stock enhancement. However, this does not solve the problem of the common property, since an increase in the stock will lead fishers to increase their effort until the profits again disappear. It should be noted too that this type of fisheries management is quite expensive since it requires MCS enforcement activity and an effective functioning judiciary system for offenders (Arnason 2000).

Direct economic fisheries management is designed to improve the economics of the fishery by reducing fishing effort. Some direct restrictions used are fishing time, such

as number of fishing days and number of days at sea; reduction in fishing capital, for example capacity of vessels, engine power, vessel speed and vessel size; and fishing gear such as gear type, volume and units of gear. This type of management also can lead to stock enhancement. Fishers have over the years found ways to circumvent these restrictions, e.g. Scott (1999) if fishing days are restricted fishers will increase the number of vessels, and if both vessels and days at sea are restricted then they will perhaps get faster and bigger vessels with more storage to counteract these measures. The fishers seem to find ways around these measures since enforcing the restrictions are expensive and often difficult to implement.

2.3.2 Indirect fisheries management

Indirect fisheries management relies on the use taxes and the different types of property rights.

2.3.2.1 Taxation

It has been observed that there are severe problems both technical and social with using taxation as a management tool and, as such, it has not been used in any significant fishery since this type of management is costly to enforce. The objective of the tax is to make the fishery less profitable thus reducing the effort to an economically viable level (Arnason 1993). If properly introduced this management tool can induce the fishery to operate in a socially optimal way. This is done by reducing revenues and increasing the cost of fishing. Taxes can either be placed on the fishing inputs such as gears, vessels, etc. or on catches. However, it has been recommended that taxes should be imposed on catches instead of inputs. Taxes on inputs can lead to substitution away from taxed inputs to those not taxed (Arnason 2000).

2.3.2.2 Property rights

Property rights can be described as the right given to an individual or a group to harvest a particular resource, in a selected area, over a given time. Property rights as a management tool have been widely applied and met with some degree of success. Property rights approach to fisheries management has been used in an attempt to remove the common property problem (Arnason 2001). This is achieved by establishing private property rights over the fish stocks. A property right in itself is not a single variable, but it consists of a number of characteristics (Scott 1999).

The various characteristics of property rights (Figure 4) are security, exclusivity, permanence and transferability. They are measured between the ranges between unity to zero and the higher the quality of the character of the property the better it is (Arnason, 2006). The illustration in Figure 4 shows what a perfect right should look like and also what the actual property rights in most cases look like. Property rights are difficult to measure but it can be done using indices. A perfect property right happens when all the characteristics are measured and equals one and they form a rectangular shape, this means the property is high since all the characteristics it possesses are high. However, this is not the case in most fisheries some of the characteristics of the property may be less than one on the scale, e.g. there is hardly any fishery where only one fisher is allowed to use the resource, thus exclusivity is

reduced, then perhaps the property may not be transferable or fully secured. This may be due to the government or the owner of the resource laying down rules on the use of the property. These effects can further reduce the quality of the property. In most cases an actual property may have high exclusivity and permanence but very low security and transferability.

Figure 4: Characteristics of property rights showing the relationship of the properties (Arnason 2000).

Security of title means its strength as a legislative right. Therefore, if the property right is challenged by government or other institutions, the owner cannot hold his property with much certainty. Zero security means the owner will lose his property (Arnason 2000).

Exclusivity is the ability of the property owner to utilise and manage the property in a manner that best suits him without interference from outside forces. Any outside influence that interferes with this right such as fishing restrictions placed by the government will reduce the quality of this particular characteristic.

Permanence is the time span of the property right and if it is zero then the property has no value.

Transferability means the ability of the owner to sell or lease his property. This is very good for a valuable and scarce resource, since it allows for optimum allocation of the resource to competing users as well as uses. Instead of using the resources for fishing it can be used for other activities such as tourism and sports fishing especially if the resource is depleted or has too many competitors.

There are several types of property rights and they include the following: territorial user rights in fisheries (TURFS), individual quotas, sole ownership, access licenses and community rights. A given property right may consist of all four characteristics. Divisibility and flexibility are considered property rights and are treated as a subset of the characteristics transferability (Scott 1999).

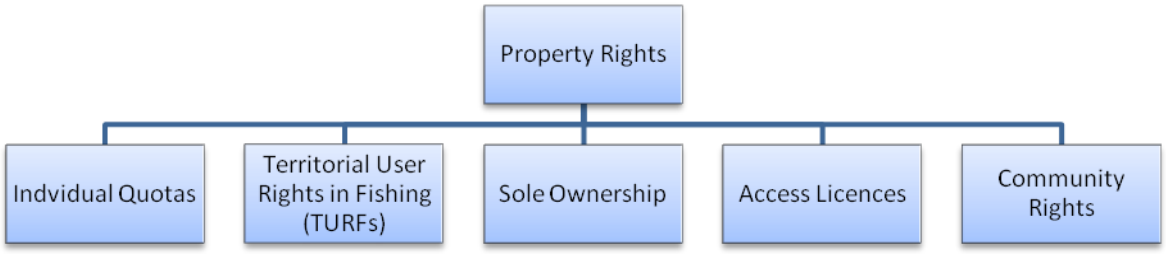

Figure 5: Various types of property rights

a) Individual quotas (IQ)

IQ systems have been implemented around the world with some amount of success, and they offer the most promising approach to fisheries management of the resources. From an economic stand point, they appear to be better than other systems once they are adequately monitored and enforced. Allocation of catch quotas to fishers or fishing firms gives them a certain level of property rights of the fishery and since the fishers' catch is secured by their quota holdings, the common property nature of the fishery is eliminated (Arnason 2000). This system frees the fisher from competing with other fishers, so they are able to concentrate on minimising harvesting costs, maximising the value and improving the quality.

Transferable and divisible IQs are referred to as individual transferable quota (ITQ), and, if permanent, they are considered a complete property right (Arnason 2000). Over time ITQs create incentives to invest in the fishery and maximise profits. Innovations in technology in the fishery would be used to enhance revenues and reduce harvesting costs (Hannesson 1994). This system has been successful in a number of fisheries such as in New Zealand, Iceland, Greenland and Australia. It must be noted that in order for this system to work, there must be some scientific knowledge and understanding of the fishery resources so as to allocate the total allowable catch.

b) Territorial user rights in fishing (TURFs)

TURFs are certain demarcated areas in the ocean given to a sole owner or a group of people that gives them the exclusive right to resources in the area. In some cases the right maybe to just harvest a particular stock or to use a particular gear in the area. Also, it can be given for all the resources within the specified area. Since TURFs convey the right to fish within a specified area fishers do not have the need to race to fish and are able to self regulate and manage the resources to the benefit of the group. TURFs have been known to be used in areas where the ITQs are not quite applicable especially in multi-species multi-gear fisheries that cannot be monitored effectively and are difficult to control. This type of management system can also be used where the fish stocks are not known and data is not available to allocate, monitor and enforce catch quotas. TURFs have been used traditionally in Japanese fisheries for centuries. Access rights and management of the area are coordinated by the fishers association responsible for the TURF. This system also operates in Chile. It was adopted by the government after some important commercial stocks were being over-fished (Cancino *et al.* 2006). Other areas where this type of management has been instituted are the Pacific, the oyster fishery in the United States of America, mussels and scallops in New Zealand and ocean quahog in Iceland (Arnason 2001).

Even though most TURFs used around the world are for sedentary species Christy (1999) suggested that TURFs as a management tool can help solve the problems in small-scale fisheries in the developing world, and that it also creates devolution of power from central to local authority. He further stated that this type of management creates a property right for the community allowing them to determine the management system.

TURFs are used in India where in some areas the coastline is over 600 km long with over 200 landing sites using 22 different types of gear and dozens of different species are landed daily. It is also used in the Maldives in the tuna fishery (Christy 1999).

c) Sole ownership

Under sole ownership the problem of the common property is solved since the right to fish belongs to one owner (Scott 1955). This means he can manage the property in the most efficient manner. Under this property right there is no damaging competition for harvesting shares. The owner has to decide, however, what management tools he would use in the fishery and how best to keep out poachers.

d) Access licences

Access licenses have been used all over the world to control and regulate fishing effort, after it was noted that limitations on gear and closures were inadequate to solve the problem of the declining stocks. The concept was to reduce the number of vessels by issuing licenses, with the license itself playing no part in regulating the fishery, but it was being used as an entry into the fishery (Scott 1999). The licenses gave the holder the right to participate in the fishery, but did not eliminate the common property problem. Fishers did whatever was necessary to improve their share of the resource (Arnason 1999b) e.g. fishers were acquiring more licenses and then increasing the storage capacity of these vessels. Attempts were then made to limit the number of licenses; again this did not put limits on the vessel catch. Therefore, alone it could not bring down the catch levels to that which was needed. The decrease in catches and the increase in harvesting costs, however, caused fishers to see the need for regulation of the fisheries since they had invested capital and they had a common interest in conserving the stock. The license then became a property with three main attributes: exclusivity, transferability and security which complimented each other. This made the fishery no longer an open access one (Scott 1999).

Access licenses are presently being used in Guyana both in the artisanal and industrial fisheries. The licenses in the industrial fishery are restrictive and are sold above the market value of the product.

e) Community fishing rights

Community fishing rights is an arrangement where a group of people is given the collective right to operate and manage a fishery. In many developing nations with artisanal fisheries this type of management system is a viable option. Over the years governments have failed in their management approaches and there is a need for some forms of participation by the resource users in the management of the fisheries resources (Arnason 2006).

The interest in community rights has grown over the years and in some instances community rights have been used instead of ITQs, since it was noted that not all fisheries can benefit from the ITQ system. This can be seen in a number of artisanal fisheries where there are different combinations of gear and vessels, along with numerous landing sites that are not managed and dozens of different species that are landed during the year (Christy 1999).

Under a community rights system, a fishing community is given exclusive harvesting rights in a particular fishery or in an entire fishery. The rights are given in two forms: use rights and management rights (Charles 2006). With use rights, the community has the right to harvest the resources and this can be done through access licenses, TURFs and community quotas. The manner in which the fishery is pursued can be determined by the community. Management rights give the right to be part of the management of the resource. The advantage of such a system is that it is often socially acceptable according to Arnason (2001), and assists in carrying out fisheries management rules because of the social and physical proximity of the community participants.

A number of fishers belonging to the same community can regulate access and enforce rules through a co-operative institutional framework to use the fisheries resources in a sustainable way. This management system can be deemed traditional fisheries management. It has been in existence for many years all over the world but they have in many cases disappeared or become weak due to government interference in restructuring, technology development, and unequal distribution of benefits in fishing communities and other socio-economic changes (Pomeroy 1995).

One of the many causes for the failure of community rights is the lack of recognition by governments of the benefits of such systems and as such a lack of protection for them. However, with greater awareness for the need to better management and the role of self-regulation, there are chances now to re-establish community based management through the use of TURFs (Christy 1999).

2.3.3 The concept of the co-management approach through co-operative societies

The reason for using community based fisheries management is that governments are ill equipped to deal with the management costs of fisheries. They are also quite incapable of monitoring and enforcing the regulations in the fisheries since it is a very expensive activity. It is believed that the community based co-operative fisheries management system will keep those management costs down and the co-operatives will assist in the implementation of monitoring, enforcement and surveillance activities. This then reduces the burden of the government through power sharing and appears to be viable for artisanal fisheries (Pomeroy 1995).

It has been observed that the co-operative approach has been used in an ad hoc manner in times of crisis as a last minute resort. Now co-management is being used as a management tool in fisheries management after recurrent crises have tarnished the top down bureaucratic and science based approaches to fisheries management (Jentoft *et al.* 1998).

This type of management system takes into account the local situation where a group of people of common interest control and manage their resources. It also gives them the accountability and the responsibility for managing their resources.

Charles (2006) noted that there has been a shift in recent years in fisheries management where the trend is the devolution and decentralisation of governance to more localised governance. Where governments and co-operatives work together in a co-management system their roles have to be well defined. Such co-management can

be categorised by a spectrum of five main areas depending on the role of the fishers and the government play: instructive, consultative, co-operative, advisory and informative (Sen and Nielsen 1996). The arrangement of co-management between government and co-operatives can be seen in Figure 6

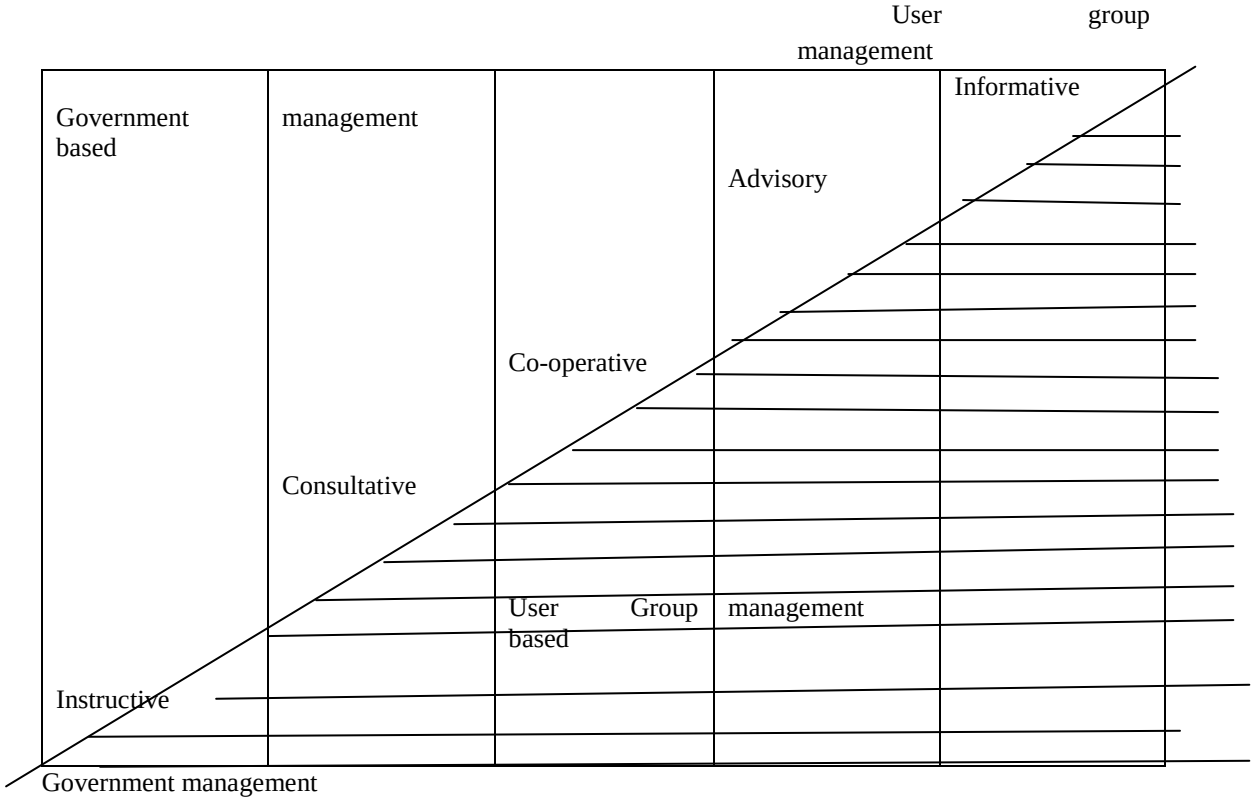

Figure 6: Spectrum of co-management (adapted from Sen and Nielsen 1996).

This arrangement allows for minimal participation by either the government or the user group. The strength of the user group will determine how it will participate in the co-management arrangement. In the instructive co-management arrangement there is minimal exchange of information between government and the fishers, with the fishers being informed about government decisions. Consultative management is where the government consults with the fishers but all decisions are taken by the government. A co-operative arrangement is where the government and the co-operative are equal partners in the decision-making progress. In advisory co-management the co-operative advises the government about the decisions taken and the government endorses the decisions. Lastly, in informative co-management, the government gives the fishers the authority to make the decisions but the government has to be informed (Sen and Nielsen 1996). The co-operative can move from instructive to informative as it strengthens itself.

There are a number of different types of tasks in co-management arrangements at different stages of the management process. The collaborative efforts between government and fishers in the decision-making process can be placed into three broad groups: 1) the role of the government and the co-operatives in the decision-making process, 2) the types of management tasks that should be co-managed, and 3) the

stage of the management process when co-management is introduced (Sen and Nielsen 1996).

1) The role of the government and the co-operatives in the decision-making process
In the very early stages of development the roles that the government and co-operatives take are very important. In the development of co-management arrangements both of the groups should work co-operatively in the decision-making process. However, this can be affected due to the level of maturity of the co-operative. Some co-operatives may be quite able to make decisions that will benefit the entire group they represent while others may not be as able. Thus each co-operative will have to be treated based on its abilities to make decisions for their members. It should be noted that some management decisions may also affect national issues and as such cannot be made by a single co-operative. This type of decision must be made by the government after consulting with all interest groups (Sen and Nielsen 1996).

2) The types of management tasks that should be co-managed
The various types of co-management tasks include policy formulation, resource estimation, access rights, harvesting regulations, monitoring, and control and enforcement. Some of the activities can be centralised and some can be delegated, since they will not only affect the co-operative but national interest as well (Sen and Nielsen 1996). The government may need to look at the capabilities of each of the co-operatives to carry out the various management functions they are required to undertake.

3) The stage of the management process when co-management is introduced
The stage at which the both parties should be involved in the co-management process should be from planning to implementation and also evaluation of the process. The can decide that it will plan the entire process since it will be more cost effective, but this approach may not work since the co-operative may feel the government is forcing co-management on them. This approach may only be necessary with weak co-operatives where decision making is a tedious task. The implementation process may be costly, along with the monitoring and enforcement, if the co-operatives are left out of the initial design stage. Therefore, the consultative approach will benefit all and some of the costs can be absorbed by the co-operatives (Sen and Nielsen 1996).

In order for the co-operative community management system to work and be efficient the co-operative societies need to meet certain conditions. For example, they must have high community property rights, inclusive membership, homogenous objectives and pay offs as shares in aggregate benefits (Arnason 2006). These conditions are highly political and they affect social relationships, interests in conflict and the distribution of power for those involved and affected by the management decisions (Jentoft *et al.* 1998).

Co-operatives around the world are in some form of partnership with their governments in managing their fisheries resources. The approaches by each country have been quite different. In the Caribbean, e.g. St Lucia, the fishers went through a process of participatory planning with the government to institute communal property rights over the resources they had considered their localised fishing grounds. The fishermen within the various communities that they inhabit operate TURFs that are co-managed by the government. This is distinctly so in two of the fisheries the sea

urchin and the beach seine operators in the Soufriere area (Brown and Pomeroy 1999).

Brown and Pomeroy (1999) noted that in the Caribbean Community even though there has been no long-term tradition of co-management within the region, there is still a need for such types of management since the governments alone are not capable of managing the resources. A workshop held in Barbados in 1988 by the Fisheries Department with the help of the Food and Agriculture Organization (FAO), looked at resources that can be co-managed by the government and resource users. They found that community property rights were appropriate for some fishery resources and less likely to work for others, e.g. in the reef and coastal pelagic fishery it was noted that potential for co-management was high and for sea urchin it was considered to have low potential for co-management, no reason was given for arriving at these conclusions. The idea was that if the potential for co-management was considered likely in some fisheries in Barbados then perhaps it would work in Guyana.

There are a number of other areas within the CARICOM areas where co-management has worked and has been quite successful. Fishermen in St Lucia have negotiated with the government with the assistance of other stakeholders and have been granted TURFs within their communities to manage. The trap fishery in Jamaica was quite successful in 1945 until the late 1950s when the government introduced a new scheme that caused the management system to collapse. This type of interference has caused fishing effort to rise and the actual collapse of the fishery which has not recuperated since. TURFs have also been used in the eastern Caribbean and have been successful until economic changes that caused the expansion of the economy where there were now multi-uses of the sea space. Disputes between resource users the fishers and tourism officials also amongst the fishers caused the system to dissolve. The most successful of all the co-management systems in the Caribbean is in Belize through the co-operatives. These fishers decided to make the co-management system work after they believed that they were being treated unfairly by the buyers of their lobsters. Now the entire process from production to marketing is carried out by the co-operative. The improved welfare has translated into a strengthened co-operative which give them political strength and the determination to protect their resources. They are involved with the government in collaborative patrolling of the resources to ensure compliance with regulations and also to keep out intruders from the resources, they also participate in decision-making in the formulation and application of regulatory measures. Property rights as described in section 2.3.2.2 above should be of a high quality for the system to work and must contain qualities such as security, permanence, exclusivity and transferability to be efficient. Membership should include all fishers in the community and should be a homogenous group for increased efficiency. If the composition of the co-operative is not homogenous and consists of other interest groups such as boat builders, net makers, etc. then this can change the entire policies of the co-operative and cause it to become less efficient. The concept that anyone can enter and leave the co-op as they please will not be beneficial since it can lead to the common property problem as Arnason (2006) observed.

The rationale for community fishery rights and management lies in the use and management rights assigned locally. The rights will assist in improving the local ecological knowledge which assists in fisheries management and improves the

acceptance of management rules with penalties for infractions. These will help to resolve conflicts and produce positive effects on fishery conservation (Charles 2000).

3 GUYANAN FISHERIES SECTOR

Guyana is on the northern coast of South America. It has an area of approximately 216,000 km² and is bordered by the Atlantic Ocean on the north, Venezuela on the west, Suriname on the east and Brazil on the south. The coastline of Guyana is 432 km and it has a continental shelf of 48,665 km². The average width of the continental shelf is 112.6 km while the area of the EEZ is 138,240 km². The country has a total population of approximately 755,000 and is divided into ten administrative regions.

Figure 7: Map of the Co-operative Republic of Guyana http://www.lonelyplanet.com/maps/south-america/guyana/

3.1 Importance of the fisheries sector

Fisheries contribute towards food security, employment, foreign exchange earnings, and the development of rural and coastal communities. Other important industries in Guyana are rice, sugar, bauxite, gold and diamonds. Fisheries is the second highest employer within the agricultural sector.

The fisheries sector employs about eleven thousand persons, both in harvesting and processing. It is also a major source of proteins with an estimated per capita consumption of about 45 kg. In terms of GDP fisheries have contributed between 1% and 2%.

Fisheries also contribute to the export earnings; in 2005 export earnings were in excess of G$ 11.4 billion with quantities being approximately 19,000 metric tonnes. Finfish and finfish products accounted for more than half of the exports in terms of volume and just less than half in value. In 2006, export quantities dropped to about 18,000 metric tonnes and just over G$ 10 billion finfish. Table 1 shows the total exports from Guyana in value and quantity

Table 1: Guyana fish export data: quantity and value (DOF 2007).

Year	Amount (mt)	Value million (G$)	Value million (US$)
1998	11 627	6 500	32.5
1999	11 170	9 000	45
2000	13 546	7 200	36
2001	18 618	11 000	55
2002	19 116	11 500	58
2003	21 901	11 200	56
2004	21 727	12 600	63
2005	19 319	11 410	57
2006	17 597	10 157	51

Exchange rate G$200 to US$1

Also, fisheries contribute to the economy in revenues it derives from license fees from vessels and processing plants, consumption taxes on fuels and rentals of fish port complexes. (Fisheries Department, 2007)

Table 2 shows exports by-products and quantities for the last seven years in Guyana. Finfish and its by-products have been increasing over the years and in some cases have been more than half of the total exports. Seabob and whitebelly (Appendix 1) are small shrimp species whilst prawn is the larger shrimp.

Table 2: Products exported by Guyana by quantity (tonnes) (Fisheries Department 2007).

Products	**Year**						
	2000	2001	2002	2003	2004	2005	2006
Prawns	1076	924	682	518	648	909	871
Seabob and whitebelly	7199	10923	9071	11534	9093	9077	8591
Finfish and by-products	5268	6768	9339	9834	11993	9319	8119
Crabmeat	3	3	24	15	23	14	16
Total exports	13546	18618	19116	21901	21757	19319	17597

3.2 Fishing area

The EEZ, for statistical purposes, has been divided longitudinally into nine fishing zones, each separated by 30 minute intervals as shown in Figure 8. Artisanal fishers operate on the continental shelf at distances up to 56 km (30 miles) from the shore, all along the coast.

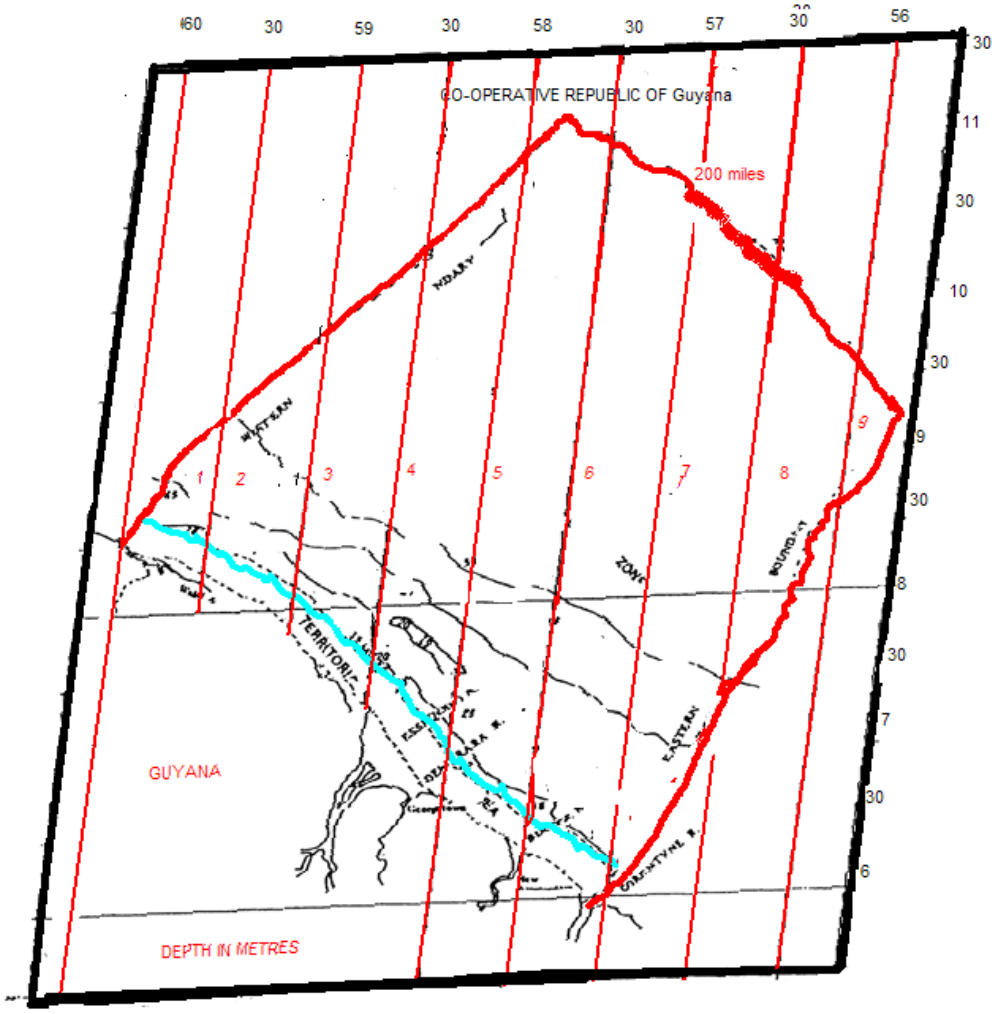

Figure 8: Guyana's EEZ and zoning of the fishing areas
(Fisheries Department 2006)

3.3 Guyana's fisheries

The fisheries sector of Guyana has three main components, inland fishery aqauculture and the marine fishery.

3.3.1 Inland fishery

The inland subsistence fishery involves the catching of fish in rivers, lakes, canals, flood plains, etc. by subsistence or part time fishermen for their own consumption or for sale. The activity tends to be influenced by the season and in some areas by the down periods for agricultural and other activities. For example, in the sugar estate areas the intensity of activity varies with the sowing and harvesting of the sugar cane. Small flat bottomed long type vessels and cast nets, seine or handlines, are used in the exploitation of the fish (FAO 2007).

This fishery is important to the well being of the hinterland population which is about 10% of the population of Guyana. A number of Amerindian communities usually get

their main source of protein from the rivers and creeks in their communities. They also depend on the fish for their livelihood. Fish is caught and dried and sold to miners and foresters in their area and in other communities. Over the years a lot of harvesting of a particular species, Arapaima (*Arapaima gigas*), has caused the stock to be depleted. The government made it illegal in its 1973 regulations for anyone to harvest the arapaima. However, with the opening of hinterland for mining and other activities the ban was completely ignored and a cross border trade developed between Guyana and Brazil.

Figure 9: Drawing of the Arapaima (Iwokrama 2006).

This depletion was caused by a demand for the product in neighbouring Brazil, since their stocks were also depleted. Sixteen communities came together and formed the North Rupununi District Development Board, with the help of Iwokrama International Centre for Rain Forest Conservation and Development, working together with the Fisheries Department, Ministry of Local Government and Regional Development, Environmental Protection Agency to develop the Arapaima management plan. The plan was developed with the assistance of a Brazilian consultant in 2001 and after a number of consultations and reviews it was finally presented to the cabinet by the minister responsible for fisheries in 2006.

During 2007, the Management Plan for the Arapaima (*Arapaima gigas*) in the North Rupununi, Guyana was approved for implementation. The goal of the plan is to develop a system in which organised fishermen will aim to recover the Arapaima population by regulating and sharing the number of Arapaima harvested among them using scientific data and traditional knowledge. This was using the community management approach.

Production figures for inland fisheries are not known, however it is usually estimated with aquaculture production to be approximately 800 metric tonnes.

There is also a small but active inland fishery for ornamental fish. Live fish are caught in the upper reaches of the rivers by collectors and bought and sold on the coast to six exporters of ornamental fish. The fish are exported mainly to the United States. The ornamental fishery is not managed by the Fisheries Department. (Fisheries Department 2006)

Figure 10: The red tail pleco is one of the high value species currently harvested by El Dorado Aquarium Traders (Iwokrama 2006).

North Rupununi District Development Board (NRDDB) has also been involved with the harvesting of aquarium fishes and has been assisted by the Netherlands Committee for the IUCN (NC-IUCN). The NRDDB members are now starting to move to self sufficiency in this area which had started out as a donor funded project but has now become a self-sustaining community-based business.

El Dorado Aquarium Traders which is a group of fishers within the NRDDB focuses on the sustainable utilisation of wild-caught aquarium fishes harvested with minimal ecological and environmental impact.

The business focuses mainly on Loricariid catfish to enable low volume harvesting of high value fishes. Presently, the project targets three species: the lemon fin (*Hemiancistrus spp.*), the bushy nose (*Ancistrus spp.*) and the red tail pleco (*Pseudacanthicus leopardus*). Other fish groups like cichlids are also harvested but in smaller quantities. Fish are exported to Germany, the US, and the UK via a company called Guyana Aquarium Traders (Iwokrama 2006-).

Community management has only been introduced in these communitiese for one year in the ornamental fishery and has seen some success in that the fishers are moving towards self sufficiency. It is too soon, however, to say what is happening in the arapaima management plan since it was implemented only in April 2007 and not much monitoring has been done by the Fisheries Department. This is due to financial and personnel constraints.

3.3.2 Marine fisheries

3.3.2.1 Industrial fishery

The shrimp fishery is economically the most important fishery in Guyana. In the late 1950s, foreign companies established bases in Guyana and its neighbouring countries and commenced exploitation of four species of prawn (*Penaeus spp*.) found on the continental shelf. This fishery expanded rapidly until 1975. Then in 1977 with the adoption of the EEZs the shrimp fishery became a national fishery and the local landings dropped along with the fishing effort. The late1980s saw a reduction in catch rates and the total catch of these species (*Penaeus spp*.). This forced some companies to close operations and to sell their vessels to local entities. Many of these vessel owners later converted the trawlers to catch seabob (*Xiphopenaeus kroyeri*). The gap in the data represents the period during the fuel shortage in Guyana between 1982 and 1985 due to foreign exchange deficiencies in the country.

Figure 11: Fishing effort in the peneaid fishery from 1962–1995 (Fisheries Department year?)

The trawl fishery for seabob started in 1984 and experienced rapid and impressive growth in terms of vessel numbers, total catch, number of processing plants and other infrastructure, peaking in 2000. Seabob production became the dominant activity of the industrial fishery during this period. Resource management and sustainable exploitation, together with rising fuel costs, are currently the major concerns for this fishery. Figure 12 shows the rise in production of the seabob resources and the decline in the prawns production over the years. Participants in the industrial fishery have formed the Guyana Association of Trawler Owners and Seafood Processors (GATOSP), and its membership includes all six seabob and prawn processing plants, which also own trawlers, and nearly all other trawler owners. The association advocates the cause for the industry and as a unit keeps its members in line as regards fisheries management issues and government regulations.

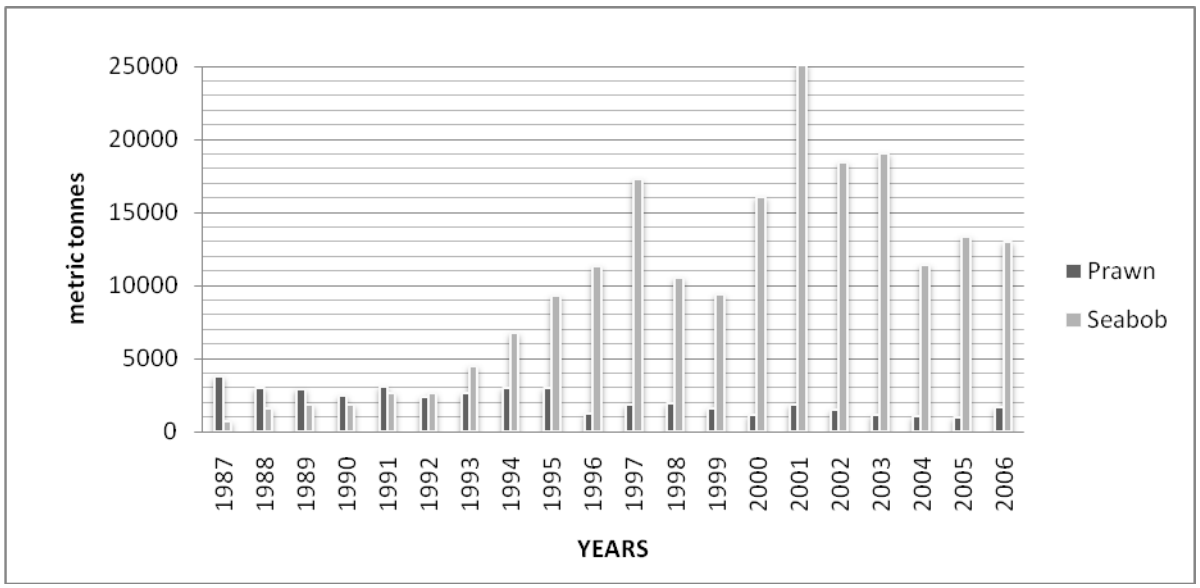

Figure 12: Seabob and prawn production 1983-2006 (Department of Fisheries 2007).

The offshore industrial fishery consists of 147 shrimp trawlers, five major processing plants, nine small processing plants, and a few wharves and dry docking facilities. The 45 shrimp trawlers mainly exploit penaeid shrimp *(P. brasiliensis, P. notialis, P. schmitti,* and *P. subtilis)* with finfish and small amounts of squid (*Loligo spp.*) and lobster (*Panulirus spp.*). The other 102 vessels exploit seabob (*Xiphopenaeus kroyeri*) and various finfish species (*Macrodon ancylodon, Micropogonias furnieri, Nebris microps, Ariusspp.,Cynoscion spp.*), with small quantities of penaeid shrimp as by-catch. These trawlers are all locally owned, about 85% of them are owned by the processing plants and the remainder are owned by private indiviuals.

The penaeid shrimp vessels would spend an average of 30 days at sea and approximately 10-12 trips per year. The seabob trawlers spend 5-9 days at sea, but an average trip lasts 7 days. A typical seabob vessel makes 2-3 trips per month, and an average of 30 trips per annum. (Hackett&Maison, (1999)).

Some of the vessels especially those configured for seabob target finfish when seabob is not in abundance. The seabob/finfish trawlers have been operating closer to shore and nearer to the artisanal vessels and have been causing alot of gear conflicts with the artisanal fishers. (National Development Strategy (NDS) 2001.

3.3.2.2 Inshore artisanal fishery

The artisanal fishery has been and still is an important source of food for both rural and urban Guyanese. It is actively pursued exclusively by Guyanese and is a source of employment and export earnings. The sub-sector experienced rapid growth both in the numbers of fishers and volume of landings until 1994, and since then the levels seemed to have reached a "plateau then decreased in 1999 until 2002 and production is now between 25,000-30,000 t from 2003-2006 increasing again". This fishery consists of approximately 1200 vessels ranging in size from 6-18 meters and are propelled by sails, outboard and inboard engines. There are over 5,000 fishers and over 1000 boat owners, with most of the boat owners being members of co-operative societies which acquire and sell fishing requisites to their members.

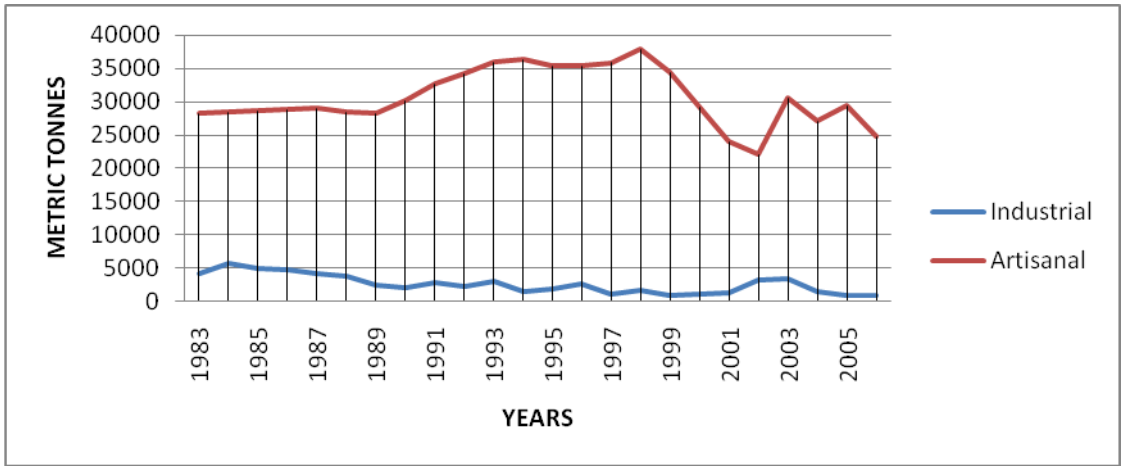

Figure 13: Artisanal and industrial finfish production for over 20 years (Department of Fisheries 2007).

3.4 Gear types used in the artisanal fisheries

There are main five gear types that harvest the resources in Guyana. Chinese seine, gillnets, handlines, caddell and traps. A description of each gear type is provided in table 3 below.

Table 3: Number of vessels, fishers estimated landings and species caught by gear type (Department of Fisheries, 2007).

Gear	**Chinese seine**	**Caddell line**	**Gillnet nylon**	**Gillnet polyethylene inboard & cabin cruisers**	**Pin seine**	**Handline**	**Traps**	**Total**
# of vessels	**285**	**55**	**351**	**421**	**17**	**20**	**65**	**1214**
# of fishers	**855**	**165**	**1386**	**2200**	**51**	**220**	**175**	**5052**
Estimated landings for 2006 (mt)	**6925**	**48**	**9242**	**6201**	**48**	**473**	**143**	**23,080**
Species caught by gear	White-belly, seabob, immature fish, banga-mary, butter-fish, catfish	Catfish esshark s spp.	Banga mary, sea-trout, butter-fish.	Grey-snapper, seatrout,gill-backer, tarpon, Spanish-mackerel, croaker, snook, shark spp.	Mullet, snook, querima, catfish, croaker, bangamary	Snapper, grouper	Snapper, grouper	

3.4.1 Chinese seine

This is the only gear type used in the inshore artisanal shrimp fishery of Guyana. Chinese seines are funnel-shaped nets, 16 m long and 4-6 m wide at the mouth. The mesh size gradually tapers from 8 cm at the mouth to 1 cm at the funnel. A flat-bottom dory vessel powered by sail, paddle, or small outboard engine is used in the fishing operations. Based on the 2005 Inshore Artisanal Vessel Count, there were 285 vessels operating this gear type (Fisheries Department 2006).

These fishing operations work in relation to the tide and spend between 6 and 12 hours per day fishing. Some operators would fish both tides per day. The catch consists primarily of *N. schmitti* (whitebelly shrimp), *Xiphopenaeus kroyeri* (seabob), *Macrodon ancylodon* (banga mary), *Nebris microps* (butterfish). An undetermined amount of juvenile fish is caught in the Chinese seine fishery and is discarded or used to produce "fishmeal" (Fisheries Department 2006).

3.4.2 Caddell line

The caddell or demersal longline fishing vessels range in size from7-9 m. A flat-bottom dory vessel powered by sail, paddle or small outboard engine is used for the caddell line. There are 55 vessels using this gear from the 2005 vessel count.

Fishing occurs between l0-l2 miles from the coast in waters approximately 1-2 m deep. The crew size on a caddell vessel ranges from 2 to 4.The catch consists mainly of catfishes *Arius parkieri* (gillbacker), *Bagre bagre* (catfish), *Arius proops* (cuirass), (*Arius phrygiatus*) and various species of juvenile sharks (Fisheries Department 2006).

3.4.3 Gillnet

The gillnet is the most productive gear in the artisanal fishery of Guyana. More than half of the total catch is caught with gillnets. Based on the 2005 vessel count there were over 1100 vessels and over 700 or 65% of the total vessel count are gillnets. There are several types of gillnet operations (Table 5).

Table 4: Types of gillnet vessels (Department of Fisheries, 2007).

Type og gillnet	Number of vessels
Gillnet polyethylene inboard engine	80
Gillnet polyethylene outboard engine	342
Gillnet nylon outboard engine	326
Circle seine	9
Total	763

The gillnet vessels of Guyana can be conveniently grouped into two size categories, large12-16 m and small 8-10 m.

Large gillnet vessels, using gillnet polyethylene (GNP) are diesel-powered inboard engine vessels with insulated ice boxes capable of carrying up 5 tonnes of ice. Most of these vessels are equipped with compasses. The length of their trip is 10-21 days.

Typically a gillnet (polyethylene) vessel will have a crew size ranging between 4-6 which consists of a captain and the others being workmen.

There are also gillnet polyethylene outboard engine vessels known as “cabin cruisers”. These vessels are equipped with iceboxes and fish for 5-10 days. Crew sizes range from 4-6.

Small gillnet vessels using gillnet nylon (GNN) are equipped with outboard motors up to 48 horsepower, fish and land their catches along the entire coast of Guyana. These vessels with small ice boxes remain at sea for 2-3 days at a time, while others without ice boxes land their catches about every 12 hours. Gillnets (nylon) vessels have a crew size of 4 consisting of a captain and three workmen.

Circle seine is a modified nylon gillnet used in the Corentyne River. Fishermen have developed circle seines of different types and sizes to catch schooling fish when they are abundant.

3.4.4 Pin seine

Pin seine fishing is practised mainly in regions 2 and 6 (Appendix 3). Pin seine or beach seine comprises the smallest number of vessels of the artisanal fleet. There are 26 pin seine vessels. Their catch includes *Mugil spp.* (mullet), *Mugil sp*. (queriman), *Centropomus sp.* (snook), *Macrodon ancylodon* (bangamary), *Micropogonias furnieri (*croaker), and catfishes of the family *Ariidae*. There are also discards of juvenile fishes of which the species and amounts are not known.

3.4.5 Hand line

The gear is made of nylon line. Each vessel is equipped with 6-9 lines with five hooks per line. The length of the line varies between 30-60 m whilst the hook sizes used are 5 and 6. The catch of hook and line is Lutjanus species (red snapper), the by-catch is lane snapper and vermillion snapper. There are about 20 of these vessels in this fishery.

3.4.6 Pots and traps

The gear is made of nylon or plastic line mesh and is flat and hexagonal, with two of the sides forming a concave, funnel-shaped angle. Each vessel is equipped with 40-62 traps with a mesh size ranging from ½-21/2 inches. The traps are often laid out in-groups of 2 or 3 units connected by a rope. The crew size varies from 5-6. The target species for pots and traps is Lutjanus spp. (red snapper) the by-catch landed includes cavalli, Spanish mackerel, grouper, etc. The vessels targeting red snapper use either hook or line or pots and traps. They are constructed of wood. The hook and line fishing method is used for fishing red snappers in deep water over the slope off the Guianas.

3.5 Gear conflicts

Conflicts amongst gear owners have been numerous, especially betweeen trawlers and the other gear types. The trawlers are now fishing closer to shore so as to catch more fish especially when shrimp resources are scarce and as a result they become entangled with the other gears mostly the gilnets. Sometimes these conflicts are settled in the courts when compromises cannot be reached. Trawler owners have been complaining that some of the artisanal vessel owners would normally set the nets without any bouys and lights and it is difficult to see the nets when they are set.

There are rarely conflicts amongst artisanal fishers using the different gear types. However, there are conflicts among Chinese seine fishers regarding the placement of pens. Resolution of the matters is done by the Fisheries Department.

3.6 Resource status

The status of the fisheries resources is not well known. However, the results from various surveys and scientists to estimate the resources are shown in Table 6.

These preliminary estimates give the general figures but do not address the specific species status. The yearly production of finfish is estimated between 30,000 and 40,000 metric tonnes clearly below what has been the estimated potential from the studies of surveys (Table 5).

Table 5: Summary of marine resource potential estimated by several scientists and from surveys (mt) (adapted fromNDS 2001).

Survey or scientist					
	Gulland (1971)	Jones and Dragovich (1975)	Klima (1976)		Sætersdal, G.; Bianchi, G.; Strømme, T.; Venema, S.C. (1988)
Squid			2,000		2,000
Demersal finish	45,000	-	75,000		69,000
Snapper/Grouper			1,500		
Pelagics	65,000	75,000			300,000
Prawns			800		
Total	110,000	75,000	79,000		371,000

Not much is known about the status of the specific species of demersal finfish resources. Some attempts have been made to assess these resources but due to inadequate data the results have been unreliable. Preliminary assessments of the main shrimp *Peneaus spp*. resources have shown that they are either fully or over-exploited, with the need to reduce effort so as to rebuild the stocks being recommended. More data is need for a better assessment of the shrimp fishery (Ehrhardt, N., & Shepard, D. (2001)). The production from the *Peneaus spp* from 1996 to 2000 has shown that the number of vessels had remained unchanged and the production of prawns decreased from approximately 2000 tonnes to 1100 tonnes later between 2001 and 2006 production varied from 1800 tonnes to 1600 tonnes. The number of vessels decreased

from 73 in 1996 to 45 in 2006. The reduction in vessels has shown an increase in production.

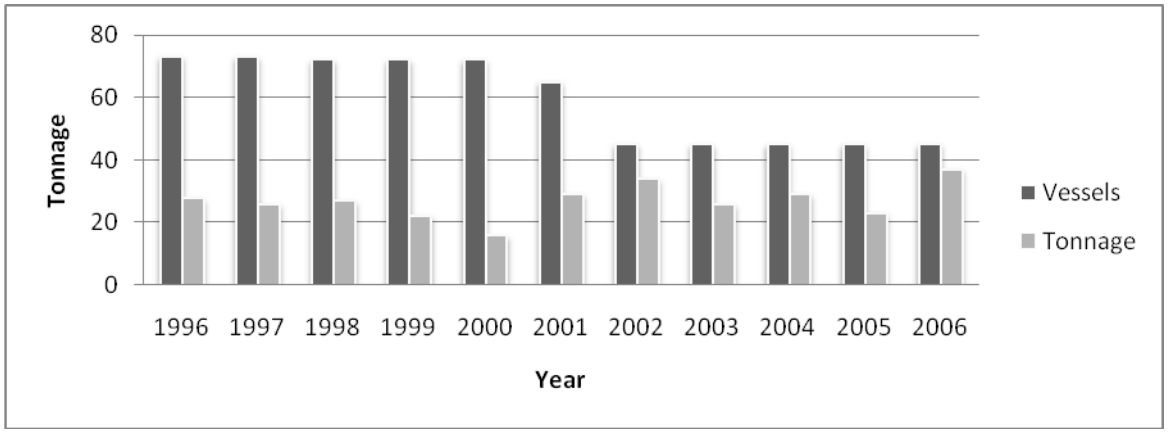

Figure 14: Total production of penaeid shrimp per vessel per year (Fisheries Department 2007).

4 FISHERIES POLICIES AND MANAGEMENT IN GUYANA

The main objective of the management and development of the fisheries sector is to achieve levels of production, productivity and real income for fishery producers and other groups involved in the delivery of products to the domestic and overseas markets, thereby contributing to national production, income and welfare (Fisheries Department 2006). This chapter will examine the fisheries management policies that Guyana has used over the years and the effect they have had on the fisheries sector

4.1 Evolution of policies and management

As described by the National Development Strategy, (NDS). (2001).), the early policies in fisheries were outlined in the Fisheries Act of 1957. Later, these and additional policies were set out for execution in the National Development Plan (1972-1976), the Fisheries Development Plan (1979-1983) and the Draft Fisheries Development Plan (1987-1990).(NDS, 2001). From 1994 to 1996, the government was given assistance from the Caribbean Fisheries Resource Assessment and Management Programme (CFRAMP) in developing management plans for the fishery sector. However, due to insufficient technical personnel and equipment, financial resources and political will, the level of implementation was very limited, with little or no attention being payed to the conservation and management of the resources. Open access remained in the artisannal fishery while there was some attempt to limit the number of trawlers in the shrimp fishery.

These management plans all focussed on the development of the industry and incentives for persons to get involved in the fishery e.g. there were duty free concessions for fuel to promote growth in the 1960s. Then later in the 1970s in the shrimp industry there was the obligatory landings of by-catch so as to prevent wastage of finfish caught by trawlers (NDS 2001). Vessels had to land 32,000 tonnes of finfish annually. This provided a cheap source of protein to the population. Later there was a

ban on the imports of fish and fish products so as to promote the growth of the industry and develop self sufficiency. The ban led to the development of the cottage industry, since persons were processsing their own salted and dried fish to meet the demand that the ban had caused. This now became a thriving business in Guyana and is a foreign exchange earner through export of products.

Later in the 1980s significant interest was placed on co-operative development (Fisheries Department 2006). The government had forged a relationship with fishers that had already formed co-operative societies and were encouraging other fishers to become members of these societies or form their own. The government then was able to provide training for fishers in a number of areas such as co-operative management and engine repairs. Data collection was first introduced to the artisanal fishers during these times. The fishers were given logbooks to be used at sea and returned to the co-operative for the Fisheries Department to analyse. This new relationship that was established triggered the Canadian International Agency to get involved and they did so through the Artisanal Fisheries Infrastrustural Programme (AFIP). This project was implemented in 1984 and closed in 1993. Through this project eight inshore fish port complexes were built and six of them leased to the co-operative societies.

During the 1980s and 1990s, two committees were formed to advise the Minister responsible for fisheries on fisheries issues (Fisheries Department 2006). These were the Fisheries Advisory Committee (FAC) and the Artisanal Fisheries Advisory Committee (AFAC), with the former never going past the formative stage and the latter functioning for only a limited period. These committees, however, only discussed complaints that were affecting the fishers and no real issue was never dealt with during these meetings and as such they collapsed. A number of attempts were made to resusitate them. In the late 1990s the FAC was resusitated but then went out of commission until April 2007, when it was reconvened by the minister responsible for fisheries.

4.2 Fisheries policies and management

The Fisheries Act of Guyana 2002 takes into account the FAO Code of Conduct for Responsible Fisheries and the United Nations Law of the Sea Convention (UNCLOS). The fisheries regulations are being revised to address various management plans, licensing and registration of processing plants and vessels.

The current fisheries management system is an open access system for the artisanal fishery, mainly using registrations and licenses to earn revenues. The trawl fishery is managed by restricting effort, with vessels being capped at the present state of 102 for seabob and 45 for the large penned shrimp trawlers. There is also a closed season for the seabob fishery.

The resuscitated Fisheries Advisory Committee is currently finalising a Draft Fisheries Management Plan for the sector. There are three sub-committees each with specific responsibilities: the administration sub-committee is dealing with the transformation of the Fisheries Department to a semi-autonomous agency so it can generate more funds and higher income, thereby attracting qualified persons to the agency; the marine sub-committee is reviewing the portions of the management plan

that deal with the marine resources; and the aquaculture sub-committee is looking at the development of aquaculture in Guyana.

The government has noted the low salaries being offered to the trained personnel through the public service and the constraints by the Finance Ministry to provide more budget allocation to the fisheries sector for the formation of the semi-autonomous institution for the fisheries sector. Presently, government revenues derived from the fisheries sector are estimated between USD 600,000 and USD 800,000 and the annual budget of the Fisheries Department was approximately USD 400,000 (Fisheries Department, 2007).

4.3 Institutional fisheries management structure in Guyana

The Fisheries Department under the direction of the Minister of Agriculture and the Permanent Secretary (Figure 15) monitor and regulate the fisheries sector. Surveillance, monitoring and control activities are also carried out by the Guyana Coast Guard and the Marine Police.

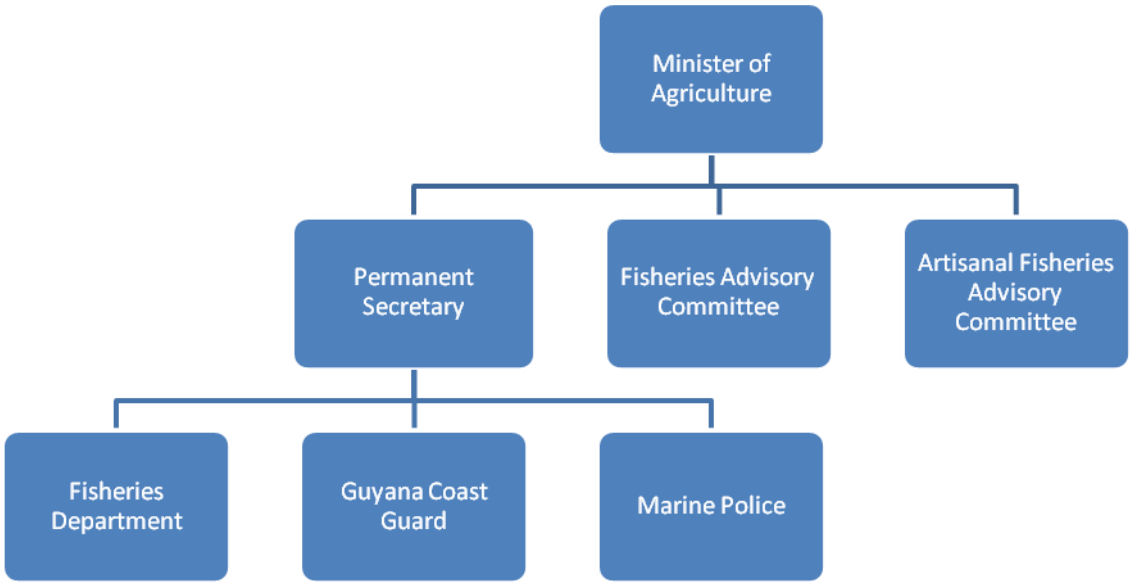

Figure 15: Primary agencies responsible for fisheries management in Guyana

The Fisheries Department has four sub-programmes (Figure 16) that manage the daily activities of the industry. The Fisheries Administration sub-programme advises on policy and provides leadership for development, management and support services to the country. The Legal and Inspectorate sub-programme monitors and regulates the industry, while Research and Development collects and manages data, undertakes analyses and provides information for planning and policy determination. The Extension sub-programme provides training, technical assistance and information dissemination to the industry and other stakeholders.

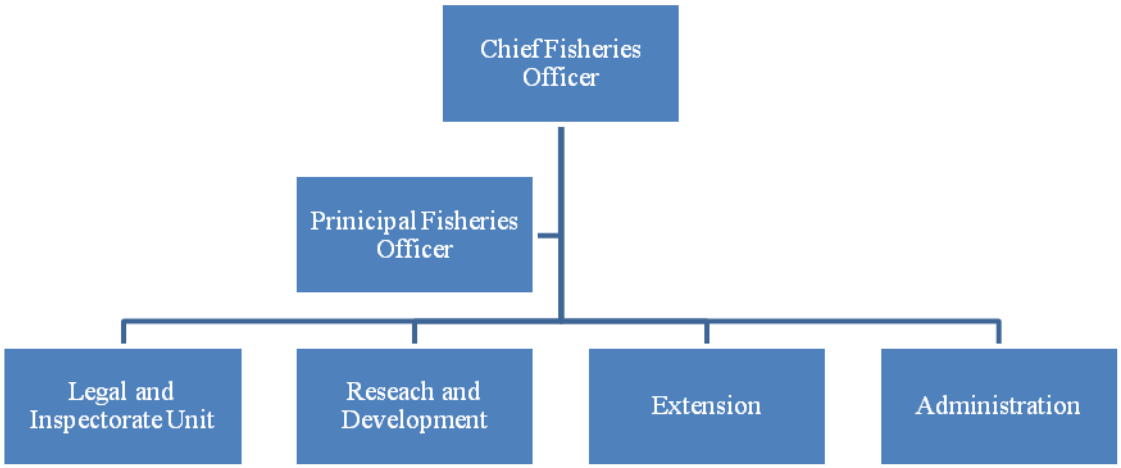

Figure 16: The four Fisheries Department programmes: Legal and Inspectorate, Research and Development, Extension and Administration

Management of the fisheries resources has been quite a challenge for the Fisheries Department, which has the responsibility for coordinating and implementing government policies in fisheries on a daily basis. However, due to economic constraints the government has not been able to offer competitive salaries. These have caused qualified personnel to seek employment elsewhere and during the period of strong industry growth the government's ability to regulate and manage the industry was greatly reduced (NDS 2001).

The main problems faced by the Fisheries Department are the lack of enforcement capabilities by both the Coast Guard and the Department to carry out the necessary MCS activities, inadequate extension services, insufficient data management and assessments and little or no socio-economic analyses to inform decision-making. There is therefore a need to move away from the present management system which places all the responsibility on central government and decentralise the management of the fishing industry in Guyana

5 MANAGEMENT OF THE ARTISANAL FISHERY: A CO-MANAGEMENT APPROACH THROUGH CO-OPERATIVES

This chapter will review the status of fishing co-operatives in Guyana, the part they presently play in the management of the artisanal fisheries and the structure and functions of the societies. Also, some of the corrective measures necessary to make these societies function effectively will be identified. A section will also be dedicated to looking at the management objectives, current regulations, and management strategy in place for the artisanal fisheries. Further, in an effort to develop a co-management plan for the artisanal fishery, the roles and functions of the Fisheries Department, the Co-operative Department and the fishers' co-operative societies in this scenario and the rational for the management measures will be addressed.

5.1 History of fishermen co-operative societies in Guyana

Fisherman's co-operative societies and to some extent the Guyana Private Trawlers Owners and Seafood Processors Association play an important role in the development of the Guyanan fisheries sector.

The fishers societies were formed in the 1950s and 1960s, with members who held meetings at homes of several fishers at different intervals. It was, however, during the 1970s when most of the co-op societies became fully establised, after Guyana had chosen to be a socialist state. The official name of Guyana had become the Co-operative Republic of Guyana and the emphasis was being placed on agriculture for development through co-operatives. Co-operatives were formed all over the country with in the agriculture sector including fisheries. Thirteen societies were formed and they assisted fishers in acquiring requisites for their fishing activities and represented them at the national level. Some of these societies later merged so as to be more effective and to share in the other benefits from the government.

The fishermen's co-operative societies have played a crucial role in the mobilisation of artisanal fishermen, in education and training, and in the maintenance and management of fish landing sites. In 1994, a line of credit to purchase fisheries equipment, was supported by the Canadian International Development Agency (CIDA). With the implememtation of the Artisanal Fisheries Infrastructural Programme during the period 1983-1994 eight inshore fishport complexes were built for the fishers. These inshore fish port complexes were built through donor assistance from the Canadian International Development Agency and the European Union. The fish port complexes provided ice, docking facilities, fuel depots, market areas, and chandleries for the sale of fishing supplies among other things (FAO 2007).

Six of the fishport complexes were handed over to co-op societies for management and the other two were operated under joint venture arrangements between the co-op societies and private business. These joint ventures did not last very long since the fishers were ostrasised from the complexes. In some cases they were not allowed to land their catches at the landing sites if they were not going to sell their catches to the complex. Sometimes they also had to pay more for ice (NDS 2001)

The objectives for building the complexes were to: reduce post-harvest losses and thereby increase the supply of fish to the local market and for export; increase the

productivity and incomes of artisanal fishermen; and move the existing fishermen's co-operatives towards the role of local organisation of producers and marketers. The first two objectives were accomplished but the last objective was more difficult due to resistance from middle-men and the influence of the established processing companies (Geer 2004).

During the first few years of the operation rents to the government were paid. Then, due to mismanagement of the funds these payments have stopped. Even the privately operated complexes do not pay the rent. The co-op societies have gone through a number of changes that have left the fishers disillusioned, but they have withstood the test of time and some are still in operation managing the inshore fish port complexes. At present, four of these complexes are being managed by co-op societies, three are rented privately and one has been converted into a marketing and cold storage centre for agricultural purposes (Fisheries Department, 2005).

The reasons why some of these co-operatives have failed in the management of the complexes are due to a number of factors such as ineffective leadership, inadequate communication between management and the general membership, inadequate management and accounting skills, insufficient oversight by the regulatory agencies and lack of transparency (CRFM 2004).

5.2 Organisation structure of the fishermen's co-operative societies

Management committees, elected by the members of the co-operative societies, are responsible for developing plans, policies and a yearly budget for the co-operatives. They conduct the business of the co-operative society, which includes the provision of supplies for fishing such as nets and twines and services, such as those available at the fish port complexes, where these occur.

The management committees consist of seven members in most cases, who are the chairman, secretary, treasurer, assistant secretary/treasurer and three committee members.

In the instances where the co-operative society is managing a fish port complex or requisite store, the committee recruits a manager who manages these operations.

5.3 The present role of co-operative societies in fisheries management

The co-operative societies have not played any major role in fisheries management, but they assisted the Fisheries Department in data collection activities from their fishers. This was an instruction that the government had passed down to the fishers with no explanation on the necessity or importance of the log books. Log books were distributed to fishers and were collected by the societies on a monthly basis. Submissions of logs were used as a prerequisite for re-licensing in the following year. However, this approach to data collection is no longer being used, as the log book system of data collection did not succeed in the artisanal fishery, so it was decided to focus on the sampling programme. The failure of the programme was mainly due to the fishers claiming to be unable to read and write, even though in most cases they

were trained to fill these books. It was then realised that it was the boat captains who should have been trained along with the boat owners (Fisheries Department, 2004).

5.4 A proposal for a community management system for the artisanal fishery

The status of the artisanal fishery was singled out in this study as the management plan to be developed. The socio-economic importance of the artisanal fishery in Guyana is high. It consists of over 1100 fishing vessels and has over 5000 fishers in eight co-operative societies and harvest over 90% of the fish production in Guyana (Figure 12). The present status of the fishery can be summed up as follows lack of enforcement, poor data on the fishery and fishers, very limited stock assessment, very weak extension services and incomplete licensing and registration of vessels.

There are over 25 species of demersal species caught by the artisanal fisheries, with 12 of them being of commercial importance. Attempts were made to have some of these species assessed but inadequate data has hampered this process. The commercially important species are banga mary, butter fish, gray snapper, sea trout, gilbacker, red snapper, snook, Spanish mackerel, king fish, cavali, croaker and vermillion snapper (Appendix 1). The seabob and whitebelly shrimp are also considered under the artisanal fishery since they are caught by the Chinese seine gear which has close to 300 vessels.

At present an open access situation exists although in keeping with the Fisheries Act of 2002 all fishing vessels have to be registered and licensed along with the crew for each vessel. However, as stated before, only about one third of the vessels are registered and just about the same are licensed yearly.

Pin seine regulations exist for the placement of one pin seine in relation to another in a given beach area. Chinese seine operators are required to have fish pen permits for each pen set up. These spaces and pen spots are supposed to be licensed yearly. This licensing operates on a first come first serve basis, so a holder of a particular pen spot or beach space in one year may not get that same spot the following year. In order to keep the spot that they have these fishers are the ones that will license their vessels, spots and pens yearly.

The Fisheries Department over the years has been considering the following management strategies for the various gear types in order to regulate the fisheries. The banning of the pin seine has been considered since it catches the juveniles of all the commercially important species. However, considerations have to be given to the fact that the gear also catches some of the small species of fish like the sardines and herring which could not be caught otherwise. Also, the available beach space for such operations may be a limiting factor, taking into consideration the natural erosion and accretion cycle along the coast, so such drastic regulation may not be necessary. In addition, pin seine activity is limited to the high (spring) tides which leads to operations of about 26 weeks per year (Fisheries Department 2006). There are approximately 30 such operations in Guyana, with the majority being in the Berbice area.

The Chinese seine is the only known means in Guyana of harvesting the whitebelly shrimp (Appendix 1). Thus, in addition to the likely socio-economic impacts, there

would appear to be some need for the use of the gear. However, limiting the number of gear per vessel might be one of the options for managing this gear type.

Cadell line fishing is being encouraged with hook size regulations being used as a means of ensuring only larger sizes of the species caught are targeted.

More in depth studies for the impact on the resources of the nylon near shore gillnet are required. If found to be necessary then regulations on mesh size and length of seine could be put in place. Also, the number of licences issued can be restricted.

With regards to the polyethylene gillnet/driftnet, because of good economic returns and a mesh size that permits only adults to be caught, this gear has been identified as the one to be encouraged. Later, limitations on effort could be addressed.

The Fisheries Department is responsible for regulating and managing the fisheries sector. However, due to a lack of trained personnel and other infrastructural arrangements the necessary monitoring, control and surveillance (MCS) activities that are needed for the sector are inadequate. All of the fisheries management activities are centrally managed, even though there are two fisheries offices in regions 2 and 6, the regional offices concentrate more on aquaculture. Data collection activities are carried out by the Fisheries Department, with some assistance from the regional offices.

The current management system that has been described in this paper on fisheries management in the artisanal fisheries in Guyana is adequate but it lacks the involvement of the fishers and very little is known about the resources. Therefore, there is need to develop a plan that would lead to optimal utilisation and management of the resources and also where fishers have a role in the management of the resources. This will eventually lead to increased welfare and possibly an improved contribution to the gross domestic product (GDP).

In order to improve fisheries management, a community management based on fisheries co-operatives is being recommended where co-operative societies will share responsibilities for the management of the fisheries resources with the government. Presently the fishers, through their co-operatives, have no say in the management of the resources that they harvest and they are allowed to do whatever they please due to inadequate enforcement capabilities of the government.

This type of management will benefit both the fishers and the government since the responsibilities will be shared by both government and fishers. The reasons for choosing this system are the inadequate resources available to the Fisheries Department and related agencies to effectively regulate and manage the fisheries and the commitment by the government to involve the fishers and their organisations in the management process. Although over the years the government excluded the co-operatives from any management decisions and only instructed them as to what they needed to do this has changed since the government has realised that it alone cannot manage the resources. However, it should be borne in mind that the weaknesses in the fishers' co-operative societies such as inadequate leadership and insufficient accountability and transparency would have to be addressed in this management process.

The type of the community management system to be used by the co-operatives is TURFs. Considerations as to why the TURFs would be used within the framework of community management in Guyana are shown in Table 6. Property rights systems were the set of management systems considered under the indirect fisheries management system after it was determined that direct fisheries management systems even though they enhance the fish stocks can later lead to depletion again by increased effort. It was also noted that these systems (gear size restrictions, area closures, etc) have high enforcement costs. These can, however, be used in combination with other management systems.

Table 6: Evaluation of the property rights systems

Management system	**Property characteristic**	**Application in Guyana**
Individual quota	A portion of the harvestable stock is given to resource users. This allows the owner the opportunity to harvest his portion in whatever ways he sees fit, but he has no say in the management of the stock. He can also sell or lease his portion if he sees fit.	Can be a very good management system, but not much is known about the resource to implement and enforce such a system. Allocating the quota would also be very difficult and complicated since the fishery is a multi-gear, multi-species.
Sole ownership	Entire resource is given to one person/firm to manage as he sees fit.	This is not feasible in most management systems, since giving a fishery to one owner will not be politically possible
Access licenses	Licenses are allocated to users of the resources to access the stocks, but they have no say in the management of the resource.	Presently being used in Guyana and has not led to any improvement in the management of the fisheries.
Territorial user rights in fisheries (TURFs)	Area of the fisheries resources given to an individual or a group to use and manage. Used mostly in sedentary stocks, but can be adopted for small-scale fisheries where ITQs are not feasible.	Presently being used in the Caribbean to manage common property resources through community management
Community rights	Rights are given to a group of people to use and manage the resources within their community. These rights can be through TURFs, IQs, and access licenses Or it can be used in combination with the three. Communities now have a responsibility to manage the resources. Fishers are able to regulate access and enforce rules through their own community	This can be implemented through the co-operatives since they are established and have legal status within the country's by-laws. Fishers are able to share in the responsibility of management.

Taxation was not considered even though it is considered in indirect fisheries management. For taxes to be used in fisheries management there needs to be information on the fishery. The taxation process is also costly to implement and enforce, it must also be determined what will be taxed (landings or fishing inputs) and

how the system will be implemented and the amount of the tax on the fishery. It was noted that taxes generate income for the central government, but they also generate government waste through misguided spending.

Taxes can also lead to cheating since the government cannot monitor all landing sites in the country and so fishers will not declare their right catches. They can also find other landing sites that are not known to the enforcement officers. Therefore taxes are costly and difficult to implement and enforce.

5.5 A proposed design of the management system

The co-operative societies in Guyana have geographic boundaries and within these boundaries are the locations of the inshore fish port complexes. The management system for these societies will most likely be the territorial user rights in fisheries (TURFs). Since these areas are also demarcated in the fishery zone they can be used as the TURFs. These TURFs can be further zoned by use of the gear types (Figure 8 in sections 3.2).

The main partners in the TURFs will be the government and the co-operative societies. Each society will be treated according to the strength of their organisations. In some cases the five different types of co-operation levels will be used depending on the strength or weakness of the co-operative. In some cases the government may have to play an instructive role because of the co-operatives' inability to make decisions. This, however, can change as the co-operative is strengthened and they are able to make decisions that can benefit the users. Before the implementation of these management tools in the various societies the societies will have to be functional and show interest in having this system implemented. The Fisheries Advisory Committee (FAC), the Co-operative Department and the Artisanal Fisheries Advisory Committee will also play important roles in the implementation of the management systems.

These associations will operate under the rules and regulations of the co-operative act and will be given responsibility for the management of the TURFs in which they fish. They will have to have some form of legal basis to operate. This can be done by the signing of a contract of rights and obligations between the government and the co-operatives

TURFs were chosen as the appropriate management system for Guyana given our analysis of the other types of property rights shown in Figure 6. Perhaps later when the recommended system is operational and more is known about the state of the resources, it can be improved extending it to an individual quota system (IQs). The objective is to have the co-operatives both accountable and responsible for the resources they harvest. A TURFs system is presently being used in Guyana in the inland fisheries. The arapaima management plan has been instituted in 2007 and this system will be reviewed after one year for its successes.

Also, using TURFs as a management option in Guyana, this property right will have high permanence, security exclusivity and possible low transferability (Figure 17). Three of the property rights will be high since the co-operatives will be given the opportunity by the government to manage the TURF. These will give the co-

operatives exclusive rights to the area to manage with the rules they see suitable for the TURF.

Security will also be high since the government through legislation or some other legal approach gives the co-operatives the sole right to the property.

Permanence in this case will also be high and remain that way unless the entire system fails and the contract is broken.

Low transferability will only result because one co-operative society may not be able to be transfer rights to another co-operative since it is in the best interest of the co-operative to have the property right manage for its fishers. This might nevertheless be solved if payments for such transfers were allowed.

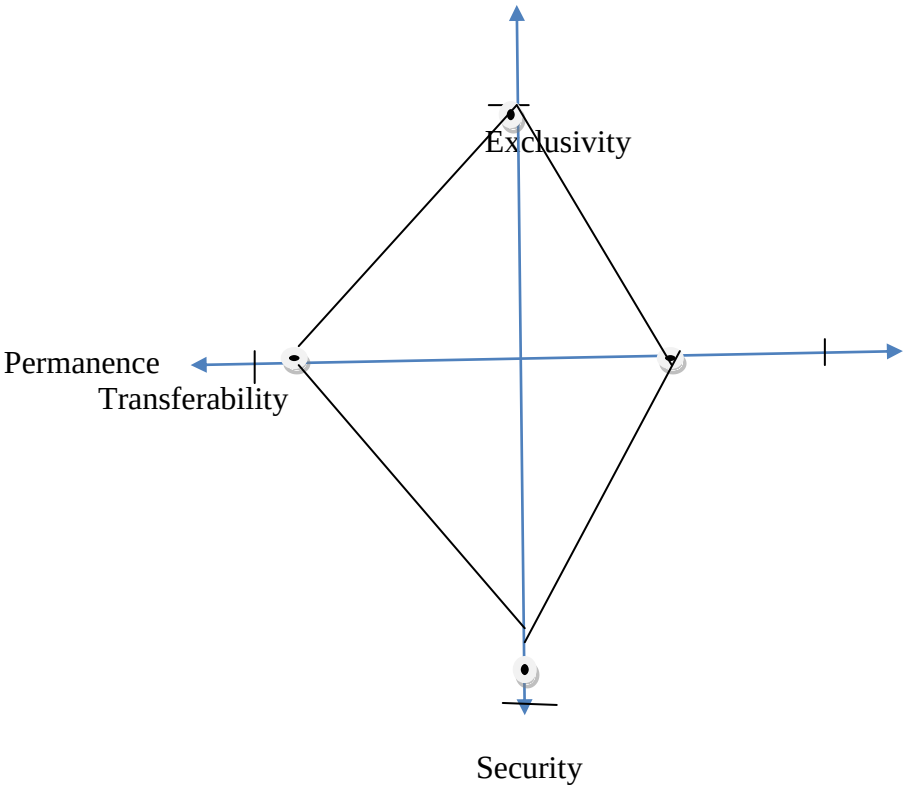

Figure 17: Possible characteristics of the TURFs implemented in Guyana

All this hinges upon the assumption that the government is able to exercise its powers in the future and that the co-operatives succeed in controlling the behavior of their members. Then exclusivity, security and permanence can be secured.

5.6 The roles and responsibilities and of co-operatives and the government

In the community based management process both government and the user group must decide what responsibilities must be delegated and the ones that would be decentralised. In this case the government is being represented by the Fisheries Department. Since the co-operatives will be given exclusive rights to a particular area (TURF), these rights will include them developing their owned regulations and access rights for its members. The co-operatives through their management committee which

is elected by the general membership of the co-operative, will have the responsibility of formulating the rules that will govern the management of the resource.

Some of the management responsibilities include developing management plans for the co-operatives, data collection programme, and monitoring and enforcement activities. The co-operatives in Guyana already have their legislative rule set in the by-laws of the country. The laws set up by the co-operatives for the management of the fisheries may include any traditional rights and rules that are not incorporated into the fisheries act but are relevant for that particular community. These laws must not, however, be in contradiction to the laws of Guyana by any means. Also they must be in line with the national fisheries policies set by the Government of Guyana. Some of the suggested responsibilities of the co-operatives are covered in Table 7 for the co-operatives but are by no means exhaustible. In the initial stages of the development of the TURFs the co-operates will need assistance from the government to develop the rules, regulatations and management plans since these are fairly new responsibilities that they would be undertaking.

Table 7: Suggested responsibility of co-operatives in a TURF fisheries system

Responsibility	**Objectives**	**Benefits**
Data collection	Determine the status of the resources.	Develop better management plans. Can later lead to setting total alowable catches
Formulation of laws (local)	Protect fish stocks Implement gear restrictions	Havesting rights ensured for all fishers. Improve welfare for fishing communities.
Enforcement activities	Enforce laws to protect the resources Regulate the behaviour of fishers Conservation of habitat. Control effort	Better fishing practices Improve behaviour of fishers to each other Control fishing gear activities and vessels

The governmental tasks include the formulation of national policies that have regional and international implications. The government will play a role in conflicts amongst co-operatives in the TURFs. National management plans for the fisheries will be done by the Fisheries Department as well as the assessment of the resources and regulation of gear types (Table 8).

Table 8: Suggested responsibilities for the government in the TURFs fisheries management system.

Responsibility	**Objective**	**Socio-economic benefits**
Conduct assessment of the resources	Determine the status of the resource	Co-operatives and government able to make better management plans.
Formulation of laws and regulations on the functioning of the co-management system	Responsiblity of TURFs shift to co-operative	Shared responsiblity for resources through enforcement and monitoring activities
Design national fisheries policy	Protect and conserve fishery resources	Increased welfare for fishers
Demarkate the fishing	Establishment of TURFs	Reduction of management costs

boundaries		
Regional and international participation in fisheries issues	Protection of transboundary stocks and international co-operation	Co-operatives able to benefit from improved management activities by other countries.
Disputes	Solve conflicts among TURF users and between the users of different gear types.	All users remain within their TURFs and zones

5.7 Operational procedures for establishing the proposed management system

In order for the proposed management system to work there need to be some guidelines in place to govern the parties involved. Therefore, it is necessary to have a contract or a formal agreement between the co-operatives and the government. This contract will determine the roles the responsibilities of the co-operatives at the community level and what responsiblities the government will share with them. Co-operatives must understand that the braking of rules set out in the contract can and will be punished. Later these new rules can also be enacted into law and general regulations.

The Fisheries Advisory Committee and the Fisheries Department as its negotiating team with the co-operatives. They will set the ground rules on how the system will work and they act as a mediator between co-operatives in any conflicts. The Artisanal Fisheries Advisory Committee will be reconstituted and will comprise of the chairman and secretary of each co-operative society. The idea is to have them meet regularly to work out any differences they may have due to the utilisation of the resources where boundaries are contiguous. Also to be involved is the Co-operative Department since they have have responsibility for co-operatives in Guyana.

A partner in all of this is the Caribbean Regional Fisheries Mechanism (CRFM), which through its expertise has been helping fishers organisations in the Caribbean to be more actively involved in fisheries management.

The length of the co-management implementation process may vary. This will depend on the entire focus and readiness of the co-operatives and government to ensure the implementation process goes well. In Guyana's case this process may take a very long time since this is a new management system. People are generally afraid of change and it will take a lot of training and convincing to have them accept change. Also the change must come from within the fishers.

In order for this to take place there will have to be the initial meetings both formal and informal, introductory meetings, drafting of contracts and legislation, seminars, training, community workshops, education and awareness programmes (Figure 18).

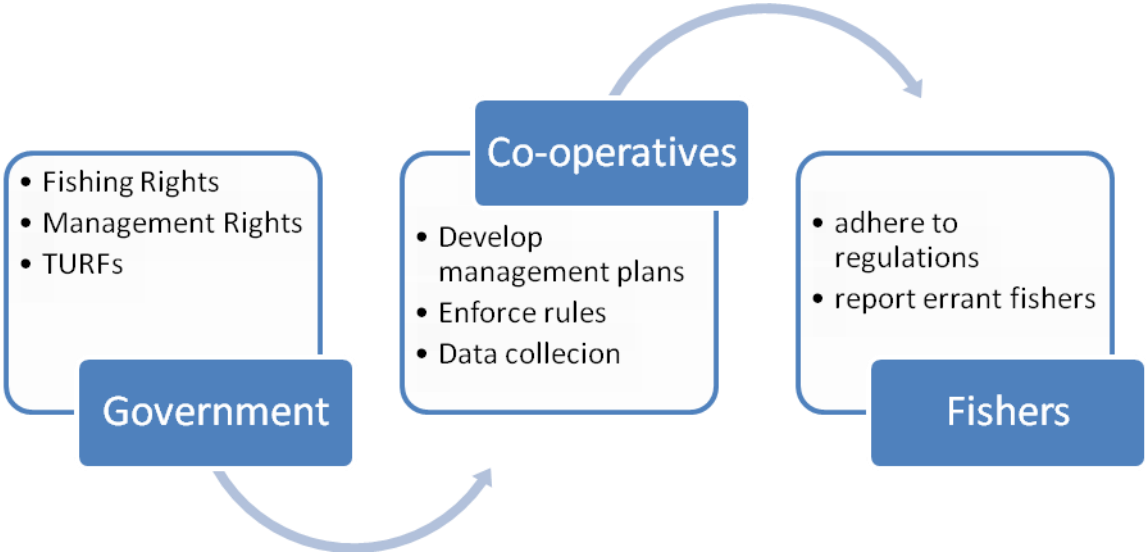

Figure 18: Linkages amongst government and stakeholders in the co-management process.

Sometimes it may become necessary to hold some meetings one on one with individuals especially those that are very influential in their communities to convince them of the process and the benefits. The signal has to come from the co-operatives that they are ready for such a move.

Some of the training will have to include management in operating a co-operative, since some of the elected officials may be new to these activities. Development of a data collection programme and how to collect data will also be necessary for some of the co-operatives. Generally when the initial meetings are being held these training needs will be identified and addressed prior to if necessary or after the implementation process has been completed. It should be noted that this is not a one off programme and the societies are left to fend for themselves, but the government will play an active role until the societies are able to manage on their own.

Those co-operatives in Guyana that are fully functioning will be targeted for the co-management process first. This will give the other co-operatives an opportunity to harmonise their members and also decide on how they will best enter the programme and on what terms.

The commitment of the officers that are in charge of this programme must be unyielding since any weaknesses shown on the government side might be taken for insincerity of the entire process. Here it is important to note that a member of the AFAC should be elected from its members to be a part of the FAC. In this way they will be represented at the highest level of decision-making in fisheries.

5.8 Estimated costs for implementation of the community management system

The costs of implementing a new system like this in Guyana will be high but in later years it will benefit all parties involved. The estimations are as follows in Table 9.

Table 9: Cost of estimates for implementing co-management in Guyana (present values)

Activity	Duration	Community costs	Government costs	Total costs (USD)
Preparatory Stages • Consultancy • Information dissemination • Consultations	12-18 months	Nil $5,000	$20,000 $10,000 $20,000	$20,000 $15,000 $20,000
Implementation Community meetings Training and awareness programmes for fishers Training and awareness programmes for fisheries staff Monitoring, control and surveillance activities Monitoring and evaluation	2-5 years	$20,000 $5,000	$30,000 25,000 $25,000 $15,000	$50,000 $25,000 $25,000 $20,000
Total		$30,000.00	$150,000.00	$180,000.00

These costs are estimates used from the Draft Fisheries Management Plan of Guyana (Fisheries Department 2006) for implementation of management programmes. These are the costs to implement community management for at least four of the eight co-operative societies that are fully functional in Guyana. It will actually take longer and more funds to have all these co-operatives fully functional and willing to participate in community management. The costs in establishing community management over the next five years on the government's part is just under 40% of the annual fisheries budget for 2007 which is low compared to the contributions of fisheries. Revenues from the fisheries sector through licensing and registration of vessels is also twice as high as the fisheries budget (section 4.2). Export earnings from fisheries in 2006 were in excess or USD 50 million (Table 1), fish exports were approximately USD 20 million of the total exports. Based on these estimates the government can assist in the implementation of community management, since eventually it will lead to reduced management costs. Revenues will be increased also, since as discussed in this paper, just about one third of all fishers are registered and licensed annually.

Instituting community management will take some time since it is a new prospect and fishers will have to get acquainted with this new concept of co-management (Figure 19). Government officials may also need the necessary time and training for this.

Community management does not involve one government agency but a number of them and they too may need to make adjustments to the system. Training will target both government and co-operative personnel in the early stages on this new fisheries management system. Government personnel will also be trained in conflict resolution, resource assessment and other areas that are necessary for the development and promotion of the TURFs management. Co-operative officials will also be trained in management of co-operatives, developing management plans, regulations and enforcement activities.

Figure 19: Timeline for the implementation of co-management in Guyana's fisheries

Some of the agencies that will have to be involved are the Ministry of Legal Affairs, the Ministry of Local Government (in the regions in which the co-operatives are located) these ministries and the other agencies that are already involved in fisheries (Figure 12). Implementation of the entire process from preparation to implantation can take as much as seven years or longer. This is where goals should be set and an entire project cycle developed and evaluation done at each critical stage so that this process is not futile.

5.9 Conclusion

Community management solves a dual purpose, it gives fishing communities some say in the management of the resources they utilise and it relieves the government of some of the responsibilities of monitoring and enforcement activities. The common property problem can be greatly reduced if allocations of resources are given to the fishing co-operatives to manage. The co-operatives would persuade the fishers to use the suitable fishing methods, control effort and monitor and enforce regulations. This could eventually lead to increased welfare among fishers, since the fishery will be improved. Also stocks that have been depleted will have the opportunity to recover under this community management system. Overall, the need to race to fish would be overcome eventually.

The shared responsibility for management of the resources between the government and the co-operatives can also lead to greater partnerships in fisheries. Co-operatives can move from being reliant on government handouts to self-management of the

resources, where they move from being producers to processing and marketing their own products. As described in Figure 6 at the initial stages of co-management the government will have a greater say and instructions will be given to co-operatives, however, as they become more involved in the management of the resources they may move up the spectrum to consultative where they would be consulted on the fisheries before any decisions are taken by the government. The example of the Belize conch and lobster can be used as an example.

In Guyana the co-operative systems are already in position but some are weak and cannot operate without assistance from the government. Co-operatives over the years have grown accustomed to government handouts and cannot visualise functioning without these contributions from the government. There are other co-operatives, however, that are managed like businesses and are earning profits. These co-operatives can benefit more from the community management system and later help the others to attain their standards. The role of co-operatives in promoting sustainable use and conservation of the resources should not be under-estimated since it is these organisations that will have to be used to develop the fisheries sector.

Co-management implementation is a long term process and cannot be achieved without partnerships. The process of co-management includes participation, empowerment, power sharing, dialogue, conflict management and knowledge generation by the partners. It may also involve the establishment of new institutional arrangements, laws and policies to support the decentralisation and participation in management (Brown and Pomeroy 1999).

Implementing this management system will benefit all partners involved. Revenues for the government will improve through better licensing of fishers, data collection, enforcement, and a better relationship with the co-operatives. Fishers will also have better control over the resources and a say in their management. This all could eventually lead to improved harvesting methods, the common property problem being resolved, an increased contribution of fisheries to the gross domestic product and overall welfare improvement.

A management system that can reverse the damages of the common property problem is well worth implementing and should be encouraged. Since such a system can also have a positive effect on the gross domestic product of the country.

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Appendix 1: List of species found in Guyana's waters and their scientific names.

	Local Names	**Scientific Names**
	MARINE	
1	Annafolk	*Archosargus rhomboidalis*
2	Bangamary	*Macrodon ancylodon*
3	Butterfish	*Nebris microps*
4	Bashaw \Croaker	*Micropogonias furnierei*
5	Catfish	*Bagre bagre*
6	Cuirass	*Arius proops*
7	Cuma Cuma	*Arius couma*
8	Gillbacker	*Arius parkeri*
9	High Water	*Hopphthalmus edentatus*
10	Kukwari	*Arius phrygiatus*
11	Lou lou	*Arius species*
12	Soft head Catfish	*Arius rugispinis*
13	Thomas fish	*Arius grandicassis*
14	Himari	
15	Cabio	*Rachycentron canadum*
16	Cavalli	*Caranx hippos*
17	Cuffum	*Tarpon atlanticus*
18	Dolphin	*Coryphaena hippurus*
19	Grey Snapper	*Cynoscion acoupa*
20	Silver Snapper	*Plagioscion squamosissimus*
21	Grouper (Jew fish)	*Ephinephelus flavolimbatus*
22	Sea Trout	*Cynoscion virescens*
23	Snook (Chinese)	*Centropomus pectinatus*
24	Snook (Blackback)	*Centropomus undecimalis*
25	Sea Patwa	*Gerres rhonbeus*
26	Suriname Mullet	*Anchoa hepsetus*
27	Sardine	*Cetengraulis edentulous*
28	Negli	*Anchoviella lepidentostole*
29	Querriman	*Mugil brasiliensis*
30	King Fish	*Scomberomorus cavalla*
31	Spanish Mackerel	*Scomberomorus brasiliensis*
32	Sea Donkey\ Jackass	Chaetodipterus faber
33	Packoo /Pacu	*Batrachoides surinamensis*
34	Pagi	*Lobotes surinamensis*
35	Pampido	*Trachinotus cayennensis*
	SNAPPERS	
36	Southern Red Snapper	*Lutjanus purpureus*
37	Vermillion Snapper \Beeliner	*Rhomboplites aurorubens*
38	Lane Snapper	*Lutjanus synagris*
39	Silk Snapper	*Lutjanus vivanus*
40	Mahogany Snapper	*Lutjanus mahogoni*
	SHARKS	
42	Sharpnose	***Rhizonopriondon porosus***

43	Tiger	*Galeocerdo cuvier*
44	Blacktip	*Carcharhinus limbatus*
45	Hammerhead	*Sphyrindae*
46	Pointes Nose	*Carcharhinus porsus*
47	Dusty	*Carcharhinus obscurus*
48	Bonnet head	*Sphyrna tiburo*
	SHRIMP	
49	Seabob	*Xiphopenaeus kroyeri*
50	**Whitebelly**	***Nematopalaemon schmitti***
	PRAWNS	
51	Brown	*Penaeus subtilis*
52	Pink	*Penaeus notialis*
53	Pink Spotted	*Penaeus brasiliensis*
54	White	*Penaeus schmitti*
	CRABS	
55	Red sheriga	*Portunus rufiremus*
56	Blue sheriga	*Callinectes bocourti*
57	Bunderi	*Cardiosoma guanhami*
58	Buck	*Ucides cordatus*
59	Mud	*Uca rapax*
60	Scissors	*Uca maracoani*
	Aquaculture Species	
61	Red Tilapia (hybrid)	*Creochromis aureus*
62	Tilapia (darker)	*Tilapia mosoambica*
63	Tilapia (lighter)	*Tilapia nilotica*
64	Hassar	*Hoplosternum littorale*
65	Pacu	
	INLAND	
66	Houri	*Hoplias malabaricus*
67	Arapaima	*Arapaima gigas*
68	Lukunani	*Cichla ocellaris*
69	Patwa	*Cichlasoma bimaculatum*
70	Sunfish	*Crenicichla saxatilis*
71	Yarrow	*Hoplerythrinus unitaeniatus*
72	Sea Hassar	*Plecoslomus sp.*
73	Pirai	*Serrasalmus rhombeus*
74	Cocobelly	
75	Snail	

Appendix 2: Fishing complexes and fishermen's co-operative societies

Fishing Complexes	**Co-operative Societies**
Inshore Fish port Complex, Meadow Bank, Georgetown (1987)	Greater Georgetown Fishermen's Co-operative Society Limited.
Rosignol Inshore Fish port Complex, Berbice (1988)	Rosignol Fishermen's Co-operative Society Limited.
#66 Inshore Fish port Complex, Berbice (1988).	Upper Corentyne Fishermen's Co-operative Society Limited.
#43 Inshore Fish port Complex, Berbice (1990)	Corentyne Pin Seine Fishermen's Co-operative Society Limited.
Lima Inshore Fish port Complex, Essequibo (1990)	Essequibo/Pomeroon Fishermen's Co-operative Society Limited.
Parika Inshore Fish port Complex, Essequibo. (1991)	Essequibo Islands/West Demerara Fishermen's Co-operative Federation Limited.
Charity Fish port Complex	Charity Fishermen's Co-operative Society Limited
Morawhanna Fish port Complex	Morawhanna Fishermen's Co-operative Society Limited.

Appendix 3: Location of the FISH PORT Complexes in the Administraive Regions of Guyana. (Fisheries Department 2006)