

COMMUNITY-BASED FISHERIES CO-MANAGEMENT IN SENEGAL

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ABSTRACT

In Senegal, the management of artisanal fisheries which account for approximately 90% of the total catch is an urgent task in view of the declining trend of fisheries resources. In this context, community-based fisheries co-management (CBFCM) has been attracting much attention in recent years as an artisanal fisheries management method. There are two reasons for the high expectations of CBFCM. (1) While various fisheries management methods, ranging from top-down methods to bottom-up methods, have been tried, positive results have only been achieved at those fishing villages where the community has taken the initiative. (2) When fisheries management receives the support of the administration and a research organization instead of leaving everything to the community, the willingness of fishermen to participate gains momentum. At the same time, management activities can be based on sound science. One successful example of the introduction of CBFCM is the recovery of octopus resources at Nianing and neighboring fishing villages. Here, local communities have established a closed season to protect octopuses during their spawning season and are using octopus pots for spawning to restore the resources. At the same time, such income generating activities as commercialization, chicken farming and fuel supply service are being practiced to compensate for any immediate economic loss of fisheries management. Meanwhile, the administration has enacted a prefectural ordinance and a research institute has been conducting participatory research to assist the community-led activities. The practice of CBFCM originally began in Nianing in 2004, spreading to seven fishing villages by 2007. The mean octopus catch per boat per day was as low as 20 kg from 2004 to 2006 but had increased to 40 kg in 2007, considerably boosting the income of local fishermen. Because of this, there is an increasing interest in CBFCM among Senegalese fishermen throughout the country, while the morale of those already practicing it is high. In this paper, CBFCM in Senegal is explained, followed by a review of several important points for the planning and implementation of CBFCM. A strategy to extend CBFCM throughout Senegal is also discussed.

Keywords: community-based fisheries co-management, Senegal, octopus, income generating activities

WHY IS COMMUNITY-BASED FISHERIES CO-MANAGEMENT ATTRACTING INCREASING ATTENTION IN ARTISANAL FISHERIES OF SENEGAL?

The management of artisanal fisheries in Senegal, which account for approximately 90% of the total catch of 440,000 tons (2004), is an urgent task in view of the declining trend of fisheries resources. In this context, community-based fisheries co-management (CBFCM) has been attracting much attention in recent years as a feasible artisanal fisheries management method. There are two underlying ideas for the high expectations of CBFCM. Firstly, fisheries management led by the community achieves better results than government-led management. Secondly, because of the need for government involvement in certain areas, the co-management of fisheries by the community and the government is the best way forward.

There are principally three reasons why community-based fisheries management is attracting increasing attention. The first reason is the failure of conventional fisheries management led by the government. In Senegal, the Fisheries Law of 1998 states that “fisheries resources are national assets and their management is the privilege of the national government”. As such, it is historically understood that the

government takes the initiative in the management of fisheries regardless of their being industrial fisheries or artisanal fisheries. The reality, however, is that the rules for fisheries set by the government are hardly observed with artisanal fishermen practically having free access to fisheries resources. Government-led fisheries management is, in fact, unrealistic as the extremely limited budget and manpower of the government cannot control fishing activities at numerous artisanal fishing villages.

The second reason is the existence of fishing villages where community-based fisheries management is in place. Typical examples are Kayar where the fisheries committee voluntarily set up by fishermen in 1994 has been managing the line fishery (Diop 1996, Watanuki 2004, Alioune and Catanzano 2005), Bamboung where a marine protected area was established in a mangrove area in 2003 with the assistance of a local environmental NGO (OCEANIUM 2003) and Nianing where the fishing of octopus and cymbium have been controlled since 2004 with Japan's technical cooperation, involving neighboring fishing villages (JICA 2006, United Nations 2006, Watanuki 2006). The common features of these three cases are: (1) minimum involvement of the government, (2) efforts of local fishermen to formulate and observe their own rules and (3) concurrent activities to create new income sources to reduce economic loss due to the practice of fisheries management. The fact that fisheries management has been achieving positive results in those villages where the community is taking the initiative is actually influencing the Government of Senegal to start to change the conventional idea of fisheries management.

The third reason is the policy change from centralized government control to community-based management. As the existing Fisheries Law does not reflect the reality of fisheries, work is in progress by the Government of Senegal to revise the law. The revised law is expected to clearly change the conventional government-led fisheries management to the adoption of the practice of co-management by promoting the participation of communities in fisheries management. Such phrases as a participatory approach, bottom-up and local initiative, which were seldom heard 4-5 years ago, are now being used not only in the field but also in government circles.

These are presumably the main reasons why community-based fisheries management is attracting growing attentions in Senegal in the recent years. However, it is necessary for the government to play certain roles in fisheries management for such management to be truly effective. In other words, it is desirable for fisheries management not to be entirely left to communities but for it to take the form of co-management with government participation. There are possibly three reasons why government participation in fisheries management is beneficial.

Firstly, the legal support of the government for community-based fisheries management can be expected to facilitate the participation of fishermen in such management and to ensure better observation of the rules by fishermen. One relevant effort currently in progress in Senegal is the enactment of a prefectural ordinance governing fisheries management activities. Once the activities of fishermen are given "government approval", there is a tendency for fisheries management to smoothly operate because of a sense of responsibility and/or sense of tension on the part of fishermen.

Secondly, the government's provision of scientific information for fisheries management not only meets the need of fishermen to understand the biology of the target resources but also makes the goal of restoring fisheries resources feasible. One effective aspect of community-based fisheries management is participatory research conducted by researchers with the cooperation of fishermen. One of the recent examples in Senegal involved visits by a researcher to fishing villages to clarify the spawning season of octopus and the introduction of a closed season by fishermen based on scientific data on the spawning season. In general, fishermen have a tendency not to listen to researchers but the implementation of

scientific research at fishing villages has the advantage that fishermen find it easier to accept the findings of such research in which they have been involved.

Thirdly, the government has a role to play in the introduction and actual implementation of the policy to expand the practice of community-based fisheries management. The restoration of fisheries resources through the fisheries management efforts is difficult if such efforts are limited to a single village. Therefore, efforts must spread from one fishing village to all villages in a region and from a region to the entire country. While it is the responsibility of the government to link one community to another, it is necessary to formulate a realistic strategy for what can be achieved with a limited budget and manpower. Even though efforts to spread community-based fisheries management in Senegal are still in their infancy, there have already been positive developments, including the establishment of local fisheries councils which are expected to act as local implementation bodies for CBFCM and efforts to achieve collaboration between CBFCM-related projects.

The reasons why CBFCM has been recently attracting much attention in Senegal have been explained so far. The author has been working for CBFCM projects for artisanal villages in Senegal as a consultant for the Japan International Cooperation Agency (JICA) and the World Bank since 2003. For the introduction of CBFCM in Senegal, the experience of Asia, which is a pioneering region of this practice, has been referred to (Watanuki 2006). Moreover, earlier efforts in Senegal have been studied to ensure that the outcomes of the pilot project can be generalized for its application to as many fishing villages as possible. The number of CBFCM projects in which the author has been directly involved is not many. However, it can be said that the continuation of CBFCM for five years at Nianing and neighboring villages has led to signs of the recovery of octopus resources (the causal relationship with CBFCM has not been fully established), raising the level of the expectations of CBFCM among Senegalese fishermen and the government.

In this paper, a case study on CBFCM at Nianing and neighboring villages which the author supervised is introduced, followed by a review of several important points for the planning and implementation of CBFCM. A strategy to extend CBFCM throughout Senegal is also discussed.

CASE STUDY ON COMMUNITY-BASED FISHERIES CO-MANAGEMENT AT NIANING AND NEIGHBORING VILLAGES

Reasons for the Selection of Nianing as the Pilot Site

When the author began the work to introduce the practice of CBFCM to Senegal in 2003, many people commented that CBFCM could not possibly be achieved in Senegal as the country's artisanal fisheries were quite messy. In truth, it was not easy to find a viable starting point because fishing villages in Senegal had many problems (increase of fishermen, collapse of fishing rules, depletion of fisheries resources due to overfishing and poverty) which appeared impossible to solve. The author visited almost all fishing villages in the country to find a suitable village for CBFCM and discussed local issues with residents. Although many fishing villages were reluctant to adopt the practice of fisheries management, fishermen in Nianing showed a positive attitude towards doing something on their own initiative to allay their sense of crisis regarding the future of fisheries. There was a good relationship between the community and the administration which is vital for CBFCM as officials of the Fisheries Department made regular visits to assist fishermen to solve their problems.

Nianing is located 90 km south of Dakar and is a medium size fishing village with a population of approximately 6,000. The village is characterized by a high proportion of Christians and a high level of education. The village used to be equally dependent on fisheries and agriculture but a continuous drought for several years has forced many villagers to concentrate on fishing which provides cash income, resulting in the depletion of fisheries resources. The same situation can be observed along the coast of Senegal and fishermen are suffering from a vicious cycle of poverty. In the case of Nianing, the livelihood is based mainly on shellfish, the sustainability of which is largely determined by fishing activities, and there is a real concern regarding a possible worsening of the poverty if the present situation is not addressed.

The annual catch at Nianing in 1998 was 1,312 tons. A survey conducted in March 2004 established that the number of pirogues (a type of canoe with an outboard engine) was 177. The main products were cymbium, murex, cuttlefish and octopus. These accounted for 80-90% of the total catch. The fishing gear/methods used were bottom gill nets for cymbium and murex, trammel nets for cuttlefish, octopus hand lines in summer and basket traps for cuttlefish (JICA 2006). These products caught by the fishermen of Nianing were mostly frozen and packaged by fishing companies for export to Europe and Asia. As neighboring villages employed the same modes of fishing and marketing of fish products, it was believed that, if successful at Nianing, CBFCM could be applied to other fishing villages in the region.

As far as the infrastructure of the village was concerned, there was electricity supply and water supply using wells. However, no fish landing facilities or market facilities existed. There was a fuel station for outboard engines but no ice-making machine. The overall picture of Nianing was that of a traditional fishing village which did not feature in any of the development plans of the central government or aid of donors. It was, therefore, necessary for the pilot project to simultaneously tackle fisheries management and poverty reduction even though these two themes are often incompatible.

Management of Octopus Fishing

At the kick-off workshop held in Nianing in 2004, local residents put forward the opinion that fishing activities should be controlled in order to avoid the extinction of fisheries resources so that their children and grand-children could engage in fisheries. However, because of the impossibility of introducing blanket management targeting all fisheries resources, octopus was selected for several reasons. (1) Despite a high market value as an export product, the catch had been decreasing with the size becoming smaller. (2) Octopus was economically the second-most important resource in Nianing. The management of cymbium, the most important resource, would cause severe economic damage. (3) The experience to be gained from the pilot project in Nianing could be replicated as many fishing villages were engaged in octopus fishery. (4) As the lifecycle of octopus is as short as 12-24 months (Mangold 1983), there is a good chance for positive effects of fisheries management to be observed early. (5) Japan's experience of the management of octopus fishery could be referred to.

It was decided that the introduction of a closed season and the use of octopus pots for spawning would be the components of the management of octopus fishing. The introduction of a closed season for octopus had previously been attempted by the government several times (Caverevière et al. 2002) but had failed. At Nianing, it was decided to leave the decision on the actual period of the closed season to the community. According to the experience of fishermen, the spawning season for octopus is from September to October. It was, therefore, decided to introduce a closed season of one month around this time. While there was an opinion favoring a closed season lasting for two or even three months, it was

decided to start with a closed season of one month in view of the capacity of fishermen to stay away from octopus fishing activity.

Octopus pots for spawning are artificial spawning reefs which utilize the habit of octopus to spawn in a confined space. When these pots are sunk into the sea during the spawning season for octopus, one octopus will enter a pot and spawn some 100,000 eggs. Octopus pots for spawning are considered effective to increase octopus resources and are also used in Japan. In the first two years of the pilot project, the JICA funded the entire cost of 200 pots in 2005 and 1,700 pots in 2006. In 2007, however, while the JICA funded 1,000 pots, the community itself funded a further 600 pots. In 2008, the JICA funded 500 pots while the community funded 1,000 pots, showing increasing burden-sharing on the part of the community. It is planned that the community will eventually fund the entire fisheries management cost in the near future by means of expanding the income generating activities which are described later in this paper.

To establish scientific proof of the timing of the spawning of octopus, the Oceanographic Research Center of Dakar-Thiaroye (CRODT) and local fishermen conducted participatory research in Nianing over a period of one year. This research found that September is peak spawning month based on the sexual maturity of octopus, supporting the belief of fishermen.

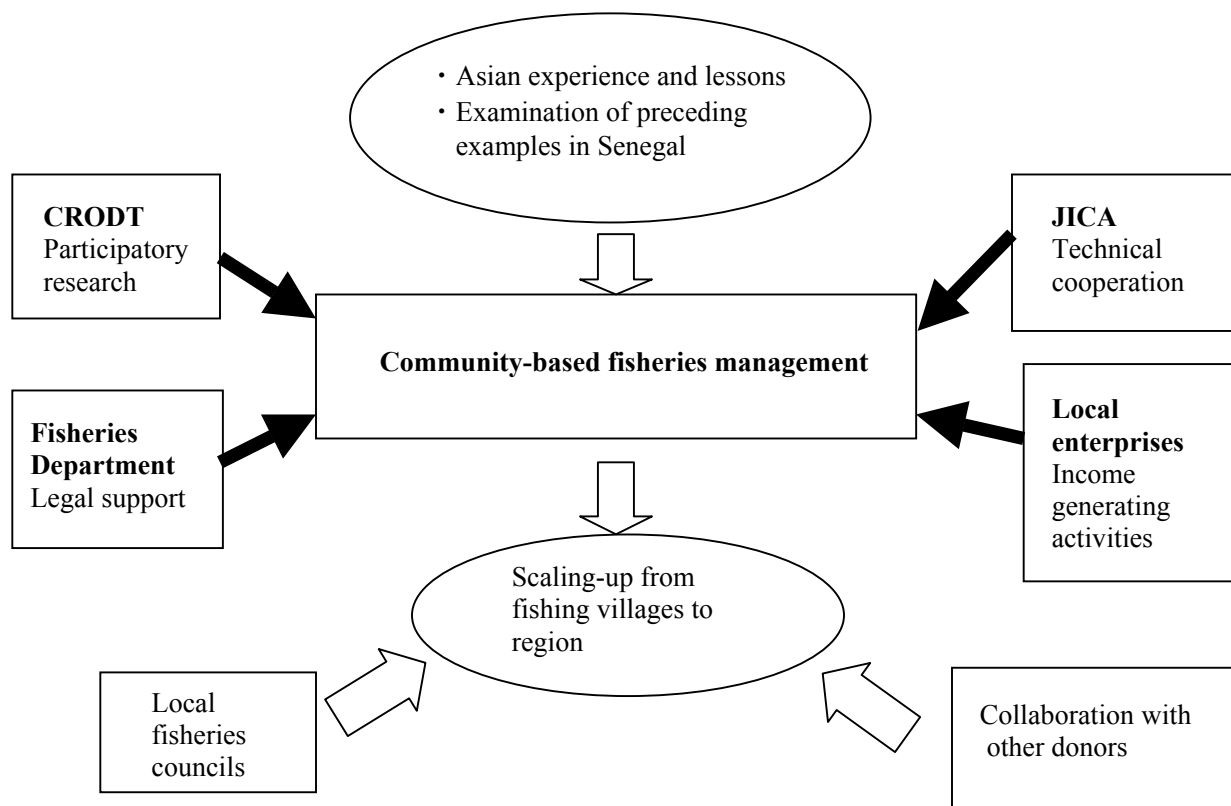


Figure 1. Schematic drawing of community-based fisheries co-management at Nianing and neighboring villages in Senegal

Fisheries management activities featuring octopus commenced in Nianing in 2004 and at the neighboring fishing villages of Pointe-Sarene and Mballing in 2005. As a result of efforts of the Fisheries Department to gather leaders of fishermen in the region to appeal the importance of joint fisheries management by not only these three fishing villages but also all neighboring fishing villages, the villages of Ndayane, Popenguine, Guereo and Mbour in the same region joined the pilot project in 2006 and 2007. According to the Fisheries Department, the closed season has been properly observed every year as almost 100% of fishermen follow the rule of not catching octopus during this season. It has also been verified that many octopus enter the pots for spawning. During a survey in 2006, some 10% of the 1,700 pots placed were hauled to check for the presence of octopus eggs in the pots. Eggs were found inside some 50% of these pots. Meanwhile, some 75% of the pots hauled had an octopus inside.

2007 proved to be a bumper year for octopus. More precisely, (1) the size of the octopus catch was large (the mean octopus catch per boat per day was 20 kg from 2004 to 2006 and 40 kg in 2007), (2) the average size of the octopus was large (600 g in 2006 and 1-1.5 kg in 2007), (3) the fishing season was longer (two months in a normal year but three months in 2007), (4) the size of the fishermen's income increased (the earnings per boat per day increased from 20,000 CFA francs (US\$ 4.5) in 2006 to 80,000 CFA francs (US\$ 18) in 2007) as fishermen were careful not to catch too many octopus to avoid a price crash and (5) the places where octopus pots for spawning had been sunk had become good fishing grounds.

While the increase of octopus could have been the result of favorable feeding conditions for the survival and growth of octopus, fishermen believe that it was a positive outcome of fisheries management. Fishermen have become the driving force of fisheries management because of their actual observation of octopus eggs in the pots, the assistance provided by the administration for a closed season by means of passing a prefectural ordinance and the revival of octopus fishery in the three years of the pilot project. Based on their experience with octopus, fishermen at Nianing and neighboring fishing villages are now pursuing the management of cymbium.

Income Generating Activities

At Nianing, the participation of the community in the pilot project was believed to be impossible unless the problem of poverty was dealt with along with the problem of fisheries resources. Accordingly, it was decided to launch income generating activities. These activities were necessary not only for the upkeep and improvement of the living of residents but also for the earning of cash to pay for the fisheries management cost and operational expenses of the fisheries management committee.

The opinions of the community were respected as much as possible in the process of selecting technically and economically feasible activities. Three activities (commercialization of fish products, chicken farming and a fuel supply service) were eventually selected. A common feature of these activities is the relatively short period of time required for the generation of income unlike aquaculture or eco-tourism. The quick earning of cash income allows the swift commencement of fisheries management.

The background of the request of the community for commercialization was the discontent among fishermen regarding the purchase prices offered by middlemen for marine products. The control of the distribution channels by middlemen in Senegal creates a buyer's market. The low prices paid for marine products mean that the only way fishermen can secure a stable income is to increase the catch, causing the depletion of fisheries resources. In 2003 prior to the pilot project, the price paid for octopus by middlemen to fishermen was 600-1,000 CFA francs/kg regardless of the size. In contrast, the fisheries

management committee which commenced the commercialization of octopus in 2004 purchases octopus at the sales price to a fishing company minus the committee's commission of 50-100 CFA francs/kg. The average purchase price by the committee in July and August 2004 was 1,600 CFA francs/kg, suggesting that commercialization by the fisheries management committee increased the income of fishermen by at least 600 CFA francs per kg of octopus (JICA 2006). Although there was strong approval of commercialization on the part of fishermen, middlemen expressed opposition to the pilot project. To calm the situation, the fisheries management committee and fishing companies explained the significance of the pilot project to middlemen. The subsequent acceptance of the pilot project by middlemen enabled all stakeholders from the production stage and distribution stage to work together to achieve reform. Any planned reform raises opposition by anyone clinging to a vested interest. It is essential that every attempt to manage fisheries resources takes the future benefits to be enjoyed (renewable fisheries resources) as well as vested interests into careful consideration.

The idea of chicken farming began with the problem posed by the large volume of waste shells requiring, if possible, recycling. To start with, nutritional analysis of the waste shells of cymbium and murex was conducted to determine whether or not they could be used as chicken feed. For comparison purposes, oyster shells actually used by a chicken farm were also analyzed. The analysis results showed that (1) the calcium content, which is important for the forming of the egg shell, is approximately the same for shells at Nianing and oyster shells at the chicken farm and (2) cymbium shells at Nianing have 20 times more iron, an important ingredient of blood, than oyster shells at the chicken farm. Based on these results, it was concluded that the waste shells at Nianing were equal to or even better than the oyster shells used to feed chickens by the chicken farm in terms of the nutritional value. Following the nutritional analysis, a further experiment was conducted with the cooperation of the chicken farm to see if chickens could digest the waste shells from Nianing. The results showed that the chickens liked the shells of cymbium and murex and that their digestion and absorption performance was also good. As Nianing produces large quantities of unsold fish and residue of agricultural products, the production of chicken feed using these would reduce the reliance of chicken farmers on expensive artificially assorted feed. Members of the fisheries management committee raised 300 chickens in 2006 using their own expertise of chicken farming and this business took off with orders placed by restaurants and hotels. However, it was soon hit by the occurrence of avian flu in West Africa which resulted in suspension of the business. At present, ways to lower the cost of chicken farming are being examined in preparation for the re-start of the business.

The idea of a fuel supply service was originally put forward by the communities of Pointe-Sarene and Mballing. The reason for the selection of this idea were that (1) a solution to the biggest problem of the lack of a fuel supply facility would be a great incentive for local fishermen to participate in fisheries management, (2) the gasoline tank and pump rental scheme could be replicated in other fishing villages and (3) villagers offered to pay for the cost of gasoline. As such, the JICA only funded the cost of the concrete foundation for the fuel supply facility. This station has been maintained by the fisheries management committee (consisting of the leader, facility operator and treasurer) under the supervision of the Fisheries Department. The operator has previous experience of maintaining a fuel supply system. Gasoline is sold between 7 o'clock in the morning and 7 o'clock in the evening and fishermen buy 5-10 liters of gasoline a time. The number of customers can be some 80 on a busy day and 40 on a quiet day. Fishermen from other villages also come to buy gasoline. Although the price of gasoline per liter is 10 CFA francs higher than the standard market price, it is cheaper than travelling a long distance to buy gasoline at a gasoline station. Each time fishermen buy gasoline, they pay a set commission of 200 CFA francs to the fisheries management committee. This commission is used to pay the salary of the operator,

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| <p>Kick-off workshop February 2004</p> | <p>With the participation of residents of Nianing and representatives of the administration, opinions were exchanged on the present situation and problems of the village, fisheries management and income generating activities, organizational arrangements for fisheries management and the expected role of the Senegalese government.</p> |
| <p>Launching of the fisheries management committee February 2004</p> | <p>A fisheries management committee was established with members consisting of fishermen, middlemen and women engaged in the processing of fish.</p> |
| <p>Commencement of participatory research on the biology of octopus February 2004</p> | <p>Biological study on octopus was conducted for a period of one year and the clarified spawning season was referred to for the introduction of a closed season.</p> |
| <p>Commencement of commercialization of cymbium and octopus March 2004</p> | <p>Through negotiations with fishing companies, the fisheries management committee realized direct trading of the catch with the fishing companies.</p> |
| <p>Village meetings on the closed season for octopus July 2004</p> | <p>The closed season for octopus (from 15th September to 15th October) was agreed by the majority of villagers. The local government subsequently issued a prefectural ordinance to validate the closed season.</p> |
| <p>Participation of Point-Sarene and Mballing in the pilot project April 2005</p> | <p>Point-Sarene and Mballing, two neighboring villages of Nianing, made a request to participate in the pilot project.</p> |
| <p>Installation of octopus pots for spawning August 2005</p> | <p>The spawning of octopus was confirmed, suggesting the potential of increasing the resources.</p> |
| <p>Commencement of chicken farming and completion of fuel supply facility October 2005</p> | <p>The diversification of income sources was attempted as additional earnings were required for the successful implementation of fisheries management.</p> |
| <p>Increase of the number of villages participating in octopus management to seven July 2007</p> | <p>The fishing villages of Ndayane, Popenguine, Guereo and Mbour made a request to be included in the pilot project.</p> |
| <p>Bumper catch of octopus July 2007</p> | <p>The catch of octopus has doubled, boosting the morale of fishermen to continue fisheries management.</p> |

Figure 2. Main activities of community-based fisheries co-management at Nianing and neighboring villages in Senegal

the maintenance cost of the facility (repair cost and delivery service cost), the cost of fisheries management activities and the cost of supporting social activities in the village. Part of it is kept in a savings account. As many fishing villages in Senegal do not have a fuel supply facility, a fuel supply service has good potential as a means of supplementing the income of fishermen. A project of the World Bank plans to set up a fuel supply facility in two fishing villages in exchange for the local acceptance of fisheries management.

Coexistence of Fisheries Management and Poverty Reduction

The questionnaire survey conducted at Nianing found that the income of more than 80% of the respondents had increased compared to the pre-pilot project period, illustrating the progress towards the coexistence of fisheries management and poverty reduction. The increased income was primarily the result of commercialization and increased catch of octopus. The residents of Nianing predicted that the activities under the pilot project will continue. The reasons for this are that both the fisheries management activities and the income generating activities are led by the community and that there is government assistance for fisheries management.

Meanwhile, there are fishermen who feel a sense of unfairness because of the fact that some fishing villages make no contribution towards fisheries management. To solve this problem, it is necessary to examine the possibility of introducing preferential treatment for fishermen and fishing village which are actively involved in fisheries management. Given the situation in Senegal where it is practically impossible for the government to introduce fisheries management in all villages in a uniform manner, the author believes that the only feasible way is to gradually scale up, starting with the pilot project for individual fishing villages.

ESSENTIAL ASPECTS OF THE DESIGN AND IMPLEMENTATION OF COMMUNITY-BASED FISHERIES CO-MANAGEMENT

In Senegal, there is a growing need for CBFCM to ensure the success of artisanal fisheries management. The author believes that an appropriate step for CBFCM is to learn from Senegal's own experience. In addition to Nianing, Kayar and Bamboung have good CBFCM experience which could provide some important lessons. There are some concerns which should carefully be examined, i.e. why do some fishermen engage in fisheries management while others do not, how was the project designed taking the socioeconomic aspect of the village into consideration and what aspects of the project contributed to its sustainability and replicability? Senegal's fisheries management experience offers answers to these questions and may prove to be more useful for the application of CBFCM in Africa than those experiences in such Asian countries as Japan, the Philippines and Thailand.

What the author has been conducting in Nianing with regard to CBFCM has been largely influenced by what the author observed in Kayar. For the design of a CBFCM project, a good strategy to motivate fishermen to participate in fisheries management is required. There are many approaches, foremost of which is the placing of fishermen at the center of any envisioned action. It is important that the opinions of fishermen are heard, their knowledge is utilized, they make decisions and believe in what they are doing. It is also important for fisheries management to be accompanied by income generating activities. This is because fishermen will give up if they do not benefit economically from a project. This reality has been learned from experience in Nianing, Kayar and Bamboung.

The long-term goal of fisheries management is not the participation of fishermen but the rehabilitation of resources. To achieve this goal, the application of science in support of the activities of fishermen is necessary. This is particularly important to determine the use of an appropriate mesh size, size of the fish to be protected and, in the case of the introduction of a closed season, the spawning season of the target species. The introduction of a closed season for octopus in Nianing is a good example. Based on indigenous knowledge of the spawning season of octopus, the proposal of the month of September as the closed season for octopus by fishermen to the Japanese side was accepted and implemented. During this season, octopus pots were laid at the bottom of the sea to act as spawning pots. To validate the knowledge of fishermen of the spawning season, scientific research was simultaneously conducted by CRODT and fishermen for one year. The study results confirmed the knowledge of fishermen. It is worthy of note that the closed season for the fishing of octopus and the laying of pots at the bottom of the sea probably resulted in an increase of the octopus catch.

The experience obtained in Nianing illustrates that it is necessary to (1) utilize the knowledge of fishermen as they have a good understanding of the resources, (2) conduct participatory research to support the knowledge of fishermen and (3) ensure that fishermen and researchers work in the same direction (co-management) to achieve the goal of fisheries management.

International cooperation projects work well as long as the donors provide the finance. In many cases, however, the activities come to an end when the support stops. The issue of sustainability must, therefore, be considered in the project design as time is required for the rehabilitation of resources. In most cases, sustainability depends on finance which is why it is necessary during project implementation to teach fishermen how to generate funds. The reason why fisheries management in Nianing has continued is because fishermen have been able to commercialize their products and deal directly with fishing companies without middlemen. This has resulted in increased revenue for fishermen. In the case of Bamboung, eco-tourism provides additional income for fisheries management. In both cases, the projects were designed in such a way that any economic loss resulting from the implementation of fisheries management was compensated by the profit from income generating activities. In this way, the issue of project sustainability has been addressed.

Replicability is also an extremely important consideration for fisheries management in view of the fact that the restoration of resources is difficult if efforts are limited to a single village. After obtaining positive results at one village, it is necessary to extend the activities to other neighboring villages. In order for a project to be replicated, it is necessary to consider (1) the capacity of fishermen to handle the management method, (2) the target resource to be managed must be the same, (3) reduction of the project cost to a minimum by means of using local resources and (4) the support of the government must not be substantial. CBFCM should, therefore, be promoted. The author believes that the project in Nianing can be replicated and the initiatives of the fishermen in Nianing are already being extended to other villages.

As described above, Senegal already has good experience of CBFCM. While the CBFCM at Nianing, Kayar and Bamboung may not be perfectly suited to other villages, the strategic approach to CBFCM can prove useful. It must be ensured that the originality of each project site is retained. Each fishing village has its own characteristics and, in general, fishermen are rivals and tend to believe that they are different from others. This is why the design of CBFCM must also include originality to give fishermen a feeling of project ownership.

STRATEGY FOR NATIONWIDE EXTENSION OF COMMUNITY-BASED FISHERIES CO-MANAGEMENT IN SENEGAL

The case of CBFCM in Nianing indicates a strong potential for the nationwide extension of CBFCM in Senegal. The next step is the extension of CBFCM to other fishing villages in Senegal and the achievement of positive results. This will require a strategy based on a realistic viewpoint and the author's idea is explained next.

- (1) Fishing villages in Senegal have their own characteristics and the conditions of fisheries and the awareness of fishermen vary from one fishing village to another. Because of the difficulty of the uniform application of a single model of fisheries management, a bottom-up type of approach is necessary to cater for the different conditions of each fishing village. As the simultaneous introduction of the practice of fisheries management at all fishing villages is practically impossible, fishing villages should firstly be classified into, for example, "villages with predominantly local fishermen", "villages with predominantly migratory fishermen" and "villages with a mixture of local and migratory fishermen". A pilot project should then be implemented in villages representing these different types of fishing villages with a view to establishing fisheries management models. Meanwhile, the government must try to extend the bottom-up type of fisheries management and introduce a policy and system to support such fisheries management.
- (2) When fish are the assets of a country, they must be protected with the collaboration of all fishermen. In Senegal, the existence of fishermen who do not practice fisheries management has created a sense of unfairness on the part of those fishermen who do practice fisheries management. To solve this problem, the introduction of preferential treatment for fishermen and fishing villages which are actively involved in fisheries management is proposed here. For example, they could be given the preferential right to sell their catch to fishing companies. An eco-label as a PR tool for consumers could be affixed to the catch of those fishing villages practicing fisheries management. Fishing infrastructure could be developed at these villages in a preferential manner. Measures to exempt the tax on fishing equipment and gasoline could be applied only to fishermen and fishing villages practicing fisheries management. The rapid spread of fisheries management could be achieved through the adoption of these preferential measures.
- (3) There are more than 100 artisanal fishing villages along the some 700 km long coastline of Senegal. From the viewpoint of the biological effects of fisheries management, it is more appropriate to concentrate the efforts of the government and donors on specified areas rather than the dispersal of their resources nationwide to quickly achieve better results and a good model(s) for other areas. The JICA and the World Bank are implementing CBFCM in Senegal. If they collaborate to implement fisheries management in the same area(s), regionally-based fisheries co-management, a further step forward from CBFCM, could be achieved with much better impacts on fisheries resources.
- (4) When the effect of CBFCM of a pilot project, i.e. prevention of the continual decline of fisheries resources, is substantiated, the drive to extend CBFCM is likely to be accelerated. The length of time required for the restoration of fisheries resources varies depending on the fish species. In the case of octopus, cuttlefish and shrimps, the short life-cycle of 1-3 years means the relatively quick emergence of the effects of CBFCM. In contrast, such demersal fish as grouper and sea bream are said to require 5-6 years to reach maturity and, therefore, a long time will be required for CBFCM to produce tangible results. If the spread of CBFCM is urgently required, it is more appropriate to

target cephalopod and crustacean first. When positive results are achieved with these, a next challenge should be directed towards demersal fish and pelagic fish.

- (5) The extension of costly CBFCM will be difficult in Senegal and other developing countries. Therefore, an inexpensive way of implementing CBFCM must be selected. The introduction of a closed season as in the case of Nianing is inexpensive. Marine protected areas recommended by environmental NGOs and artificial reefs preferred by some donors incur a huge cost for the surveillance of illegal activities (Watanuki and Gonzales 2006). Efforts to introduce such advanced methods as rights-based fisheries management, marine ranching and stock enhancement as practiced in Japan are doomed to failure in developing countries. The practice of fisheries management in Senegal is still in its infancy and it is better to start with easy fisheries management with a view to gradually advancing to more difficult stages.

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