

Annex 2

Conflicts Arising from Re-Allocation of Fishing Lots: Perceptions from Community Fisheries in Cambodia

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Executive Summary

Fish has long been part of the staple diet of the Cambodian people. As Cambodia moves towards a free market economy, the commercial pressure on natural resources has dramatically increased. Privatization of the remaining fishery resources has been affecting the local livelihoods, leading to an alarming increase in conflict over the fishery resources. In order to protect the people's livelihood and natural resources, the NGOs have advocated that the government institutions must exert more efforts in solving the problems in fisheries.

Many boundaries of the fishing lots were either neglected or the government was not able to re-demarcate them during the war. This has resulted in confrontation between the lot owners and the local residents. Many fishing lot owners are speculated to be taking advantage of the situation. Additionally, violence also happened in the former abandoned fishing grounds controlled by the military. Fishing villagers used to customarily access the areas. When the war ended in 1999, however, fishing lot owners wanted to annex these areas to the neighborhood fishing lot areas.

As an attempt to mitigate the abovementioned conflicts, this study of fish fights over fish rights was initiated. The aims of the project were to develop a broad framework for addressing approach for reducing over capacity in Southeast Asia, and to examine where fisheries conflicts may arise and provide plans to ameliorate these conflicts and its role in reducing conflicts and enhancing national/regional security.

In terms of research methodology, 270 samples were selected from Community Fisheries (CF) and Non-Community Fisheries (NCF) in three provinces. Kandal and Pursat provinces have freshwater fisheries. Kamptot represents marine fisheries. Aside from interviews on fishers and 18 representatives from different institutions, 12 focused group discussions were also conducted. The data were encoded using Access and analyzed in Excel program. The duration of the field survey was four months, starting from May 2004 and finishing in August 2004. The project ended in January 2005.

The results of this research are summarized as follows. Most of the respondents in the study areas had ages ranging from 40 to 59 years old. Young people (age range from 20 to 39) in CF seemed to be higher in proportion than those in the NCF by about six percent. Conversely, household heads whose ages ranged from 60 to 79 in the CF seemed to have lesser proportion than in NCF.

Male-headed households were dominant in both CF and NCF areas. Female-headed households accounted for only 25% in CF and about 13% in NCF. More female-headed households lived in Pursat and Kamptot than in Kandal. However, the respondents in Kandal had more number of widowers than the other two provinces. About 54% of the respondents in both CF and NCF sites had completed primary school. Only about 4% had reached secondary school. Illiterates still comprised about 20% in CF and NCF sites. The mean of number of years for male's schooling was about 4 years, while females only completed about 2.2 years of education on the average.

Fishing was the principal occupation in both CF and NCF sites. Farming predominated in CF than in NCF areas. In the CF, farming was represented by about 16% while in the NCF it constituted about 1%. Besides farming, about 2% in CF and 1% in NCF were engaged in small business. In addition to these main occupations, five secondary occupations also existed in these three provinces. These are fish-related activities, small business, farming, laboring and government/NGOs workers. Farming was identified by most respondents in both CF and NCF sites. Very few people worked as government/NGO workers. Male-headed households tended to have more secondary occupation than female-headed households.

Many respondents had family members ranging from 1 to 5, which constituted to about 41%. There were very few households who have members greater than 11. Although the number of people in the households ranged from 1 to 5, the effective manpower in the households consisted only of about 1 to 3 persons. In terms of gender, the manpower engaged in fishing had a ratio ranging from 3 men per 1 woman (3:1) up to 14 men per 1 woman (14:1). On the average for all respondents, 5 men for every 1 woman (5:1) were engaged in fishing.

Besides manpower in the household, capital asset is an essential element. There were five main capital assets identified by the respondents. House is a great capital asset which contributed to a very high proportion of the total household assets. The cost of house varied from location to location, whereby the price of houses in CF tended to be lower than in NCF. This is because most of the respondents in the CF areas live on water rather than on land. For small-scale fisheries, the households who live on the water were poorer than those who stay on land. Furthermore, land holdings, boats and electronic appliances were also much lower in value than in NCF (a comparison in value). Hence, the assets of the households were related mostly with location, rather than on any other factors. This finding was confirmed by the result of T- test at 95% confidence level ($p = 0.00$).

Income of the household respondent is another importance factor. In CF areas, the income of each province was the least. On the average, the household income varied from 5.12 to 5.44 million Riel. The income of the household members in CF tended to be higher than those in NCF. This amount of income, however, cannot represent the population's income because the Standard Deviation (SD) was too high, which fluctuated from 5.03 million Riel to 17.06 million Riel. With this SD, the distribution of household's annual income had a big gap, which can make the poor become poorer. The average income of these two sites was similar, but the SD of CF sites were almost double when compared to the average annual income. In the NCF sites, the SD of income was only a bit higher than the average. Consequently, the socio-economic conditions of the respondents in NCF is comparatively better than in CF sites.

Fishing was the main source of household income. It contributed to some 68% of the total income of the CF respondents, and about 84% to the NCF respondents. The second source of income was fish-related activities which included fish trading, fish/seaweed culturing and fish processing. This activity contributed to about 23% of the total income in CF, while it accounted only 2.4% for NCF. Farming provided also supplementary income to the respondents.

Fishers went to fish mostly in CF sites for CF the members. The management regime was mostly open access for the NCF sites. Few of CF fishers (0.7%) went to fish in protected areas while about 6% of the total NCF respondents fished here. The reasons for going to fish in those areas were because of easy access for CF, and easy to access and no alternative for NCF. Aside from fish, those fishing grounds also provided some vegetables, water for household uses, and fuel wood for the fishers. Other benefits provided by the fishing grounds included medicine and housing construction materials.

The fisheries rules and regulations which were administered by the local governor through *prakas* (declaration) in CF covered the community members. Illegal fishers are also affected by such declarations. Before 2001, the respondents customarily used gillnet as a fishing gear for catching fish. Some of them used hooked line and a few use seine net. Respondents in CF sites tended to use gillnet less than in NCF, while the use of hooked line was greater in NCF than in CF. Furthermore, CF respondents used more fish trap and seine net more than in NCF fishers. The NCF respondents were more keen to use *samras/krasom*, which are illegal fishing methods, compared to their counterparts in CF sites.

The fishing method used, the species caught, the number of fishing trips per week, and the number of both crews varied from fishers to fishers. Generally, the fishers in CF went fishing for about 5 times per week whilst NCF fishers often went fishing for 6 times per week. The number of people who went fishing was about 2 persons per fishing trip. Fishers in CF tended to fish for fewer periods than in NCF. They spent about 8.45 hr and 10.58 hr, respectively, per fishing trip. This is because fishers in CF sites fished only within their vicinities. Fishers in NCF went to fish in open access, which may be far from the village where they live. Amount of catch also depended on the areas. Respondents in CF sites tended to have lesser catch than their counterparts in NCF sites. This was because they fished only within their limited areas. The average catch per fishing trip was

about 17.5 kg for CF fishers and about 24.4 kg for NCF fishers. Those figures total to about 4.55 mt and 7.6 mt per annum, respectively. However, these production figures of both CF and NCF sites cannot represent the whole population given that the SDs of these two production values were very high, when compared to the means. The SD of production value for respondents in CF was about 41 kg; in the NCF, it was only about 32.7 kg per fishing trip. With these two high SD values, one can assume that the production volumes of these two sites may reach up to about 58 kg for CF and about 57 kg for NCF per fishing trip. These translate to about 15 mt and 17.8 mt per annum, respectively.

The data obtained in 2003-2004 was similar to the data generated before 2001. There were differences in some respects, though. Fishing gear like fish trap increased by about 13%, followed by cast net that increased to about 160%, and then gillnet to about 4.5%. Significantly, seine net increased in numbers by about 500% or 5 times than in 2001. Conversely, hooked line and other fishing methods, on the other hand, decreased to about 13% and 53%, respectively. The number of fishing trips and people who went fishing did not change from the 2001 values. The fishing time per trip was only slightly reduced to about eight minutes. Unpredictably, the production volume per fishing trip decreased from 21 kg to only 4 kg. The decrease in fish production volume was about 466% or about 5 times since 2001. In 2003-2004, the average fisheries production per fishing trip was about 2.7 kg for CF fishers and about 4.7 kg for NCF fishers. These values are equivalent to about 702 kg and 1,466 kg per annum, respectively. These production values of both CF and NCF sites cannot represent the whole population because the SDs of these two production values were very high, when compared to the means. The SD of fishes caught by respondents in CF was about 14.7 kg and in NCF was about 20.7 kg per trip. With these two high SDs, it can be assumed that the fisheries production of these two sites for each trip may reach to about 17 kg for CF and about 25 kg for NCF. These may total to about 4.4 mt and 7.8 mt per annum, respectively. Even then, the fish production in 2003-2004 still decreased to about 71% in CF sites and about 56% in NCF sites.

Although there was a decline in fish production to about 64% from the 2001 figure, the price of freshwater fish increased. This increase was about 1.2 times for high value fish and about 1.7 times for medium value species. Surprisingly, low value species, which are mostly consumed by the poor people, increased by about 2.6 times from 2001. There was also an increase in price of marine fisheries, which contributed very little to the livelihood of the people in the country. The price of high value species increased only about 0.7 times, followed by medium value species that increased by about 0.6 times, and then low value species that increased by roughly 1.3 times.

Fish production decreased dramatically since 2001 while the price of fish increased substantially. This result was the same with the perceptions of the respondents in both CF and NCF sites. Furthermore, they mentioned that fish production decreased dramatically because of excess fishing effort. More farmers also became fishers after fisheries administration reforms started in the late 2000. Farming and lotus culturing in the lake also contributed to the decline in production. Other reasons stated were fishing is now less productive, intervention in the upstream river, and increase of fish price. Given the increase in fish price, fishers try to catch fish as much as they can to generate higher income for their households. Moreover, the increase of fish prices implies an increase in the price of many basic commodities. Hence, fishers try very hard to catch more fish to pay for their higher expenditures.

Due to increasing fisher population and increasing fishing effort, the small scale fishers are faced with many conflicts to sustain their livelihood. Most of the time, they had conflicts among themselves, as well as with medium-scale and large-scale fishers. Sometimes, they had conflicts with illegal fishers, fishery officers and local authority. These conflicts were classified as sometime serious, sometime somewhat serious, and sometime not serious at all. However, all conflicts that arose in the areas did not result into violent confrontation.

To solve these critical issues and conflicts, the respondents suggested 14 solutions. First is to clarify fishing boundaries among small-scale, medium-scale and large-scale fishers. Right now, fishers are mostly unclear about their fishing boundaries which allowed them go to fishing almost everywhere. Sometimes, when the fish is close to the fishing lot, the lot owners do not allow them to harvest the fish. The second suggestion was to eliminate illegal fishing practices, which are already codified in the fisheries law. Creating a community fishery was stated by the respondents in the NCF as the third solution. Eliminate medium-scale and large-scale fishing gears in the CF sites was the fourth suggested solution to mitigate the identified conflicts. The last suggested

solution was to eliminate corruption of powerful men in both CF and NCF sites. This suggested strategy was given by only very few fishers.

Given these conflicts and possible solutions, more than 58% are still committed to stay in the fisheries. About 18% were not sure, while about 19% would like to move out of fishing. The reasons for exiting from fishing include: (1) fish production is declining, (2) existence of other livelihood opportunities, such as farming and seaweed culture (for coastal province); and (3) preference to engage in other small business. Furthermore, some of them would like to exit from fishing but they need some assistance, such as provision of some skills training, farmland for agriculture and alternative livelihood activities. Most of the respondents were keen to acquire some farmlands for agriculture. Some of them would like to obtain skills training and few of them requested possible alternative livelihood activities.

There were mixed reactions concerning the strategies to reduce fishing pressure in both CF and NCF sites. The measure most agreed to reduce fishing pressure was to ban the use of some fishing gears. To relocate and find land-based job for marginal fishers was the second preferred option by the respondents. Conversely, some proposed measures were not acceptable. This include setting of maximum limit on the amount catch according to scale of operation. The respondents also disagreed to ban fishing during non-fishing season (for inland waters).

There were eight recommendations forwarded during the workshop. One is to review the effects of land reform to fishers and how land ownership could encourage exit from fishing. Two is to identify appropriate skills and training needs that are suited to the areas. Three, information is needed on other existing non-fishing jobs among fishers so that these could be enhanced, when relevant, as an exit option. Fourthly, there is a need to identify appropriate income-generating activities. Five is to improve market information to help decision-making among fishers. Sixthly, more biological studies are needed to support decisions to establish fish conservation areas. Seven, further study of fishers' perceptions and willingness to exit from the fisheries is needed. The eighth recommendation is on integrated (inter-sectoral) and inter-temporal analysis of impact of suggested livelihood options.

1. Introduction

Recently, commercial fishing and its impact on local people's livelihood and food security have been the subject of studies by donor agencies. Fish and rice have long been part of the staple diet of the Cambodian people. Fish provides some 75 % of the total animal protein intake of the population. Hence, a well managed fisheries sector is essential for the Royal Government of Cambodia (RGC) to meet its key national goals of food security and poverty alleviation.

As Cambodia moves towards a free market economy, the pressure on natural resources for commercial exploitation has dramatically increased. Privatization of the remaining fishery resources has been impacting on local livelihoods, leading to an alarming increase in resource use conflicts over fisheries. In order to protect the people's livelihoods and the natural resource base, the NGOs have advocated that government institutions must exert more efforts in solving fisheries-related problems.

Freshwater fisheries in Cambodia are mainly situated in the Great Lake and the Mekong River. Freshwater capture fisheries probably contribute substantially to national food security and the economy, more than similar fisheries do in any other countries in the world. The annual catch ranges between 290,000 to 430,000 (mt), which ranks fourth in the world in terms of fresh water fish production. Since approximately 90 % of the total population of Cambodia live in the Mekong Delta and Great Lake regions of the central plain, the wetland resources are under pressure from agriculture, activities related to forestry and fishing. (About 80 % of these rural people are agriculturalists and fishers). As a result about 10 % of the Great Lake wetland has already been converted into agricultural land uses.

In contrast some coastal inhabitants involved in harvesting marine products for supplementing their daily diet represented a very small percentage of the population. Motorized trawling and purse seining were introduced into the Cambodian sea fisheries only recently. Presently, less than 10,000 households are involved in marine fisheries, especially monofilament gill netting, trawling and crab trapping. The marine fish production was about 30,000 ton in 1970s. Official records during the period 1982 to 1992 indicated that volumes varied between 30,000 mt and 40,000 mt. The rehabilitation effort for marine fisheries took place in the late 1980s. Today, marine productions have considerable economic and social importance. Most of the marine fishes and other sea products landed directly are in Thailand. A small quantity is supplied to coastal and inland Cambodian markets, as well as to processors, to satisfy the inland market demand for processed and preserved marine products.

In recent years, it has been claimed that the natural fish stocks of both inland and marine water have declined drastically either in terms of the volume of catch or the market value. Such decline has been attributed to over-fishing to fulfill local demand related to population growth and the market to export demand. The general census of 1998 estimated that the population of Cambodia was 11.43 million individuals. This figure was about double compared with the 1962 census where the total population was estimated at 5.73 million. Recent report in the Cambodia Daily (dated 24 October 2002) indicated that in 1979, after the invasion by Vietnam, Cambodia's population was approximately 4 million people. Today the population is estimated at 12.2 million, which is a threefold increase since 1979. The population is projected to be over 15 million by 2010. These population growth figures are indicative of the increasing human threat in the exploitation of the riverine and wetland environments in the future.

1.1 Fishery Situation in Cambodia

The plight of the poor people can be improved by giving more access to forests, fisheries, water resources and other public goods. Providing better access to the fishery and water resources in order to improve the livelihoods of the people living in the Tonle Sap and the Riparian Region has been a high priority of the RGC. A comprehensive reform of the traditional fishing lot system was completed in late 2000. The RGC has released some of official fishing lots comprising of 536,302 ha. These account for some 56.23 % of the total fishing lots for distribution in 12 provinces to allow the poor people free access to fishing areas for them to earn a living. Such fishery reform has improved access by poor farmers and fishers to fishery resources, thus contributing to the implementation of the government's poverty reduction policy.

As stated earlier, fish is one of the most important diet of the Cambodian throughout their history. In the past days, the people enjoyed exploiting of the fisheries resources, which seemed to be inexhaustible. The Government statistics indicated that the average per capita consumption of fish for 1987-1994 was 10.6 kg/person/year. This consumption rate was lower when compared during the internal conflict period of 1974-79, which was in the range of 20-25 kg per/capital year. The substantially lower post-war per capita consumption rate was attributed to high post-harvest losses from marine capture fisheries due to lack of infrastructure facilities, over-fishing in both inland and coastal waters and environmental degradation. The consumption of fish and fishery products during 1991-93 period was estimated at 10.3 kg/capital per year. The government authorities projected the demand for fish in the year 2000-2005, based on the estimated population growth rate, under two scenarios: (1) a constant current fish consumption rate of 10.6 kg/capital/year and a higher consumption rate of 21.5 kg/capital/year. Hence, the demand for food fish would be in the range of 120,000 - 245,000 mt by the year 2000 and between 137,000 - 277,000 mt by 2005.

The fishing industry of Cambodia is subsistence and small-scale in nature. The total number of fishers in 1999 was estimated at 139,490. In the same year there was a total of 29,556 fishing vessels used in both in inland and marine fisheries. Most of the vessels were non-motorized and were small in size (96 % were less than 5 gross tons). From the motorized boats used in inland fisheries, 76 % were equipped with engines of less than 10 horsepower (hp).

Like many south east Asians, Cambodians prefer to consume fish fresh. Hence, there is a high degree of utilization of catch at nearly 100 %. Unlike most the south east Asian countries, however, inland fisheries instead of marine fisheries plays a more important role in food security of the country. Inland fisheries currently supply about 70 % of the total fish production, with an average of 113,450 mt annually from 1990-92. While the growth of inland capture fisheries during the last decade was registered at an annual average of less than 1 %, the growth of marine fisheries production was estimated at 92 %. Aquaculture production increased during the same period by 48% per year on the average. Nevertheless, the production from both inland and marine capture fisheries has shown a declining trend since 1990. The Department of Fisheries (DoF) attributed that the declining trend due to the following factors: (1) increasing number of fishers, (2) increasing use of destructive fishing methods, (3) environment degradation and (4) error in reporting of fishery statistics. This extensive capture fishery is constituted by two main sources, namely: the Mekong River and the famous Great Lake.

During the last three decades of internal conflicts, the inland fisheries have been and still are being over-exploited. The inundated forests that constitute effective breeding, spawning, nursing and feeding grounds for many of the fish species have been indiscriminately converted into other agriculture uses. The extensive capture fisheries in Cambodia are largely undertaken in the Mekong River and Tonle Sap River with the Great Lake at its upper stretches.

The total annual freshwater production of 127,000 mt was recorded in 1937 and 78,000 mt in 1939. However, this figure considered only the commercial catches with the exclusion of family and rice field fisheries. These are considered by many experts as equally important as the commercial fisheries. In this regard, the DANIDA-sponsored Mekong Project for the Management of Freshwater Capture Fisheries in Cambodia being implemented since 1994 reported that the freshwater fisheries production is still as high as 400,000 mt per year.

Over 500 fish species inhabit the inland water, of Cambodia. Many of these species are captured and used as food. Most fish species in the Mekong are well adapted to a wide fluctuation in water levels, and have wide tolerance for changes in environmental parameters. Some species can move out of the wetland, which enhances their survival when aquatic habitats dry up. Inland capture fisheries can be subdivided into two main components – Great Lake (Tonle Sap) and the Mekong – on the basis of their location. The Tonle Sap accounts for about 60 % of the country's total inland fisheries production. The inundated forests of the Great Lake and Mekong rivers are considered to be essential for maintaining the current level of inland fisheries production. About 90 % of the total freshwater fish stocks follow the inundation-spawning pattern and many of fish species breed in the inundated forests.

1.2 Major Issues and Problems in the Fisheries Sector

1.2.1 Excess Capacity

Majority of the people in Cambodia are dependent on rice and fish for their daily sustenance. Fisheries and other aquatic resources play vital roles in economic and social life of the rural population. About 75 % of protein intake is derived from fishery products. A survey (1995/1996) reported that the average fish consumption rate of 4.2 million people in central Cambodia was 67 kg/capital/year. About 40 % of the total population of 11.5 million people is engaged in fishing and fisheries-related activities.

In recent years, it has been claimed that natural fish stocks of both inland and marine water have declined dramatically in either volume of catch or market value, due to over fishing to fulfill the local demand of the increasing population and in response to export demand. Another contributing factor is the increasing number of fishers, fishing gears and fishing boats (Table 1.1).

Table 1.1 Number of, Fishing Population, Fishing Gears and Fishing Boats from 1994-2003

Item	Year									
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1- Fishing population										
- Families	5,768	11,725	11,236	10,993	10,913	15,565	15,732	300,168	357,291	333,456
- Persons	17,622	32,531	31,091	30,020	24,180	33,274	34,089	501,394	812,582	654,955
2- Fishing gears										
- Ro bang thnuos	362	427	403	603	635	599	604	485		384
- Day Trey	85	91	42	127	72	72	72	73		32
- Day bang kang	13	13	13	24	13	21	21	34		25
- Nor rut chhoung	28	27	26	21	26	26	26	19		18
- Gillnet (m)	1,217,500	813,610	471,454	1,799,810	2,443,120	2,833,470	963,311	6,004,854		8,367,140
- Seine net	1,323	3,814	331	5,946	327	2,343	451	8,734		677
- Neam	295	317	219	210	152	187	283	199		220
- Chhoun	78	54	61	80	68	85	74	70		81
- Chay Ra	104	118	118	147	113	500	620	644		1,010
- Chhnouk					150			116		127
- Lob nor rav						200	205	63,427		356
3- Fishing boats										
- With engine	29,762	27,401	30,428	23,023	20,783	15,106	18,292	30,129	37,109	24,551
- Without engine	7,766	6,075	7,675	11,213	11,199	14,460	16,888	25,921	28,607	40,600

Source: Department of Fisheries, 2002-2003

The declining fishery resources are correlated with many factors, such as modification of the natural environment, siltation, cutting of inundated forest and river damming. Environmental degradation is associated with increasing pressure on land, deforestation of catchments and the conversion of pristine lands to agriculture leading to accelerated soil erosion. Mining within catchments of some rivers entering the Great Lake have contributed to the degradation. Canals and other connections between rivers and floodplains have led to increasing siltation. Such forms of environmental degradation have been impacting on the fish stocks.

The reported increase in rate of siltation in the Great Lake from 20 to 40 mm per year is not only making the lake shallow and narrow, but has increased water temperature during the lowest water levels. The connection between the Great Lake and the Tonle Sap River, as well as the junction of the Tonle Sap River with the Mekong River in Phnom Penh, has become shallow because of silt deposition. This has led to a reduced water flow, especially during the periods of lower water levels. Such impede not only boat transportation but also possibly reduce the fish migration and the drift of juvenile fishes. The reduction in the water flow of the Tonle Sap River has been speculated to be the reason for mortality of sand goby in cages. High silt loads in the Mekong River after the first rains also contribute to fish mortality, such as by clogging the gills of the goby. Some of the increase in siltation might have resulted from the clearing of inundated forests in the catchments of several small rivers entering the lake in the northwest. Mining activities with limited environmental safeguards likewise aggravates the siltation. Since scientific information is quite limited on the negative impacts of siltation to the Great Lake's fish stocks, the dredging of the Great Lake is not yet justified from the fisheries point of view.

The exploitation of inundated forests has accelerated since the 1950s. Inundated forests of floodplains of the Great Lake and the Mekong River system have been under severe pressure for agricultural plantation, for charcoal and firewood production, and also for the use of branches for brush parks (fish aggregating devices). Cutting of inundated forests for the construction of fish traps and as fuel for smoking fish has also contributed to the forest destruction. It has been established that many species of fish breed, spawn and feed in these forests during the high water level. Given the absence of the trees and bushes, such areas are no longer conducive for breeding, as eggs and juveniles become vulnerable to wave action. Some fish species require a suitable substrate for attaching their eggs. Finally, fishes feeding on algae and small organisms dwelling on surfaces of trees and bushes will be affected due to lack of food.

Given the continuing depletion of the inundated forest, the proposed development project of constructing dams in the main stream of the Mekong River is becoming less probable. Another environmental concern of cage/pen culture in Cambodia is its negative effect on natural fish stocks. This may lead to over harvesting of wild fish seed resources that are needed as stocking materials for both domestic and for export markets. It may also lead to illegal capture of juveniles during the closed season to feed the culture fish.

The existing fishery resources may be able to provide a sustained supply to the growing population. As the population increases, so is the demand for fisheries products. Hence, competition among resource users will also increase for small-scale fishers constitute the bulk of the total fishers in the country. PIU-the Fisheries Component (2001) reported that about 90 % of fishers were classified as small-scale (family-scale fishing). The remaining nine percent and one percent were composed of medium-scale and large-scale fishers, respectively.

The conflicts are not only among small scale-fishers who are fishing for their daily food and livelihood. Conflicts are also brought about by the arrival of medium-scale fishers who intend to catch more fish to increase their income. Furthermore, the conflicts are also accentuated by large-scale fishers who are extending their fishing lot boundaries and are undertaking illegal fishing activities within their lots.

1.2.2 Fisheries Conflicts in Cambodia

Conflicts in fisheries refer to simple complaints or violence among all types of resource users. Such users include traditional users and powerful armed forces behind any groups or individual stakeholders. A case study by Ly (2003) reported that in Tonle Sap River and Great Lake, the most common conflicts are between fishing lot owners (commercial fishers) and village members who are composed of family fishers (subsistence) and medium-scale fishers. Conflicts often occur when

villagers dig wells for drinking water or store water for irrigation purposes. Fisheries log book allowed people who reside within the fishing lot territory to use water for their family needs, agriculture and home gardening. Notwithstanding, they are prohibited from engaging in any activity that may lead to a change in water regime, which could affect the fishing activities in the lots. People who reside within the fishing lot territory are also allowed to travel and transport any agricultural products or fishing products across the area. Provided, however, that they do not disrupt the fishing activities in the fishing lots. Yet, traveling across fishing lots during the rainy season is still problematic. This is because the fishing lot owners have interpreted the last sentence of this article to defend their ownership. For instance, lot owners may charge a fee to the passers by. This is one example of inadequacies in the existing law, which allows fishing lot owners to find legal justification for their actions.

With the law of the two-year auction system, some fishing lot owners were encouraged to use means including illegal fishing gears and destructive fishing practices to increase their catch. They try to maximize their benefits, as it is uncertain whether they will win the next auction of the fishing lots. This auction system has ignited the conflicts with the neighborhood fishing villagers who share the neighborhood's body water. They come to fishing lots to catch fish, confiscate water pumps and bring them to the local authority. To compete for their survival, the fishers commit similar illegal practices in the open access areas. They do such acts despite knowing that they will be punished by the fisheries inspectors, if they will be caught in the act of committing the violation.

The use of illegal fishing gears, especially trawling riverbeds in the fish reserve areas, is considered the most lucrative job. Involvement by armed forces in this job is reportedly not uncommon. Brush park (a big pile of dead trees in the water) is a passive gear that is easily observed, as it needs to be in place for months to attract fish. Protection rackets for illegal fishing boats are common. The competition between illegal operators and local fishers trying to survive often leads to violent confrontations. Even the local police, fisheries inspectors, military police and the navy reportedly compete for turf.

The incidence of violence happens not only on the body water itself. It also occurs in the area of inundated forest of the fishing lots, where there are competing commercial interests, such as hunting, firewood gathering and agricultural plantation. Despite the prohibition by law, thousands of hectares of inundated forests have been destroyed for rice cultivation and land titling. Until now, the law on land ownership is not well defined, resulting in confusion between land ownership and possession. In this respect, violence often happens especially in open fishing season (from months of October to May). It is during this dry season in whereby many types of forest products and wildlife can be commercially exploited.

Furthermore, many boundaries of fishing lots were either neglected or the government could not afford to re-demarcate during the war. This resulted in confrontation between lot owners and the local residents. Many fishing lot owners are speculated to be taking advantage of the situation. Additionally, violence also happens in the former abandoned fishing grounds controlled by the military. Fishing villagers used to customarily access these areas. When the war ended in 1999, fishing lot owners wanted to annex these areas to their neighborhood fishing lot areas. A case in point is fishing lot No.8 in Battambang province. The NGO forum on Cambodia's fishing conflict in Battambang mentioned that the fishing lot boundaries are now not clearly defined on the ground. The fishing lot owners allegedly collude with fisheries officials, policemen, military officers and district officials in determining the lot boundaries.

1.3 Objectives the Study

- To develop broad framework for addressing approach for reducing over capacity in Southeast Asia
- To examine where fisheries conflicts may arise and provide plans to ameliorate these conflicts and its role in reduction conflicts and enhancing national/regional security.

1.4 Research Method

1.4.1 Study Area

Cambodia is situated in Southeast Asia on the coast of the Gulf of Thailand. It has a total land area of 181,035 km². About 85% of the total population is employed in agriculture. Most of these people are living in the lowlands. Aside from using the fertile soil in the lowlands, they also encroach into the forested lands for their livelihood. In Battambang province, close to the Tonle Sap Great Lake, for example, people practice agriculture on the arable lands. Agriculture is the predominant economic activity, which provides the staple food to the people. However, the current agricultural production is insufficient to support the people's requirements because of the population increase, small land holdings and low agricultural production. Consequently, poor rural people encroach into the marginal lands, such as the embankment of rivers and flooded forest areas, in order to enlarge their paddy rice fields or vegetable gardens. Besides these traditional agricultural activities, farmers have a good alternative livelihood in fishing, to generate additional income and achieve food security.

Pursat province is located along the Tonle Sap River endowed with rich natural resources, which include forests and fisheries. The natural resources in the province provide a significant livelihood activities and nutrition to the people. In the late 2000, there were about 45,000 ha of fishing grounds which include fishing lots, inundated forests and farm lands. These areas were released to 17 community fisheries to manage and to use to generate income. Two locations within Pursat were selected for community and non-community fisheries separately. Anlong Raing is a community fishery (CF) which was formed in 2001 by one local NGO called CFDS-Oxfam (Cambodia Family Development Services of Oxfam). After forming the CF, the CFDS-Oxfam established partnership with the DoF and many other organizations, such as Angkor Participatory Development Organization (APDO), (FAC), and Buddhism Development Association and Supporting Environment (BDASE) to help in improving the project. This community is located in Anlong Raing village, Kampong Pou Commune, Krakor District of Pursat Province. There were about 431 people belonging to 91 households who live in the village with fishing area of 1,700 ha. Wile Prek Trabek is a floating fishing village (non-community fisheries), which is located in Kanh Chor Commune, Kandieng District of Pursat Province. There are 1,378 people comprised of 254 households who live in this village. Rice farming, small-scale fishing and fish culture are the main occupations.

Kandal is the other province, which is located around the capital city of Phnom Penh. There are 1,087 village, 147 communes and 11 district located in the province. In 2000, the governor of Kandal reported, that the population was about 1,075,125 individuals. The number of men was almost equal with that of women. Labor ages between 15 to 64 predominated in the province. Ta Skor is a village located in Lvie Em District of Kandal. It is a fishing village that was formed into a CF in 2000 by the Mekong River Commission as part of the Reservoir Fisheries Management Project in collaboration with the DoF. And Peam Ta Ek is another village with farming as the main occupation. This village is located in the same commune and district as with Ta Skor. There are 1,665 people belonging to 350 households living in this village. Agriculture is the main occupation in the village with fishing as a supplementary occupation. No CF is formed yet for this village because fishing is not the main occupation and there appears to be less conflict compared with other villages.

Kampot is a coastal province located in the southern region of the country. This coastal province is composed of 477 villages and 92 communes (8 districts). The population is 528,405, of which 52.1% are women. This population contributed 4.6% of the total population in the country in 1999. Doun Toak is a village of Troeu Kor Commune, Kampong Bay District, Kampot Province. The main occupation of the people in this village is fishing, while farming is the secondary occupation. Population in this village is about 1,118 individuals with almost equal number of men and women. Finally, Chan Hoan is another selected village, which is located in Prek Thnoat Commune, Kampot District. There are about 3,650 households who are living in the village with fishing as their main occupation. Some households have rice farming as the main occupation. Wood fuel collection is undertaken by few households in the village. The study areas are illustrated on the context of the entire country. (Figure 1.1).

Table 3.1: Population and Sample of the Study Credit members Sample

	Pursat		Kandal		Kampot		Total
	CF	NC F	CF	NC F	CF	NC F	
Individual interview	45	45	45	45	45	45	270
Group discussion	2	2	2	2	2	2	12
Meeting with NGOs and institution involvement	3	3	3	3	3	3	18

Note: CF: Community Fisheries

NCF: Non-community fisheries (Fishing villages which are not recognized by the law)

1.4.2.2 Data Analysis

The data generated concerning resource use conflicts and the possible mitigating measures in the selected locations were qualitatively analyzed. The data sets were derived from the surveyed questionnaires, checklist, personal observation and informal group discussions. The information furnished by the respondents through the survey questionnaires were analyzed quantitatively. The descriptive statistics used included frequency distribution, means and percentages using the Excel program.

2. Description of the Study Area

2.1 Institutional and Legal Framework in Fisheries Management System

2.1.1 Management Review of Administration

Fisheries administration management in Cambodia encompasses at two levels: (1) central level, and (2) provincial/municipal level. The central level is administrated by the DoF, subject to approve by the Ministry of Agriculture, Forestry and Fisheries (MAFF). The provincial and municipal levels are directly managed by the DoF.

- Central Management Level

Fisheries management requires undertaking a multitude of intricate activities and/or tasks. The management is intended to ensure that optimal benefits and stable fish production are achieved and also to maximize local participation. To achieve these objectives, the DoF's sets of activities are comprised of fisheries management policy and planning, implementation strategy, fisheries law, human resources development (HRD), data and information management, and monitoring.

- Fisheries Management Policy and Plan

Since 1979, the DoF's policy has been to supply sufficient fish to people through the judicious exploitation of fisheries resources to meet the needs of the country. At the same time, the DoF also aims to conserve the fishery resources for future use. At present time, the national fisheries policy is mainly concerned with managing and conserving the natural aquatic resources in order to provide adequate stable diet to the people. Furthermore, the RGC has a vision for fisheries in the future. Cambodia and its people are envisioned to be able to enjoy sustainable social and economic benefits from the exploitation and farming of living aquatic resources.

The department has developed three types of Fisheries Management Plan (FMP). These are short-term planning (1 year), medium-term planning (5 years) and long-term planning (10 years). All these planning exercises are approved by the MAFF.

Short-term plan of 1 year plan has been in operation since 1999. Medium-term management plan (1999 – 2003) started since the completion of the short-term plan. This plan was strongly concerned with a sustainable fishery environment to provide sufficient supply of a higher-quality

protein to the population. The priority programs consisted of: (1) arrangement and delivery of fishery resource conservation and management to the fishing communities; (2) revision of the existing fisheries laws, which are more suited to the social and natural environments; (3) strengthening of law enforcement; and (4) prevention of illegal fishing practices. Moreover, the full operation of the Inland Fisheries Research and Development Institute (IFReDI) was also contained in the plan.

Long-term planning aims to maintain sustainable natural resources, as well as to develop aquaculture, inland and marine fisheries research. These activities would provide higher fishery yields to increase its share in the country's Gross Domestic Product (GDP), improve the living standards of the people and uplift the national economy as well. The promotion of reforestation and restoration of natural inundated forests and aquaculture activities are also undertaken in this planning exercise.

2.1.2 National Fisheries Policies and Laws

Cambodia's Fishery Law is divided into 17 chapter and 129 articles. The first chapter mentions the law's provisions. It contains three articles, which include the purpose of law, the fisheries resources in the country, and the means of catching fish.

The second chapter contains four articles, which focus on fisheries domain. Fisheries domains in Cambodia are divided into two: marine and freshwater fisheries domains. Both domains are owned by the state. Inland fisheries domains are categorized into three: (1) fishing areas (2) reserved fishing areas and (3) inundated forest areas. Meanwhile, marine fisheries domains are categorized into four: (1) coastal fishing areas, (2) offshore fishing areas, (3) reserved fishing areas, and (4) inundated forest areas. These fisheries domains are further divided into finer categories.

Details of fisheries administration are stated in Chapter 3. It contains five articles, which include administration authority, uniform organizational structure, and responsibility and functions of fisheries administration. Chapter 4 discusses the sustainability of fisheries management in Cambodia. This chapter is divided into four articles, which include fisheries statistical records, fisheries management policy and committee, national fisheries management plan development, and division of fishing season. Furthermore, fisheries protection and conservation are mentioned in Chapter 5 of Cambodia's fisheries law. This is the largest chapter in the law, composed of eight articles. Such articles cover the classification of fishery resources in the country, prohibited activities in the fishing conservation areas, description and prohibition of illegal fishing gears/methods, as well as fishing activities and import of endangered species in and out the country. The last article pertains to the establishment of illegal structures that block fisheries domain, such as dams/dikes across the rivers.

The management of mangroves and inundated forest management is stated in Chapter 6. There are four articles in all. The first article mentions the establishment of inundated forest and Mangrove Fire-Fighting Committees. The second article describes the protection of inundated and mangrove forest in fishing lots. The last two articles mention the prohibition of cutting mangrove areas for large-scale commercial use and the ban of using inundated forest lands for any other purposes. Chapter 7 talks about the exploitation of fishery resources. This chapter is composed of nine articles. Among the areas covered are definition of fishing scale, fishing location by scale of fishing operation, fishing permit, fisheries monitoring by using logbook, and fish trade permission. Chapter 8 discusses the exploitation of inland fisheries. This chapter is comprised of six articles, which include fishing lot operation mechanism, medium-scale operation mechanism and family/small-scale operation mechanism. Chapter 9 pertains to the exploitation of marine fisheries. Eight articles are combined in this chapter. Among the items covered are medium-scale operation and recording in logbook, shipment of fisheries products and permission to do fishing, as well as fisheries research in the international marine waters.

Aquaculture management is cited in Chapter 10. This chapter has six articles, which include the permission of aquaculture operation, aquaculture statistics book record from fisheries administration, fisheries laboratory requirements, and other aquaculture seed collection and export-importation. Chapter 11 is concerned about community fisheries in Cambodia. This chapter is made up of five articles concerned. The provisions include the rationale of forming community

fisheries, procedure of forming based on sub-degrees, fishing boundary, mechanisms of community fisheries management, and entitlement to abolish the community fisheries for public benefit. Chapter 12 has also six articles. This chapter is concerned about the transportation and trades of fishery products. Among others, these cover provision for: procedures of transportation of fishery products; process of commercial exporting of fishery products; and exporting, importing, buying, selling, transporting, processing and stocking of endangered fishery products. Chapter 13 describes the licensing scheme. It has only 2 articles, which include license authorization and license formation. Chapter 14 is concerned about the procedures for solving fisheries offences. It is also a large chapter, which is composed of 14 articles. Fishery offence is a crime as stipulated in this law. Uniform of fisheries administrator as well as rights and duties of fisheries administrators are also stated in the this chapter.

Chapter 15 describes the penalties pertaining to the illegal/informal fish activities in the country. There are 19 articles in this chapter. The penalties to illegal or informal fish-related activities are divided into three classes. Imprisonment from 3 to 5 years and all evidences seized belong to class 1. Imprisonment from 1 to 3 years and subject to a fine from 5 million Riel to 50 million Riels is covered under class 2. Imprisonment from 1 month to 1 year or being subjected to a fine from 1 million Riel to 5 million Riels is under class 3. All evidences seized for an offense are considered a state property. Furthermore, any person who commits a fishery offense leading to a damage of fisheries system in the fisheries domain must pay the cost to rehabilitation. Alternatively, he may repair the damage and pay the corresponding penalties. The same holds true for a person who implements fishing and fish transporting activities, without any permission from the Fisheries Administration Office and contrary with the provision of the law.

Chapter 16 is a very short chapter. Consisting only of three articles, the focus is about enforcement of the court judgment or ruling. The enforcement of the court judgment is the duty of duly-designated fisheries administrators. After the court judgment comes into effect, the confiscated evidence shall be managed following legal procedures.

Final provisions of the law are stated in the last chapter of 17. The MAFF has drafted a new Fisheries Law, as well as prepared a Fisheries Master Plan. A sub-decree on community fisheries and fishing lot auctions has been issued after extensive consultations with all stakeholders.

2.2 Conflict in Fishery

2.2.1 Background of Fishery Conflicts

Literature on fisheries conflicts can be divided between those that examine site-specific conflicts and those that review the theoretical aspects of conflicts. The former provides detailed information regarding a particular scenario. Although many studies provide useful information on a specific location or issue, the results cannot necessarily be extrapolated with any ease or certainty to a wider context. Hence, these literatures provide limited utility to the policy makers.

The theoretical approach to the study of conflict provides new frameworks that can be used to describe and analyze natural resource conflicts. Since the inception of conflict theory during the immediate post-war period, this approach has included sociological, economic, econometric, technological and anthropological aspects as part of the analysis. In addition, there is a large body of literature that sees the emergence of conflict in natural resources context as the specific function of rising population and/or a decreasing resource base.

Although both approaches have their merits, there have been few studies on the institutional aspects of fisheries conflicts. Given the increasing recognition of the role of institutions in general, this appears to be an important omission. For example, little attention is paid to the way communities can and do cooperate over natural resource use. This might explain why conflicts do not emerge in such situations.

Conflict emerges when the interests of two or more parties clash. Under this condition, at least one of the parties seeks to assert its interests at the expense of another party's interests. Conflict involves one group asserting its interests at the expense of another group. This type of conflict is not always negative. Positive conflict highlights incompatible goals or objectives, thus focusing

attention on something that needs to change for the benefit of all concerned. Positive conflict has also been described as the means by which communities hold themselves together through establishing consensus within group members. It must be noted, however, that only when political and economic elites are prepared to interact with marginalized groups that change is likely to occur. If the elites' priority is to maintain their position and the status quo, the positive role of conflict may not emerge.

- Origins of Conflict

Conflicts between groups emerge for a variety of reasons. Conflict can arise as a function of social structure (the sociological perspective), as a function of power relations (the political perspective), or as a result of rational decision-making by an individual seeking to maximize his personal utility given a pool of scarce resources (the economic perspective). The issue that often sparks off a conflict is the 'perception' that the one group is gaining (or in economic terms maximizing its utility) at the expense of another. The underlying reasons why conflict emerges, however, is often more complex. It may be possible that the conflict between two groups over access to a pond is not about access at all, but about ethnicity.

Warner (2000) identified the emergence of conflicts over natural resources into four issues: (1) demographic change; (2) natural resources competition (increased dependence upon the natural resource can heighten competition for space and resources); (3) developmental pressures (as government policy switches from livelihood protection to food production); and (4) structural injustices (changes in legislation that deny or severely restrict access to a resource by dependent groups in society). In addition to these four reasons, institutional failure has to be considered explicitly. Thus, the roles of institutional analysis in general, and institutional failure in particular, are explored in the following sections.

- Institutions and Conflict

Two types of institutions are involved in fisheries management: informal and formal. Informal institution refers to markets, communities and social capital having a set of rules or norms defined and enforced by the users. These rules and norms are not written down, but held as a set of accepted practices, which govern behavior and shape society. Formal institutions - such as marriage, the State, the judiciary and the political system -- also consist of a set of rules and norms. These elements, however, are defined and enforced by a distinct group (not necessarily the users). These rules are enshrined in regulations and constitutions, and are designed to govern behavior and shape society. Notwithstanding, they are not necessarily accepted by all users.

Although the terms are frequently used interchangeably, there is an arguable distinction between institutions and organizations. Organizations refer to the groups of individuals that are bound by the institutions as described above. Thus, the government is an organization bound by the institution of politics; a Fisherman's Committee is an organization bound by the institution of the local community, property rights and market, among others.

Neo-classical economic theory states that institutions emerge through a process of rational choice. New institutional economics, on the other hand, argue that institutions exist to minimize and internalize transaction costs. Knight (1992) suggested that institutions evolve to help individuals deal with issues of collective action. He envisaged two types of collective action institutions: those that only produce goods for the community and those that produce bad products. In both cases, they fulfill the criteria of reduced transaction costs and maximized benefits, although the bad may produce sub-optimal outcomes. The second group includes slavery, serfdom and sharecropping.

Socio-economic disciplines allow for the interaction of non-rational actors in institutions. It is argued that institutions emerge as the result of a supply and demand effect. A shock creates an institution, demand for subsequent change to the set-up of that institution results when a gain cannot be captured under existing arrangements. Demand for change may be stimulated by changes in product and factor prices (wages, land, etc), technology (new machines and processes) and market size (rise in population). Demand for change can also arise from a perceived need to shift income towards the institution. Hence, demand may emanate from a need to increase supply and alter distribution. Feeny (1998) shows the same argument explains the institutional choice of serfdom over slavery. He argues that where markets were too limited to warrant the large-scale agricultural production associated with slavery; serfdom emerged as an institution, rather than slavery. In the case of institutions that emerge in fisheries, the community of users demands rules to mediate access, use and allocation of resources. The rationale for the institution to mediate access, use

and allocation arises from within the community to meet the demands. The form of the institution then changes as conditions in the fishery (gear use, number of fishers, stock levels, etc) change and demands change accordingly.

The above supply and demand thesis, however, fails to account for power dynamics and power asymmetries. In its broadest sense, power may be regarded as the potential or ability to effect change, mobilizing forces in order to achieve particular results. In his analysis of power, Foucault (199?) asserts that power is not merely the power to say "no" or to prohibit illegal or legitimate actions. It is also the ability to say "yes" to promote certain forms of behavior and activity. In this sense, power in Foucault's view is not about prohibition but rather about normalization. He understands power as a mobile network of relations, rather than as a centralized and stable repressive force. It operates through discipline, surveillance and regulation. Quite significantly, it involves self - regulation). This mobile network of relations occurs as a result of small happenings, which gradually form a whole. More importantly, Foucault (199?) argued that power (and knowledge) has to be understood from the bottom up, rather than as a top down process. Acknowledging the use of power to manipulate actions, Knight (1992) observes that institutions emerge as a response to 'strategic conflict' over substantive social outcomes. Hence, institutional development is the result of a process of bargaining between actors -- each trying to structure outcomes that favor themselves over others. He further notes that the nature of the contest is determined by the actors' relative power differentials and their ability to manipulate the choices of others. In other words, institutional rules do not necessarily emerge as the logical choice for the collective goods. They have agreed with them not because they evolved as Pareto improvements, but because the weaker contestants cannot do better than comply. Thus, the supply and demand for change is rarely a collectively agreed upon action; rather, it is the outward manifestation of power asymmetries within the 'community' of users.

The role of the State in the allocation and use of power in institutional change is important. Irrespective of the demand, the ability of institutions to change or emerge is often dependent upon the state's willingness and ability to allow this to happen. Strong states can control institutional change through a variety of instruments (freedom of speech and movements, for example) and weak states often unwittingly control change by allowing special interest groups to dictate the conditions under which change will (or will not) happen. It is thus clear that the role of politics is also a key part of the institutional change process. Political order is able to facilitate change, including the cost of institutional design, knowledge and normative behavior. Existing arrangements assert that without state intervention, institutional change will probably not be supplied at a socially optimal level because the private return to the political entrepreneur is far greater than the social return.

- Conflicts -- Containment, Management or Resolution?

Conflict is an essential part of societal functions. Its positive role, however, can become destructive. A useful indication of how far conflict has become a destructive force within society is to observe to what degree, if any, it is managed. At the very basic level, conflicts are 'contained' where infractions are policed; rules are written, though not necessarily enforced; and the existence of a problem is recognized, though in no way forward may be discernible. When civil and state institutions have reached a point that they are able to step in and actively deal with conflict, they will at first manage it. Platforms for airing grievances will be developed and will be easily accessible for all stakeholders, including the most disadvantaged. Management should ensure that the positive elements of the conflict are recognized, and that the situation does not decline. Resolution takes management one step further.

Much of the research into conflict resolution started with studies of the Arab-Israeli conflicts in the late 1960s. The recent resurgence in interest is due to the rise of European conflicts following the end of the Cold Wars. The principles of conflict resolution have spread into a wide range of other disciplines, such as personnel management. Galtung (1971) identified three key stages of conflict resolution: (1) peace keeping (the dissociate approach) by which the two sides to the conflict withdraw from the arena; (2) peace building (the associative approach) where symbiosis is developed; and (3) peace making (conflict resolution). The tools for maintaining each stage have to be economic and social incentives, and some viable threats should the agreement reached in Stage I will be violated (Figure 2.1).

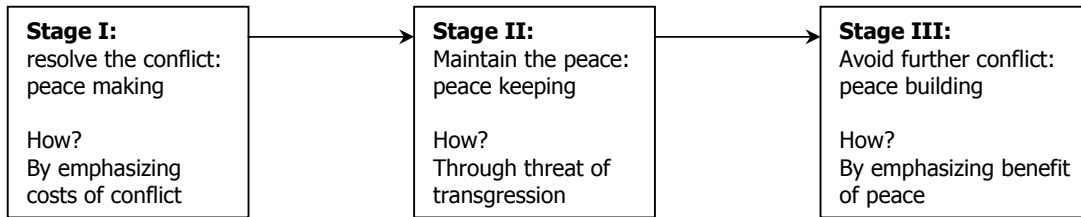


Figure 2.1. Three Stages of Conflict Management, (after Galtung, 1971).

'Tit-for-tat' and 'trigger punishment strategies' also help explain why incentives might be needed to maintain Stage II (peace keeping). Under a situation of repeated games, a tit-for-tat strategy indicates that player A will choose the same option in the next game -- what is chosen by Player B in the previous game. If player B opts to abide by the rules, so will Player A and vice versa. Assuming that one player always chooses to abide by the rules, peace will be kept by the threat of punishment should they not abide. As described by Miall, Ramsbotham and Woodhouse (1999), a tit-for-tat strategy actually involves cooperation, bears no grudges and, is crucially predictable. They argue that in the first stages of conflict resolution, there has to be an ability to initiate cooperation.

A more dramatic form of punishment for transgressing the peace agreement is the trigger strategy. As soon as player B opts to break the agreement, player A plays the Nash Equilibrium strategy forever, which results in the breakdown of peace. Ideally, both players should choose the cooperative equilibrium as the rational choice when faced with the possible threat of retaliation by the other side, should it fail to abide by the agreements. Thus, strong institutions capable of delivering credible threats are needed to maintain peace and manage conflicts.

Nicholson (1970) and Powelson (1972) use a modified production possibility frontier model to explain conflict resolution. Taking the view that conflict is a result of unequal allocation of resources; it is argued that the optimum resolution has to be on the line BA, at points D or E, for example (Figure 2.2). Any moves beyond the line are not theoretically possible because this would involve allocation of resources that do not exist. Conversely, any resolution that is inside the line (point C) is an inefficient use of resources. Moves towards the line BA are thus beneficial to society; those away from it are not beneficial. In economic terms, perfect markets would produce production solutions on the line. This has parallelism in conflict resolution terms whereby perfect institutions would produce resolutions on the line.

A key issue of resolution would appear to come from within the community. Almost all situations, though, would certainly require an outsider to facilitate the process. Successful conflict resolution is achieved where the solution is perceived to have improved for all stakeholders. The resolution of conflicts does not necessarily change long-term issues. For this to occur, more active management and resolution techniques are needed. In order to achieve this, full and effective participation of all stakeholders in the process has to be included. By definition, this has to include those state structures that would assist change to take place within communities, and other sections of civil and political society as well.

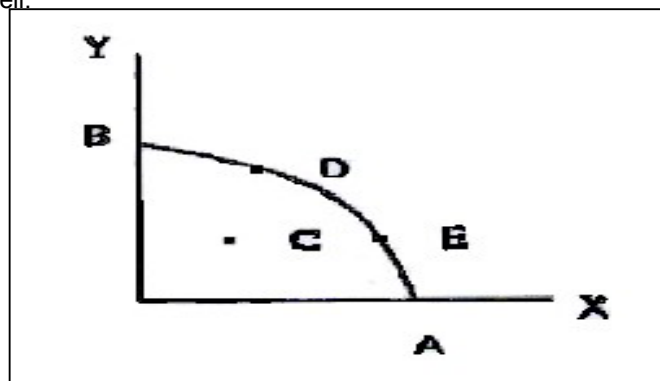


Figure 2.2. Conflict and the Possibility Frontier (after Powelson 1972).

2.2.2 Typology of Conflicts in Fisheries

In any bio-socio-economic system as complex and as dynamic as the fisheries, with its many interactions among natural resources, humans and institutions, it is hardly surprising that conflict tends to be prevalent. Internal fish disputes arise regularly over allocation of scarce fishery resources, over the division of fishery benefits between fishers and processors, and over short-term management arrangements between fishers and governments. Meanwhile, external conflicts are increasingly common with competing users, such as aquaculture, forestry, tourism, and ocean mining. All of these economic sectors are vying for access to aquatic space and fish habitats. Underlying these more immediate internal and external conflicts are philosophical debates over ownership, control and overall policy directions in the fisheries.

The diversity of these conflicts seems to conjure up an image of the fisheries as being endlessly buffeted by a 'sea' of disjointed, unconnected incidents. There is a risk that the management and policy making process may neglect the overall fishery picture, if too much focus is given on 'fire-fighting' these seemingly unrelated conflicts. Furthermore, there is a possibility that a perceived fishery 'chaos' may be used as an excuse by governments and donor agencies to abandon fishery development efforts.

It is thus crucial to recognize these two conditions. First, there are many examples of fisheries that work well, with little conflict. Secondly, when fishery conflict is prevalent, it tends to follow definite patterns, with clearly discernible roots. In particular, conflict can often be best understood as arising from natural tensions among three differing fishery paradigms (or 'worlds views'), each based on a different set of policy objectives. This paper attempts to characterize the various forms of fishery conflict, to provide a means of analyzing fishery policy debates within a unified framework of paradigms, and to learn from those fisheries that are relatively free of conflict.

A conflict typology is based on four principal categories: (1) philosophical conflict, (2) management/institutional issues, (3) internal allocation, and (4) external issues between the fisheries and outside players. A case study presented by Anthony (1992) focused on what is rapidly becoming the key philosophical debate in fisheries. The prevalent form of centralized government management is often compared with two competing property rights options. The first property right option is based on individual harvest quotas. The other is hinged on community property rights. This study is correlated with the analyses of two studies involving internal allocation conflicts - in Canada's Pacific salmon fishery and Atlantic ground fish fishery, respectively. Finally, the relationship between fishery conflict analysis, the framework of paradigms presented herein, and the broad policy goal of developing sustainable fisheries is discussed.

In most fisheries, there appears to be little room available to increase long-term sustainable fishery benefits simply by increasing production. Thus, fishery policy tools are generally limited to address two objectives: (1) increasing efficiency of harvesting and of management; and (2) making allocation (distributive) decisions, particularly determining who has the privilege of access to the fish available for capture.

- Efficiency and Allocation

The concept of efficiency is a source of considerable confusions and policy discussions, not only within the fishery but throughout the economy. Essentially, the concept is a simple one. Efficient policies are those which give the 'best' possible results (measured in terms of overall well-being or net social benefits) within the resources available. Efficiency may also mean achieving the desired goals with the least negative effects. Hence, the pursuit of efficiency is desired objective in fisheries management. However, difficulties arise in applying the concept, due to the inherently multi-faceted nature of 'societal well being' as a policy goal. There has been a widespread tendency to oversimplify this goal equating social well being with wealth (or rent) maximization. Hence, it confuses the general idea of efficiency with the narrower idea of economic efficiency. From an overall policy perspective, it is crucial to note that a blind pursuit of 'efficiency' is meaningless without clearly defining what is meant by the 'well-being' of the relevant stakeholders.

In the fisheries context, the importance of pursuing efficiency is especially great in 'zero-sum' fisheries. Under this condition, an increase in one group's allocation means less for others. For example, measures to decrease post-harvest losses have the potential simultaneously to improve the well being of all participants. In reality, however, fishery players will probably differ

philosophically over the management objectives to be pursued. Consequently, they will differ over the definition of an efficient fishery. The aims may be geared towards efficiency in generating wealth, providing employment, maintaining the sustainability of coastal fishing communities, or some other measures of improving the well-being.

Given these differences over the goals of efficiency-enhancing policies, it is not surprising that such measures lead to fishery conflicts. In practice, such disputes typically revolve around proposals to re-allocate limited fish resources to those sectors of the fishery that are perceived to be the most 'efficient'. Consequently, fishery conflicts tend to be dominated by allocation issues. In most cases, the allocation of fish harvest represents the only real tool at the disposal of fishery managers.

- A Typology

Despite superficial appearances of 'chaos', the wide range of fishery conflicts (of both the efficiency and allocation varieties) can be organized into a relatively small number of categories. These are clustered under four interrelated headings: (1) fishery jurisdiction, (2) management mechanisms, (3) internal allocation, and (4) external allocation. Fishery jurisdiction involves fundamental conflicts over who 'owns' the fishery. Other conflict-related questions often asked include: who controls access to it, what is the optimal form of fishery management, and what should be the role played by governments in the fishery system. Management mechanism is concerned with relatively short-term issues arising in the development and implementation of fishery management plans. These typically involve fishers and government conflict over harvest levels, consultative processes and fishery enforcement. Internal allocation involves conflicts arising within the specific fishery system. Such conflicts could be between different user groups and gear types, as well as among fishers, processors and other players. External allocation incorporates the wide range of conflicts arising between internal fishery players and 'outsiders'. The latter may include foreign fleets, aquaculturists, non-fishery industries (such as tourism and forestry), and the public at large.

Table 2.1. Typology of Fisheries Conflicts.

Fishery jurisdiction	Management mechanisms	Internal allocation	External allocation
Property rights	Management plans	Gear War conflicts	Domestic vs foreign
The role of government	Enforcement conflicts	User group conflicts	Fishermen vs aquaculture
Inter-governmental conflicts	Fishermen/Government interactions	Fishermen vs processors	Competing ocean users

These four principal conflict classes are intended to be comprehensive, but not necessarily mutually exclusive. Each current fishery dispute appears to fit under at least one of the headings. Some cases, though, will certainly fall under more than one category. Examples are cases where apparently straightforward allocation disputes have roots in philosophical conflicts over jurisdiction. Furthermore, most fishery players are involved in a wide variety of conflicts simultaneously. In any case, the headings are sufficient to allow the formation of a conflict typology, described in the table above. Each of these areas of conflict is described briefly below.

- Fishery Jurisdiction

Property rights: These involve major long-term philosophical questions or debates concerning legal, historical and/or de facto ownership, access and control in the fishery. A particular focus lies in conflict over the relative desirability of fishery property options. Such alternatives include open access, centralized management, territorial use rights in fisheries, community-based common property management, individual quotas, and privatization.

The role of government: A major and fundamental conflict is rapid evolving between advocates of a range of management regimes. At one end is 'modern' fishery management that focuses on centralized government regulation of harvesting activity. At the other end are more decentralized alternatives, including the community-based and market-based management options. Included here is the development of 'cooperative management' schemes.

Inter-government conflicts: Despite new challenges to the dominant role of government in fishery management, there is still a large government presence in most cases. Intergovernmental conflict is still common between nations (as in trans-boundary fisheries) and between jurisdictions within a nation (as in disputes over fishery access between the fisheries provinces on Canada's Atlantic coast).

- Management Mechanisms

Fishery management plans: The development of periodic management plans for determining allowable harvest levels, harvest allocation fishing times and/or fishing gear is a major source of conflicts between the recurrent fishers and the government. Hence, it deserves a category of its own. These conflicts, in fact, often reflect the fishers' concerns over internal and external allocation issues, as discussed below.

Enforcement conflicts: Fishers and government conflicts over enforcement are of two major forms. First, which is the most common, involves complaints concerning excessive government enforcement imposed on a particular user group. The second form, which is the reverse, is based on complaints by one set of users that enforcement is overly-lenient when applied to other competing users. For example is the frequent perception of conflict between inshore and offshore fishers in Canada's Atlantic coast.

Fishers/government interactions: An ever-present source of conflict is the perception on the part of fishers that the government managers and scientists ignore the knowledge and ideas of the fishers. This occurs even in fisheries with elaborate and expensive consultative processes. Such conflicts are likely to remain, as long as the fishers are excluded from the actual decision-making processes.

- Internal Allocation

Gear wars conflicts: Conflicts arise within the commercial sector of the fishery. Such conflict is generally focused on allocation between vessel categories. Typically, this involves differences in fishing gears. Differences in fishing ground (as in traditional/artisanal versus all industrial fisheries conflicts) may also fit her. Other examples are cases where such disputes involve technological interaction on the fishing ground.

User group conflicts: Major disputes, both short-term and long-term, arise between the various broad classes of fishery users. These conflicts generally represent quite different segments of society. Examples are conflicts between artisanal and industrial fishers, or commercial versus recreational fishers.

Fishers versus processors: It is always possible that vertical integration by processors could increase conflicts between small-scale and industrial fleets. Such type of conflict may be included under user group conflict as described above. Fishers-processors dispute tend to be of a typical labor-management form, often involving price and/or wage bargaining.

- External allocation

Domestic vs foreign fisheries: A range of conflicts exist among independent coastal nations. These are exemplified by conflicts between coastal states and domestic fishers on one hand, and distant-water fishing nations and their fleets on the other hand. The associated problems include illegal fishing within the coastal state's exclusive economic zone (EEZ), legal fishing just outside the EEZ (as in the case of Canada's Grand Banks), destructive high-seas fishing (as with drift-nets), and opposition of domestic fishers to bilateral fishing agreements.

Fishers vs aquaculture: The potential exists in some aquatic environments of developing aquaculture as an economic alternative for those in the fishery sector. However, a variety of factors - such as poor control and planning of aquaculture development, lack of suitable government training and risk-alleviation programs, and a natural reluctance among fishers to abandon capture

fisheries for culturing operations - have tended to limit such economic diversification. Conflict has been more common than symbiosis between these two fish-based sectors. This conflict focuses on ocean space and water quality, fish price and market access, and the possibility of disease transfer.

The fishery vs competing aquatic uses: In addition to conflict with aquaculturists and foreign fleets, fishers also face other external disputes. The most notable conflicts include shipping (particularly involving oil spills), ocean mining (as in Canada, Indonesia, Norway and elsewhere), tourism (as in many Caribbean islands) and forestry (for example, in the rivers of North America's Pacific coast). More generally, this conflict category may be viewed as incorporating the most 'global' of disputes. Such conflicts involve the nature of, and the priorities, for usage of oceans and other aquatic systems.

As with any categorization of real world complexities, the above typology is of necessity a simplification. However, it does appear consistent with the realities of present-day fishery management systems, incorporating most policy debates underway in particular types of fisheries. The case studies presented below focus on conflicts arising within the fishery, under the 'Fishery jurisdiction' and 'Internal allocation' headings. The increasingly important 'external allocation' conflicts will be considered in a subsequent article.

2.3 The Fisheries

2.3.1 Historical Catches and Landings

- Inland Fisheries

The inland fishery was the first natural resource to be commercially exploited in Cambodia for generating national income. The Cambodian inland fishery industry started at the beginning of the French protectorate period in 1864. Fishery management practices were introduced, such as the lot system (from the French *lot de peche*) and licensing. It is the second largest sector after agriculture in terms of employment. A study in Svay Rieng province indicated that more than 80% of the total population is engaged in agriculture, and 80-90% of the agriculturalists are engaged in family or rice-field fisheries.

There was no record of inland fish production figures prior to 1940, even though fishing formally became an industry in 1864 with the introduction of fishery management practices. The inland fisheries production figure recorded from the licensed fisheries during the 1940 to 1970 period ranged between 100,000 and 138,000 mt. Surprisingly, official statistics of the DoF within the 1982 to 1992 period varied between 55,000 and 74,000 mt. Although there is no other information to verify its accuracy, it showed a drastic decline between the 1940 to 1970 period. The market value of the approximately 100,000 mt fisheries production in 1992 was estimated at US\$ 30 to US\$ 40 million, based upon an average fishing gate price of US\$ 0.30 to US\$ 0.40 per kg. Government revenues amounted to approximately US\$ 4.8 million in 1991, not including local trading taxes.

A 1998 assessment estimated the economic value of the inland fisheries to Cambodia between US\$ 150 and US\$ 250 million annually. The best estimates of Cambodia's freshwater fisheries production were from 1940 through 1992. Early data points are from Chevey and Le Poulin (1940) and Bardach (1957). Due to the discontinuity of data collection from 1971 through 1979 during the Khmer Rouge Regime, no data was recorded during this period. The official statistics cited here are taken from the DoF reports.

In recent years, it has been claimed that the natural fish stocks of both inland and marine waters have declined drastically in either catch tonnage or value. This was attributed to over-fishing to fulfill local demand related to population growth and in response to the increasing export demand. The general census of 1998 estimated that the population of Cambodia was 11.43 million. This was about double from the 1962 census, where the total population was 5.73 million. Another perspective on population growth was reported in the Cambodia Daily (dated 24 Oct 2002) that in 1979, after the invasion by Vietnam, Cambodia's population was approximately 4 million people. The 2004 population was estimated at 12.2 million, a threefold increase. The population is expected to reach 15 million by 2010. These population growth figures are indicative of the potential threats of more intensified exploitation of the riverine and wetland environments in the future.

Since approximately 90% of the total population of Cambodia lives in the Mekong Delta and Great Lake regions of the central plain (80 % of them are rural agriculturalists and fishers), the wetland resource is under pressure from agricultural land expansion and logging operation. This is in addition to the fishing activities. As a result, about 10% of the Great Lake wetland already have been converted into agricultural land uses.

Fisheries socio-economic survey conducted in eight inland provinces in 1994-95 showed that among 562 communes, there were 328 (58 %) fishing-dependant communes. From the survey's 2.4 million respondents involving 452,714 households, there were 39%, 13%, and 9% who were actively involved in fishing, fish marketing and fish processing, respectively. Other household members were occasionally engaged in fishing.

Most of the Cambodian rural population partly depends upon the inland fisheries for their daily diet and cash incomes. Freshwater fish commodities, including fresh and different types of processed products, are the most preferred foods of Cambodian people, especially the rural people. The Mekong River Commission (MRC), in its 1992 review of the Lower Mekong Basin fisheries, mentioned that in the Cambodian diet, freshwater fish constituted about 70% of animal protein intake. The MRC also reported in 1992 that the nationwide fish consumption, including marine fish, averaged about 13 kg/capita/year. Ahmed (1998) assumed that in fishing-dependent communities freshwater fish consumption is as much as 75.6 kg/capita. However, a 1993 study in Svay Rieng province (a fish resource-scarce area in southern Cambodia) proved that protein intake from all kinds of fish commodities ranged from 3 to 4 kg/capita, which is equivalent to a consumption of 35-48 kg/capita of fresh fish.

- Marine Fishery

The marine fisheries were largely characterized by one-day trips. Although a portion of the daily catch is sold to the local market, most of the catches are 'exported' to Thailand. The catches are transferred to the Thai vessels in the high seas. Cambodia seems to have ignored the importance of the coastal and marine fishery resources until the late 1960s. The relative lack of interest in the marine fishery is due to three main factors. First, except for some indigenous people located in the coastal region, most Cambodians (>80 % of the total population) were rice farmers and fishers whose daily life revolve around inland resources. Therefore, the strong preference of the Cambodian consumer is for inland species. As a result, the marine fisheries today mainly satisfy the export market, rather than being primarily used for domestic consumption. Secondly, the coastal and marine fisheries are very limited in terms of size. The jurisdictional seawaters is extending only to a very limited 435 km of coastline. Catch volumes are too small to support a large modern fishing fleet, or modern freezing or canning operations. Thirdly, the jurisdictional Exclusive Economic Zone (EEZ) widely overlaps with its neighboring countries (Thailand and Vietnam). This often results in competition for the catch with those foreign vessels, as well as occasional conflicts over fishing rights. It also results in an 'informal' and extensive trading of the catch from Cambodian boats to foreign boats in the ocean to avoid export taxes and regulations.

Major commercial species of the seawaters are short mackerel (Trey Pla Thu or *Rastrelliger brachysoma*), torpedo scad (Trey Kantuy Roeung or *Megalaspis cordyla*), shrimps (Bangkiea or *Penaeidae* sp.), and squids (Moeuk or *Loligo* sp.). A new fishery activity targeting the undulated surf clam was introduced to Cambodia in 1999. This fishery specifically targets the Thai market, since there is no demand from Cambodian consumers. Popular seafood for inland communities is short mackerel in steamed (actually boiled) form, followed by crabs, squids and shrimps. However, most of the marine products are exported, through both legal and illegal channels.

In contrast, coastal inhabitants involved in gathering marine products to supplement their daily diet represented a very small part of the population in the past. The density of coastal population, however, increased gradually since the late 1960s with the introduction of motorized trawling and purse seining into the Cambodian marine seas fisheries. Presently, there is not less than 10,000 households involved in marine fisheries, especially monofilament gill netting, trawling and crab trapping.

The marine fisheries production figures prior to 1970 averaged about 30,000 mt annually. Notwithstanding, the official records during the period 1982 to 1992 ranged between 30,000 and 40,000 tons, as the rehabilitation of marine fisheries took place in the late 1980s. The DoF

personnel involved in keepers of marine fishery production statistics could only speculate regarding the catches of the Thai fishing fleet that are licensed to operate in Cambodian jurisdictional seawaters, but landed their catch directly in Thailand territory. Most of the marine fish and sea products were landed directly in Thailand. A small proportion is supplied to coastal and inland Cambodian markets, and to processors to satisfy the inland market demand for processed and preserved products.

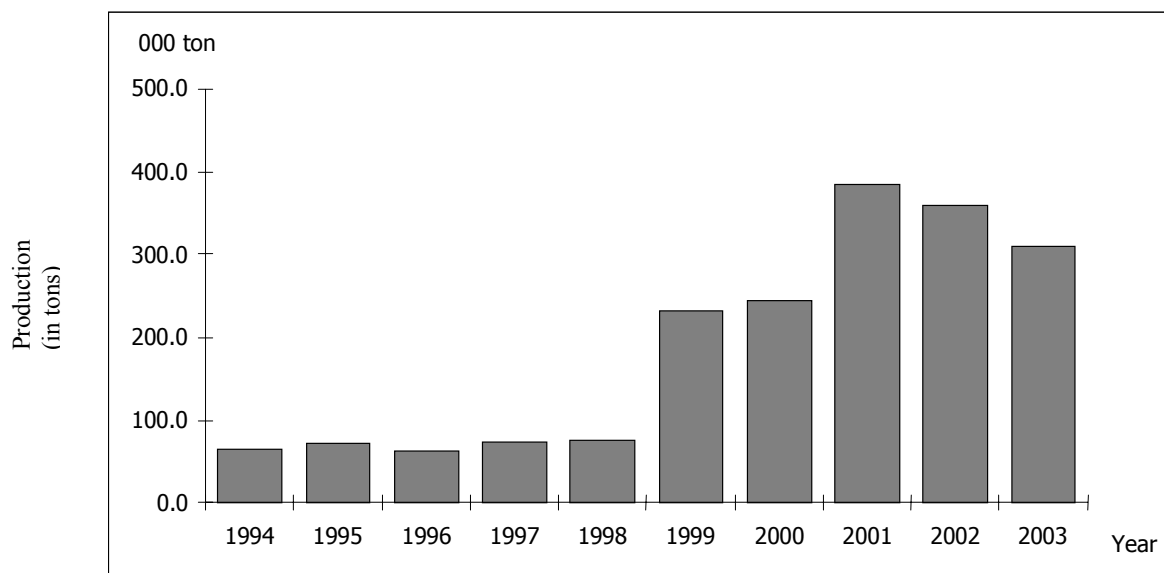
2.3.2 Historical Effort Data

- Inland Capture Fisheries

Freshwater fish and aquatic products are the single most important protein source for the majority of the population. The domestic demand for fishery products is high considering that about 75% of the animal protein requirement for about 12 million inhabitants in the country is derived from the fishery resources. The per capita consumption of fish is estimated at about 65 kg on average. About 60 % of total fish production comes from the Tonle Sap.

Compared to the pre-Khmer Rouge period, officially-recorded inland fisheries production figures showed a drastic decline between 1980 (*Len: there is no 1980 figure in the table*) and 1998, then an increase of more than treefold in 1999 to 2001 (Figure 2.3). This was a great surprise for biologists and statisticians, as well as for planners and policy makers. Based on the results of catch assessment studies conducted by the MRC, further data included the small-scale fishing production that had never been considered in the earlier statistics. Therefore, the actual figures for inland capture fisheries production became a subject of debate.

The DoF (2004) stated that total inland capture fisheries production has increased from 231,000 to 385,000 mt during 1999-2001. The production has decreased after 2001. In 2003, the production has decreased by about 15.5% compared to the 2002 catch. The harvesting of fishery products from freshwater fisheries in Cambodia takes place through large-scale, medium-scale fisheries, and small-scale, and rice-field fisheries. The large-scale and medium-scale fisheries are required to secure fishing licenses. Small-scale and rice-field fisheries are not required to obtain licenses.



Source: Department of Fisheries Year

Figure 2.3. Inland Captures Fisheries Production (1994-2003).

The Government's gross revenue from freshwater fisheries declined from about US\$ 2 million in 2000 to only US\$ 1.7 million in 2003. The decrease of revenue was due to the transfer in late 2000 of some fishing lots and concession fishing areas to the local fishing communities. Similarly,

capture fish productions in Kandal province dramatically decreased to about 14% from 21,500 mt in 2001 to about 18,500 mt in 2003. Furthermore, capture fish production in Pursat rapidly decreased to about 24% based on 2001 figures. In 2001, capture fisheries production in Pursat was estimated at 15,000 mt, which decreased to about 11,400 mt in 2003 (Figure 2.4). However, the contribution of these two provinces was very low (about 9 %) since 2001 and a bit high in 2003, which was about 9.7%. Over a 10-year average, the contribution of these two major provinces was up to about 20% to the total inland capture fisheries production.

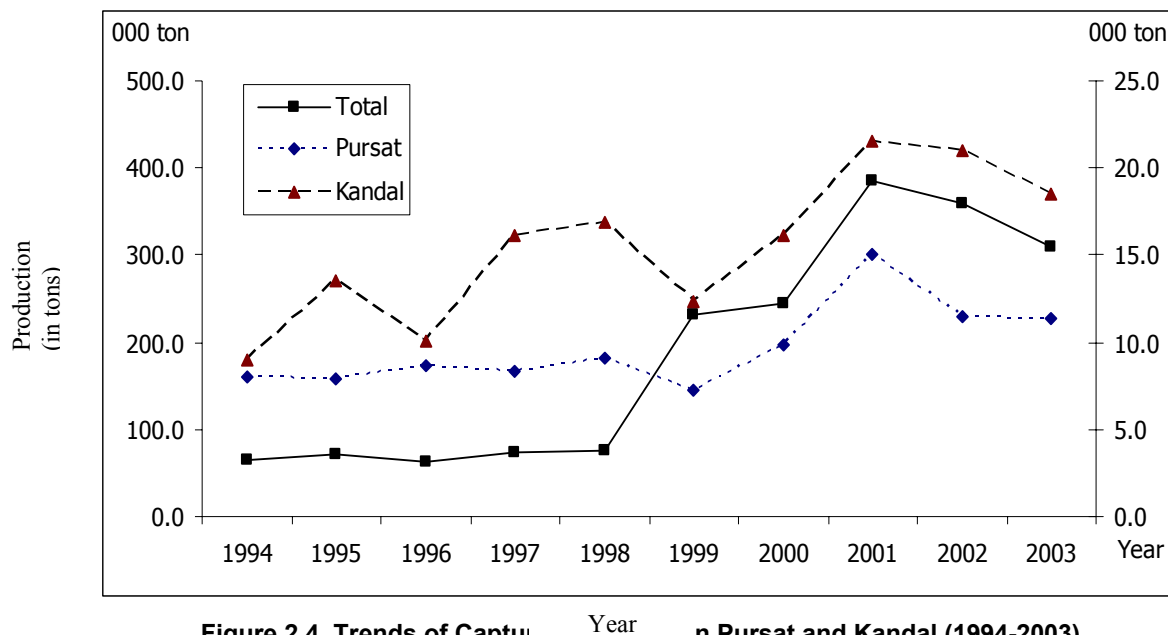
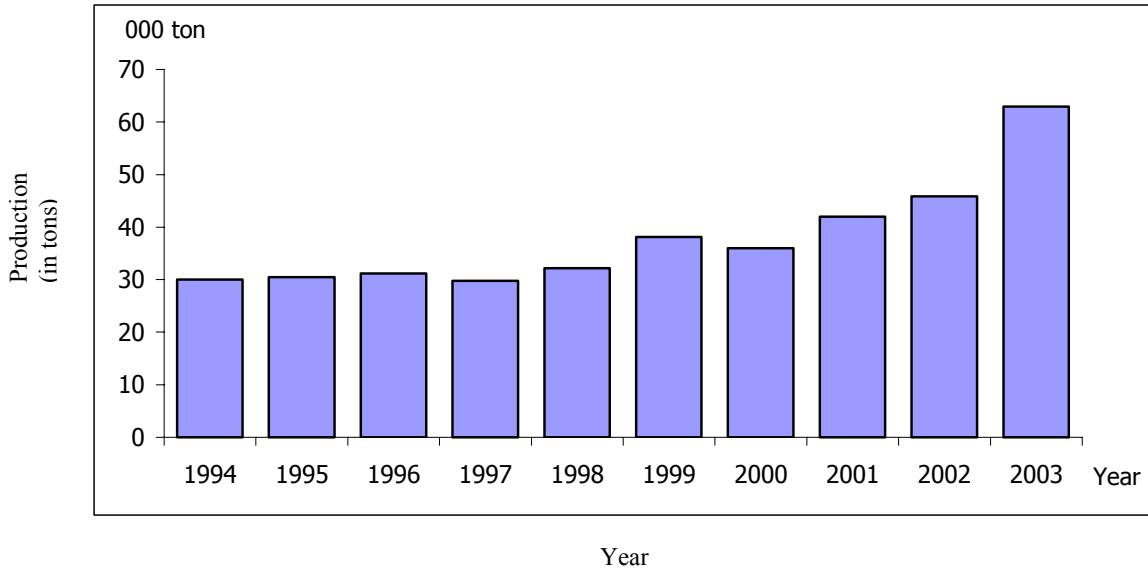


Figure 2.4. Trends of Capture Production in Pursat and Kandal (1994-2003).

- Marine Capture Fisheries

Compared to freshwater finfish and also in comparison to its neighboring Vietnam and Thailand, marine capture fisheries production in Cambodia is very small in terms of production. Marine capture fisheries mainly take place in coastal and inshore sub-sectors. Due to the lack of complete and accurate data collection, information on marine landings is very scanty and fragmented. According to the statistical data of DoF (2004), the production in 2000 was 36,000 mt. This increased to 45,850 mt in 2002 and then to 54,750 mt in 2003 (Figure 2.5). Nearly 70% of this production was finfishes, mostly groupers and snappers. The remaining 30% were cephalopods (squids, cuttlefish, octopus), shellfishes (shrimp and crab) and mollusks.

Only about 48% of marine capture production was exported to neighboring countries and to other countries through international seaports in 2003. Conversely, the quantities of processed fish for exports were very small compared to fresh fish. About 1,790 mt of processed products were exported during 2003 (DoF 2004). The total exports of fresh and processed fish correspond to only about 52% of total marine fish production in 2003.



Source: Department of Fisheries 2003-2004

Figure 2.5. Total Marine Captures Fish Production (1994-2003).

Marine capture fisheries production from Kampot contributed to about 21% on average of the national production. The production in Kampot decreased dramatically since 1999. The total production, however, increased rapidly since 2000 from 36,000 mt to 54,750 mt in 2003 (Figure 2.6).

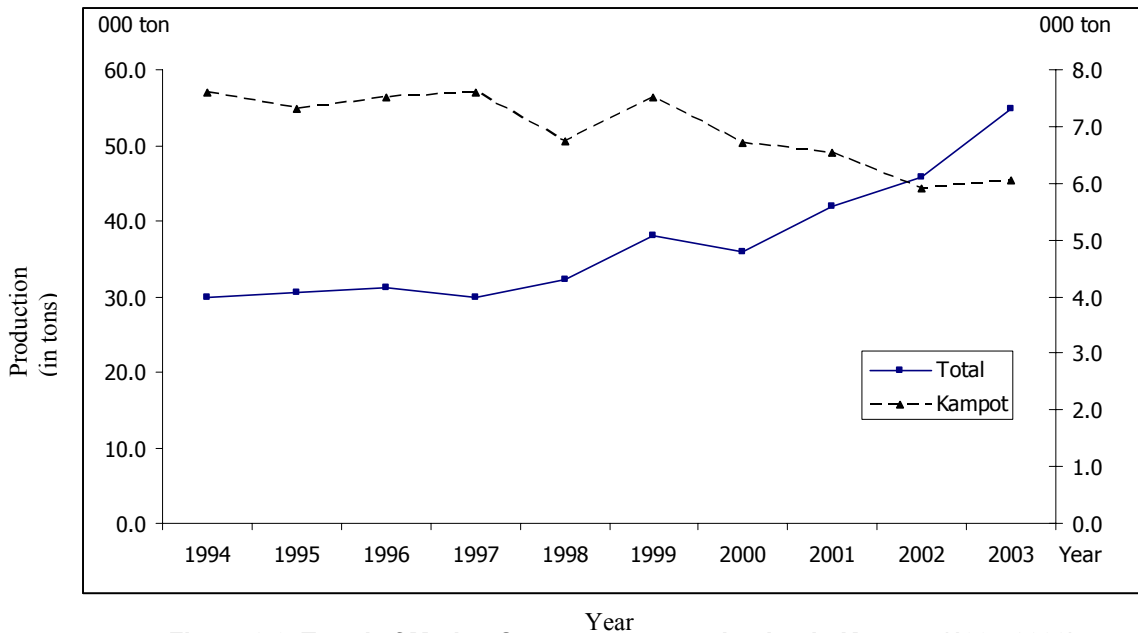


Figure 2.6. Trend of Marine Captures Fish Production in Kampot (1994-2003).

- Exploitation of Fisheries Resources

The inland capture fisheries production has decreased from 385,000 mt in 2001 to 360,300 mt in 2002. Furthermore, in 2003, the production declined further by about 14% compared to 2002. Based on the Second Five Years Fisheries Sector Development Plan (2001-2005), the DoF had projected that fish production will decrease from 385,000 mt to 273,000 mt in 2005. The bases for projections include changes of natural conditions (for examples, lakes and canals are getting

shallow or increasing height of floods) and related to population growth (Table 2.2).

Similarly, marine fisheries production has increased from 29,800 mt in 1997 to 38,100 mt in 1999. Then, it decreased in 2000 (36,000 mt). In total, there are between 3,000 and 4,000 marine fishing boats (with engine and without engine) that can catch between 35,000 and 40,000 mt per annum on the average. In 2003, the total volume caught was 54,750 mt. This figure was higher than the planned target of 40,000 mt. Marine capture fisheries production has increased by about 15% per year since 2001.

Table 2.2. Exploitation and Production of Fisheries Resource in Cambodia - Plan and Actual.

Description	Years							
	2001		2002		2003 ¹		2004	2005
	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Plan
Inland Capture Fisheries	247,000	385,000	255,000	360,300	345,000	308,750	268,000	273,000
Marine Capture Fisheries	37,000	42,000	40,000	45,850	40,000	54,750	47,000	50,000
Total fish production	304,000	444,500	325,000	424,400	385,000	363,500	365,000	383,000
Aquaculture - Fish	20,000	14,000	30,000	15,000	40,000	26,300	50,000	60,000
- Crocodile	22,000	36,000	25,000	50,850	50,000	78,008	32,000	38,000

Source: DoF, 2003 and 2004

¹ Statistics supplied by the Department of Fisheries 2004

3. Results and Discussion

3.1 Socioeconomic Activities

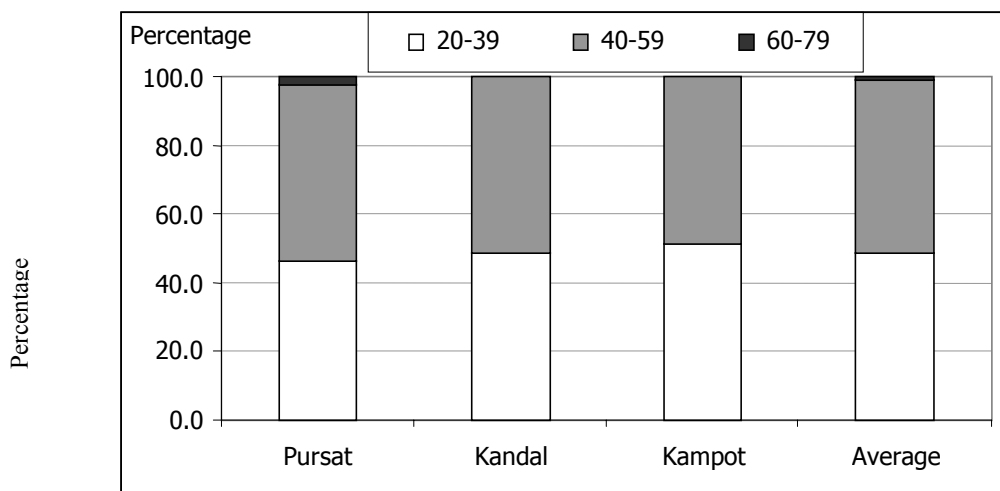
3.1.1 Profile of the Household Heads

- Age Distribution of Respondents

In the CF area, the age distribution of research respondents was divided into three categories. The first is called young generation group (ages from 20 to 39), who knew the condition of the country after the Pol Pot regime. The second is the middle-aged group (40 to 59 years old) who knew the condition during Pol Pot and Lon Nol regimes. Thirdly is the elder group (from 60 to 79) who knew most of the conditions in the country and is engaged in fishing.

The ages of household heads from the CFs who participated during the study ranged from 20 to 79 years old. The highest proportion of freshwater fisher community is in the middle-aged group, whose age ranged from 40 to 59 years old (51.1%). Elderly people participated very little in fishing activities, as well as in community activities. Furthermore, young generation whose ages ranged from 20 to 39 years old was also much involved in fishing activities. The highest proportion of younger respondents was found in the coastal communities. Hence, the ages of respondents for marine communities ranged from 20 to 39 years old only (Figure 3.1). There were few elderly groups who participated in freshwater CF, while there was none in marine-water CF. Nevertheless, middle-aged and young-aged group were the dominant groups in the CF, rather than elderly groups who had more experiences in conflict resolutions. Figure 3.1 illustrates the age distribution of respondents from the CF sites.

Figure 3.1 Age Distribution of Respondents from CF Sites



Source: Field Survey August 2004

Similarly, in NCF areas, the people engaged in fishing and agriculture activities belonged mostly to the middle-aged group, whose age range from 40 to 59 years old. This was slightly equal to the people from the young generation group, whose ages was between 20 to 39 years old (43.0 %). However, in Pursat and Kampot provinces, people who participated mainly come from the middle-aged group (40 to 59 years old). There was less participation from those between 20 to 39 years old, and even less from the elderly. Farmers in Kandal whose ages ranged from 40 to 59 years old had less proportion than the middle-aged group (Table 3.1).

Table 3.1. Age Distribution of Respondent from NCF Sites.

	Age range		
	20 – 39	40 – 59	60 – 79
Pursat	17 (37.8)	18 (40.0)	10 (22.2)
Kandal	21 (46.7)	20 (44.4)	4 (8.9)
Kampot	20 (44.4)	23 (51.1)	2 (4.4)
Average	19 (43.0)	20 (45.2)	5 (11.9)

Source: Field Survey August 2004 Note: Numbers in parenthesis are percentages

Majority of those who participated in the study had ages ranging from 40 to 59 years old (Table 3.1.). However, there was a bit of difference between young household heads in CF and NCF. Young age (range from 20 to 39) in CF seems to be higher in proportion compared with the NCF which were 48.9 % and 43.0 %, respectively. Conversely, household heads whose ages ranged from 60 to 79 in CF seem to have less proportion than in NCF (0.7% and 11.9%, respectively). This data appeared similar as the data from the National Institute of Statistics (NIS) which undertook a census in 1998. The census data showed that the population in economic ages (range from 15-64) represented about 53.7 % of the total population.

- Gender of Respondents

Gender of household heads in the CF is a critical main factor. This in turn is related to the poverty and deprivation of households. The status of women is often at a disadvantage in comparison with men in many developing countries, especially in Cambodia. A World Bank (1997) report indicated that the gender gap of female-headed households was worse off compared with those headed by males. Moreover, female-headed households are more likely to be poor than male-headed households. However, in the study areas of CFs in Pursat, Kandal and Kampot, the proportion of the gender of household heads seemed to have differences. In Pursat, male-headed households was estimated at 64% and female-headed households was only about 36%. Similarly, in the coastal province of Kampot, male-headed households accounted for about 60% while female comprised some 40%. The situation was quite different in Kandal Province where the male-headed households comprised 100% in the selected sample. This figure, however, does not mean that there was no female-headed household in the province. It only implies that male-headed households were in a greater proportion compared with the female-headed households at roughly three times.

The NIS (1998) indicated that male-headed households dominated about 74% of households in Cambodia. This proportion is similar to the selected CF sites. In the NCF of Pursat, Kandal and Kampot, male-headed households still constituted the higher proportion at 87%. The female-headed households were less, comprising only of the remaining 3%. In Pursat, female-headed households seemed to be of greater proportion when compared with those than in Kandal and coastal province of Kampot.

Table 3.2 Gender of Respondents in the Study Sites.

	Male		Female		Total	
	CF	NCF	CF	NCF	CF	NCF
Pursat	29 (64.4)	33 (73.3)	16 (35.6)	12 (26.7)	45 (100.0)	45 (100.0)
Kandal	45 (100.0)	44 (97.8)	0 (00.0)	1 (2.2)	45 (100.0)	45 (100.0)
Kampot	27 (60.0)	41 (91.1)	18 (40.0)	4 (8.9)	45 (100.0)	45 (100.0)
Average	34 (74.8)	39 (87.4)	11 (25.2)	6 (12.6)	45 (100.0)	45 (100.0)

Source: Field Survey August 2004

Note: numbers in parenthesis are percentages

- Number of Years in Fishing of Respondents

Generally, respondents in CF were engaged in fishing as their main occupation for a long-time. Such time period ranged from 3 to 49 years. However, they are fishing mostly from between 11 to 20 years (37.8%). The number of years participation in fishing of a household head respondent is also related to the age. For instance, in Pursat, participants were mostly mature persons whose ages ranged from 40 to 59 years old. The number of years that they were involved in fishing was also the highest, ranging from 21 to 30 years. Similarly in Kandal, the number of years of engagement in fishing was the highest, ranging from 11 to 20 years (44.4%). Consequently, the ages of respondents ranged from 40 to 59 years old. In Kampot, the number of years as fishers was highest for the age category of between 1 to 10 years. The ages of fishers here ranged from 20 to 39 years old. Moreover, the number of years of engagement in fishing was also related to household migration. Statistical method of paired-samples t-test shows that the number of years of participation in fishing are related mostly to age and the number of years of stay in their present residential at 95% confidence level (Table 3.3).

Table 3.3 Result of T-Test of Paired Samples Correlations

	N	t-value	Sig.
Number of year in fishing vs Number of years staying in current village	135	0.465	0.000
Age of respondent vs Number of years in fishing	135	0.612	0.000

Household heads who are not part of the CF (or the so called NCF) who are engaged in fishing and agriculture activities were mostly adults whose age ranges from 40 to 59 years old (Figure 3.2). Hence, the proportion of household heads engaged in fishing from 21 to 30 years was also the highest. For instance, in Pursat, the proportion of household heads engaged in fishing was mostly adults whose ages ranged from 40 to 59 years old. The number of years participating in fishing was also highest for the age category of between 21 to 30 years. The age of household heads in NCF of Kandal was mainly within the range from 20 to 59 years old. This suggests that the number of years of engagement in fishing was also dependent on the age of the respondents.

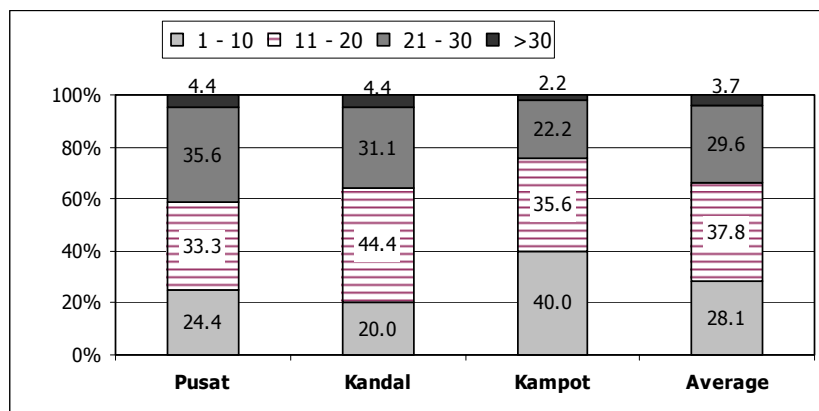


Figure 3.2 Number of Years Engaged in Fishing.

- Marital Status of Respondents

About 81% of the household heads interviewed were married, 16.3% were widow/ers and only 3% were single. However, the higher proportion of widow/ers was found in the freshwater CF rather than in the marine CF. Household heads who were single accounted for very little proportion in the

CF. Chi-square test shows that the distribution of household heads participation in the CF by marital status is not significantly different at 95% confidence level.

Similarly in the NCF, the proportion of married household heads was 92%. Single and widows had almost slightly equal proportion. Representation of household heads who were single are more represented in the marine waters of Kampot rather than in freshwater provinces. Widow/ers participating in coastal fishing seem to be less compared with widow/ers engaged in inland fishing. However, there was no significant difference between provinces, as well as within CF and NCF, at 95% confidence level (Table 3.4).

Table 3.4 Marital Status of Respondents.

	Single		Married		Widow/ers	
	CF	NCF	CF	NCF	CF	NCF
Pursat	1 (2.2)	0 (0.0)	38 (84.4)	41 (91.1)	6 (13.3)	4 (8.9)
Kandal	2 (4.4)	2 (4.4)	29 (64.4)	41 (91.1)	14 (31.1)	2 (4.4)
Kampot	1 (2.2)	2 (4.4)	42 (93.3)	42 (93.3)	2 (4.4)	1 (2.2)
Average	1 (3.0)	1 (3.0)	36 (80.7)	41 (91.9)	7 (16.3)	2 (5.2)

Source: Field Survey August 2004

Given the above assumption, the proportion of married household heads was highest in both CF and NCF of coastal and inland provinces. The lowest proportion of participants was classified as single. Coastal areas seemed to have more married household heads compared with the inland sites. Statistically, there was no significant difference between CF and NCF, as well as between provinces at 95% confidence level.

- Education of Respondents

The educational levels of household heads and spouses are important indicators of the human resources. The quality of human resources in a household can have an important impact on extension to enable them to meet the needs for food and income. The low level of education of some people may trigger conflict with some educated people. World Bank (1999) used poverty head count index based on the reported literacy of the household heads, showing that poverty was lower among the literates (34%) than among the illiterates (42%).

In terms of educational level of the household heads in CF areas, 54% of the total participants finished only primary education (1 to 5 years schooling). About 24% did not attend any formal education levels (illiterate). About 20% finished secondary school and only about 5% finished high school level. However, the household heads who participated in coastal CF tended to possess high school education when compared with the respondents from fresh-water CF where not even one finished high school. The coastal province had also the highest proportion of illiterate household heads. Household heads of Kandal provinces tended to have the highest secondary schooling than the respondents in the other selected provinces. Again, there was no significant difference between education levels in the study sites at 95% confidence level ($p = 0.431$).

Similar to the CF, the illiterate household head participants in the NCF comprised about 20% of the total samples. Those who finished primary and secondary levels of education constituted about 53% and 23%, respectively (Table 3.5). The proportion of participants who completed schooling beyond the secondary level (high school) seemed to be higher than the NIS figure at 1.1%. Household heads in Kandal CF tended to have higher education than the other selected CFs. This may be due to the location of the province, which is more closed to the capital city of Phnom Penh. Consequently, the participations in Kampot had the highest proportion of illiterates.

Table 3.5. Educational Level of Respondents.

	Illiterate		Primary		Secondary		High school		Higher	
	CF	NCF	CF	NCF	CF	NCF	CF	NCF	CF	NCF
Pursat	10 (22.2)	13 (28.9)	27 (60.0)	24 (53.3)	8 (17.8)	6 (13.3)	0 (0.0)	2 (4.4)	0 (0.0)	0 (0.0)
Kandal	7 (15.6)	2 (4.4)	24 (53.3)	27 (60.0)	14 (31.1)	15 (33.3)	0 (0.0)	0 (0.0)	0 (0.0)	1 (2.2)
Kampot	16 (35.6)	12 (26.7)	22 (48.9)	21 (46.7)	5 (11.1)	10 (22.2)	2 (4.4)	2 (4.4)	0 (0.0)	0 (0.0)
Average	11 (24.4)	9 (20.0)	24 (54.1)	24 (53.3)	9 (20.0)	10 (23.0)	2 (4.4)	2 (4.4)	0 (0.0)	1 (1.1)

Source: Field Survey August 2004

Notes: numbers in parenthesis are percentages

However, there was no significant difference between the CF and the NCF, nor among the selected provinces at 95% of confidence level. It implies that the educational level shown in the above table was not dependent on either the location or the type of fishing community. Furthermore, educational level was also not dependent on the age of the respondents. However, the educational level of household heads was closely linked to the gender of the household heads. This indicates that the male-headed households tended to have higher education than the women ($p=0.008$). The mean number of males' schooling was about 4 years, while females on the average completed only about 2.2 years of schooling. This data was consistent with the statistics from the NIS, which stated that the literacy of adult females was much lower than for males.

- Principal Occupation of Respondents

Fishing is the main occupation of the survey respondents from the CF. About 88% of the interviewees were engaged in fishing as their main occupation (Table 3.6). All respondents of the CF in Kandal were engaged in fishing as their main occupation. However, only 71% of the respondents in Pursat were engaged in fishing. In Pursat, farming ranked as the second most occupation and small business ranked as third. Fishing was the only occupation for the CNF sites in Kandal and Kampot province. Only 2.2% of the respondents did farming and small business in Pursat province. This may be attributed to the fact that there is no available land for agriculture. Lands are owned by the lot owners in Kandal province and by the government at Kampot National Park.

Table 3.6. Principle Occupations of Respondents

Location	Fishing		Farming		Small Business	
	CF	NCF	CF	NCF	CF	NCF
Pursat	32 (71.1)	43 (95.6)	12 (26.7)	1 (2.2)	1 (2.2)	1 (2.2)
Kandal	45 (100.0)	45 (100.0)	0 (0.0)	0(0.0)	0(0.0)	0(0.0)
Kampot	42 (93.3)	45 (100.0)	2 (4.4)	0(0.0)	1 (2.2)	0(0.0)
Average	40 (88.1)	44 (98.5)	7 (15.6)	0 (1.0)	1 (2.2)	0 (1.0)

Source: Field Survey August 2004

Note: numbers in parenthesis are percentages

- Secondary Occupation of Respondents

Secondary occupation is contributing supplementary income to the households. There were about 42% of CF respondents from Kampot who did not have any secondary occupation while there were only about 11% in Kandal. About 53% of respondent in Pursat had one secondary occupation and about 44% in Kandal were in the same situation. About 29% of Kandal's respondents had two secondary occupations and about 13% had three. Furthermore, about 2% of respondents in Kandal had four secondary occupations. Conversely, respondents in Kampot tended to have only between 1 to 2 secondary occupations and Pursat had between 1 to 3. On the average, about 75% of respondents had secondary occupation ranging from 1 to 4. About 25 % did not have any secondary occupation at all.

The situation is different in the NCF where about 35% of total respondents did not have any secondary occupation. About 45% of them had one, about 19% had two, and only about 1.5 % had three secondary occupations. There was no one among them who had more than three secondary occupations. About 56% of respondents in Kampot had one, about only 4% had two, and no one had three secondary occupations. In Kampot, about 56% of the respondents had one secondary occupation. Nearly half of the respondents in Kandal had two secondary occupations rather than one and three (Table 3.7).

Table 3.7. Number of Secondary Occupation

	Non		One		Two		Three		Four	
	CF	NCF	CF	NCF	CF	NCF	CF	NCF	CF	NCF
Pursat	9 (20.0)	24 (53.3)	24 (53.3)	21 (46.7)	8 (17.8)	1 (2.2)	4 (8.9)	0 (0.0)	0 (0.0)	0 (0.0)
Kandal	5 (11.1)	5 (11.1)	20 (44.4)	15 (33.3)	13 (28.9)	22 (48.9)	6 (13.3)	2 (4.4)	1 (2.2)	0 (0.0)
Kampot	19 (42.2)	18 (40.0)	24 (53.3)	25 (55.6)	2 (4.4)	2 (4.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Average	11 (24.4)	16 (34.8)	23 (50.4)	20 (45.2)	8 (17.0)	8 (18.5)	3 (11.1)	1 (1.48)	0 (0.7)	0 (0.0)

Source: Field Survey August 2004

Note: numbers in parenthesis are percentages

There were several secondary occupations that generated income to the respondents. These include fishing (for respondents who do farming as primary occupation), fish processing, fish trading and motor taxi/car/engine boat driving. Given the information gathered from the field, the secondary occupations were clustered into five main livelihood activities: (1) fishing and fish-related activities, (2) small business, (3) farming, (4) laboring and (5) government/NGOs worker. About 62% of respondents at the CF in Pursat were engaged in fish-related activities, such as fish processing and fish culturing as their secondary occupation while there were only about 5% in Kampot who were in the same situation. Pursat had the highest proportion of small businesses when compared with the two other provinces. Respondents in Kandal were involved mostly (71%) in farming rather than other secondary occupations. Beside their involvement with farming, about 42% of them also provided labor services to the city markets. Laboring and farming were very common among respondents in Kampot (about 54%) while small business and fish-related activities ranked the least (9%). On the average, however, farming ranked as the first secondary occupations while fish-related activities ranked second for all respondents (Table 3.8).

Similar to the CF sites, farming ranked first as the secondary occupation for the NCF sites. About 80% in Kandal, 51% in Kampot and about 31% in Pursat were involved in farming. Laboring also contributed supplementary income to the respondents in Kandal, while its contribution was marginal in Pursat and Kampot. Small business provided only supplementary income to only about

5% of the respondents. Occupation as government officers and NGOs workers accounted only for 3%.

Table 3.8. Specific Secondary Occupations of Respondents.

	Fish related activities		Small business		Farming		Laboring		Government /NGOs worker	
	CF	NCF	CF	NCF	CF	NCF	CF	NCF	CF	NCF
Pursat	28 (62.2)	4 (8.9)	7 (15.6)	2 (4.4)	12 (26.7)	14 (31.1)	3 (6.7)	2 (4.4)	3 (6.7)	1 (2.2)
Kandal	14 (31.1)	8 (17.8)	1 (2.2)	2 (4.4)	32 (71.1)	36 (80.0)	19 (42.2)	16 (35.6)	2 (4.4)	3 (6.7)
Kampot	2 (4.4)	3 (6.7)	2 (4.4)	2 (4.4)	12 (26.7)	23 (51.1)	12 (26.7)	1 (2.2)	0 (0.0)	0 (0.0)
Average	15 (32.6)	5 (11.1)	3 (7.4)	2 (4.4)	19 (41.5)	24 (54.1)	11 (25.2)	6 (14.1)	2 (3.7)	1 (3.0)

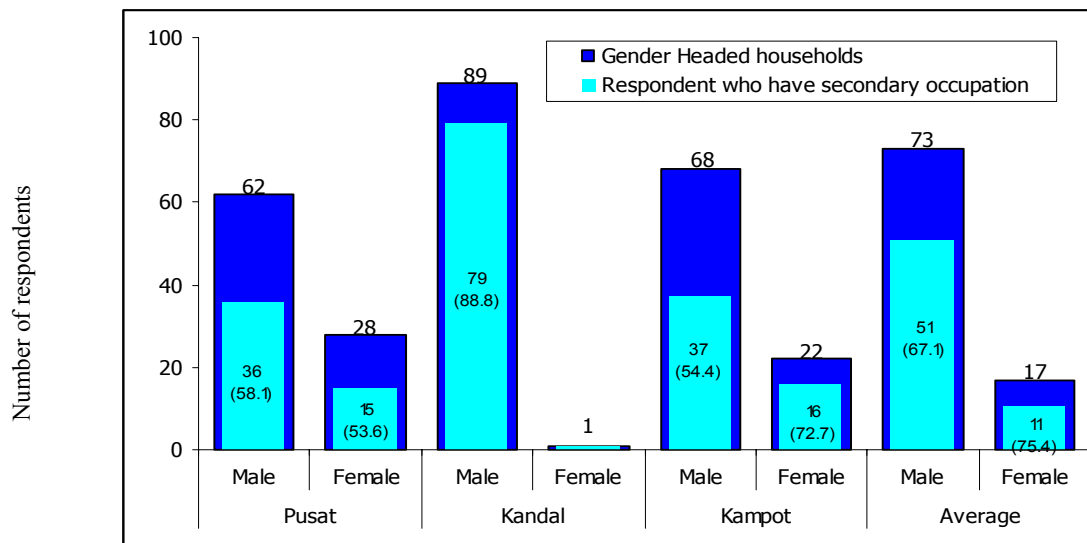
Source: Field Survey August 2004

Note: numbers in parenthesis are percentages

Respondents in the NCF sites who had no secondary occupation were higher compared with the CF sites. Hence, the CF respondents had a high proportion of having one secondary occupation compared with the NCF residents. Three secondary occupations occurred in higher proportion in the CF sites. Up to four secondary occupations also existed in these CF locations. However, the NCF respondents were likely to have two secondary occupations.

Fish-related activities provided very marginal contribution in both the CF and the NCF sites in Kampot. This is because farming served as the main occupation of the respondents. Small business got the highest proportion in the CF of Pursat province, while it contributed very little in Kandal and Kampot. Farming was largely practiced by the respondents in Kandal but the proportion of those engaged in it was less in Pursat (both CF and NCF). This is because respondents in Pursat are living either on or very close to the water. Laboring as a secondary occupation was quite high in Kandal province. The main reason to this is Kandal's location, which is very close to the capital city where labor is very much in demand. Government/NGO workers were very few in both sites. Chi-square test showed that the secondary occupations of the respondent were significantly different between provinces, but not between communities. Furthermore, it was also related to the marital status of the household heads. Female-headed households tended to have more secondary occupations than the male-headed households. Figure 3.3 shows that about 75% of female-headed household respondents had secondary occupation, whereas about only 67% of male-headed households had the same occupation.

Figure 3.3. Distribution of Secondary Occupation by Gender Among Household Heads.



Source: Field Survey August 2004

Location by gender

- Number of Years Living in the Current Locations

The number of years of residency in the current locations is very important in identifying conflicts that arise in those areas. Many migrant people in the world face a lot of conflicts. However, the conflicts are also present more in old villages, rather than in new villages. About 38% of the respondents in the CFs were residing in home villages for more than 30 years, 31% were living from 21 to 30 years, 21% from 11 to 20 years, and less than 9% from 1 to 10 years. Respondents in Kampot and Pursat province were mostly new entrants (after the Pol Pot regime), while about 67% of Kandal respondents were old residents. However, there was a very small percentage (11%) of total respondents who lived for less than 10 years.

Similar to the CFs, the NCF respondents lived for more than 20 years (about 71%) whilst only about 29% lived for less than 20 years in their current villages. About 80% of the respondents in Kandal province were living mostly for more than 20 years in their current villages. The proportion was about 64% and 69% of respondents in Pursat and Kandal, respectively (Table 3.9).

Table 3.9. Numbers of Years Living in Current Village of Respondents.

	1 – 10 years		11 – 20 years		21 – 30 years		>30 years	
	CF	NCF	CF	NCF	CF	NCF	CF	NCF
Pursat	6 (13.3)	5 (11.1)	8 (17.8)	11 (24.4)	18 (40.0)	24 (53.3)	13 (28.9)	5 (11.1)
Kandal	3 (6.7)	3 (6.7)	6 (13.3)	6 (13.3)	6 (13.3)	8 (17.8)	30 (67.7)	28 (62.2)
Kampot	6 (13.3)	3 (6.7)	13 (28.9)	11 (24.4)	18 (40.0)	14 (31.1)	8 917.8)	17 (37.8)
Average	5 (11.1)	4 (8.2)	9 (20.0)	9 (20.7)	14 (31.1)	15 (34.1)	17 (37.8)	17 (37.0)

Source: Field Survey August 2004

Note: numbers in parenthesis are percentages

About 69% of respondents in both CFs and NCFs were living in their current villages for more than 20 years. Only about 31% were living for less than 21 years. The number of years of residency in the current locations was closely related with age, occupations and ethnicity. The T-test showed that the number of residency years in current location was related mostly with age and occupation at 95% confidence level. Considering the real condition and the statistical test, the age of the respondent was the main key factor that influenced the number of years of residency in their current villages. The respondents' ages ranged from 20 to 79 years old. Furthermore, most of them (88.1%) were engaged in fishing as their main occupation.

3.1.2 Profile of Household Members

- Household Members

In CF, the number of household members ranged from a minimum of 2 to a maximum of 14. Average family size was 6.4, which were higher than the average of 5.1 in rural areas of Cambodia. In the CF of Pursat, the highest proportion of households (46.7%) had between 1 to 5 family members, which were similar to the Kampot province. Family members of 6 to 8 persons presented the highest proportion of family in Kandal. In Kampot, 20% of household respondents had members of 9 to 11 people. However, most of the families had member ranging from 1 to 5, and very few had more than 11 members. Nevertheless, the results from a Chi-square test showed that there was no significant difference in family size among selected provinces at 95% confidence level.

Similar to the CF, the highest proportion of family members in the NCF belonged to the class whose ages ranged from 1 to 5 (40%). The lowest proportion was for big family, who had more than 11 members. However, the families of participants in the coastal province (Kampot) tended to have more members compared with the inland areas. More than 66% of the interviewed households had more than 6 members. More than 50% of the households in Pursat had only 1 to 5 family members (Table 3.10).

Table 3.10. Profile of Family Members.

Number of member	1 – 5		6 - 8		9 - 11		>11	
	CF	NCF	CF	NCF	CF	NCF	CF	NCF
Pursat	21 (46.7)	23 (51.1)	17 (37.8)	15 (33.3)	7(15.6)	6 (13.3)	0 (0.0)	1 (2.2)
Kandal	17 (37.8)	16 (35.6)	21 (46.7)	17 (37.8)	7(15.6)	11 (24.4)	0 (0.0)	1 (2.2)
Kampot	18 (40.0)	15 (33.3)	17 (37.8)	19 (42.2)	9(20.0)	7 (15.6)	1 (2.2)	4 (8.9)
Average	19 (41.5)	18 (40.0)	18 (40.7)	17 (37.0)	8 (17.0)	8 (17.8)	1 (2.2)	2 (4.4)

Source: Field Survey August 2004

Note: numbers in parenthesis are percentages

In this regard, the CF households that participated tended to have fewer members than the NCF areas in both coastal and inland waters. Moreover, about 60% of the CF households and about 66% of the NCF households in the coastal province had more than 6 members. However, there was no significant difference between household participation at different selected provinces at 95% confidence level (Chi-square test).

- Number of Labor Force in the Households

The number of laborers in the households is very important factor pertaining to the income and poverty of the fishers, as well of farmers. Table 3.10 earlier describes the family members in the households of inland and coastal selected provinces that constituted the labor force. The CF households seemed to have high labor force ranging from 1 – 3 (70%) individuals. Inland CF tended to have more proportion of labor members (range from 4 – 6) rather than in the coastal CF (Table 3.11). Similarly for the CF, the NCF's highest proportion of labor members belonged to the

range from 1 – 3 (74%). There was less proportion for households who had labor members of more than 6. Household participants in Kandal seemed to have more labor members than the other provinces. There were about 51% of the total NCF interviewees who had labor force of more than 6 members (7 – 9 range).

Table 3.11. Number of Household Labor.

	1-3		4 – 6		7-9		>9
	CF	NCF	CF	NCF	CF	NCF	NCF
Pursat	31 (68.9)	31 (68.9)	13 (28.9)	14 (31.1)	1 (2.2)	0 (0.0)	0 (0.0)
Kandal	24 (53.3)	0 (0.0)	16 (35.6)	22 (48.9)	5 (11.1)	19 (42.2)	4 (8.9)
Kampot	40 (88.9)	36 (80.0)	4 (8.9)	8 (17.8)	1 (2.2)	1 (2.2)	0 (0.0)
Average	32 (70.4)	34 (74.4)	15 (32.6)	11 (24.4)	2 (4.4)	7 (14.8)	4 (8.9)

Source: Field Survey August 2004

Note: Numbers in parenthesis are percentages

Household participants in both the CF and the NCF sites tended to have more labor force in the families for the range of 1 – 3 members. Inland water provinces of Kandal and Pursat tended to have more labor force than the coastal province of Kampot. However, there was no significant difference between CF and NCF; also between locations. It means that the number of labor members in the households was not dependent on either the geographical location or the type of fishing communities. Nevertheless, the number of labor in the family was very much dependent on the amount of family members, compared to other factors at 95% confidence level.

- Household Member Engaged in Fishing

Household members engaged in fishing are very important for households who remain in fishing as their main occupation. Without labor, the fishers cannot undertake fishing. In CFs of Pursat and Kampot, the respondents preferred to go fishing in pair. Members ventured into fishing in Kandal as individuals. The highest proportion of women who are engaged in fishing was in Pursat (23%). This constituted the highest ratio of 3 men per 1 woman (3:1). The proportion of women was very low in Kandal (only about 7%). Hence, Kandal had the lowest ratio of 14 men per 1 woman (14:1). In Kampot, the number of women engaged in fishing was about 12.5%. Consequently, the male-to-female ratio was estimated at 7:1. On the average, in the CFs, there were about 15% of women engaged in fishing practices.

The situation is different in the NCFs where the ratio of men per women was about 4:1. In Pursat, the ratio of men per women was relatively lower than the average (only 2:1). This means that women were highly involved in fishing activities. Women participation in fishing at Pursat reached up to 34% of its respondents. On the other hand, there was a very small percentage of women in Kandal (3%), followed by Kampot which made up to 11% of the respondents. On the average, women participation in fishing at NCF was about 16%, with a ratio of 4:1 (Table 3.12).

Table 3.12. Household Members Engaged in Fishing by Gender.

	Male		Female		Average		Ratio M/F	
	CF	NCF	CF	NCF	CF	NC F	CF	NC F
Pursat	56 (76.7)	69 (66.3)	17 (23.3)	35 (33.7)	2	2	3:1	2:1
Kandal	55 (93.2)	58 (96.7)	4 (6.8)	2 (3.3)	1	1	14:1	29:1
Kampot	70 (87.5)	74 (89.2)	10 (12.5)	9 (10.8)	2	2	7:1	8:1

Average	60 (85.4)	67 (84.1)	10 (14.6)	15 (15.9)	6:1	4:1
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Source: Field Survey August 2004 Note: Numbers in parenthesis are percentages; M means male while F means female

It may be interpreted that family members in Pursat family members were engaged in fishing more than the other two provinces of Kandal and Kampot. The ratio of respondents was about 5 men per 1 woman (5:1). Nonetheless, women participation in fishing was not related to the household heads condition. Rather, it is strongly correlated to the number of people in each household. The households who had more female members tended to have more women engaged in fishing activities.

3.1.3 Households Assets

The cost of housing of CF respondents in Kandal was classified as 'poor' and 'medium' households. Isolated poor respondents were living in huts costing only 60,000 Riel (US\$ 15²). The middle class respondents were living in houses costing up to 30 million Riel (US\$ 7,500). Kampot and Pursat respondents claimed similar conditions with poor and middle class households. The poor households of these two provinces were living in huts costing about 120,000 Riel (US\$ 30) while the medium households live in houses with costs that varied from 11 to 20 million Riel (US\$ 2,750 to US\$ 5,000). However, on the average, the housing cost of the rest of households was estimated at 3.31 million Riel (US\$ 827).

Moreover, land is the other asset which contributes to the people's livelihood. The cost of land was up to 16 million Riel. Respondents in Kandal were likely to have higher economic values for their lands, compared with Pursat and Kampot provinces. This is because the province is located around Phnom Penh City. Besides housing and land, most of them owned boats. These are used as means of transportation, aside from fishing. A marine boat costs up to 25 million Riel. It only costs a maximum of about 3 million Riel for a boat used in inland waters. On the average, the cost of a boat was about 1.18 million Riel (US\$ 295). The respondents in Kampot tended to have more expensive boats compared with interviewees from Kandal and Pursat.

Household appliances, such as furniture, beds, tables and closets were common assets for respondents in these three provinces. These contributed to a very small proportion of assets, amounting to only about 40,000 Riel (US\$ 10) for respondents in Pursat, and about 290,000 Riel for respondents in Kampot. Hence, Kampot's respondents were likely to have more valuable household appliances than the other provinces.

Electronic appliances, such as fans, batteries, radios and televisions, seemed to be more expensive than household appliances. Pursat respondents were likely to have more electronic appliances than the other two provinces. The electronic appliance costed about 70,000 Riel for Kampot's respondents, about 180,000 Riel for respondents in Kandal, and about 330,000 Riel for Pursat's respondents. However, the value of electronic appliances on the average was estimated only at about 190,000 Riel.

The values of household assets may be put in perspective. The respondents located in Kandal tended to have highest-valued asset (up to 1.70 million Riel). The lowest was in Pursat where the assets were appraised only up to 1.08 million Riel. Hence, the asset of the household is related mostly with location, rather than on any the other factor. The same result is shown in T-test at 95% confidence level (Table 3.13).

Table 3.13. Household Assets of Respondents in CF.

Household asset in Million of Riel					
House	Land	Boat	Housing appliances	Electronic appliances	Average

² 1US\$ = Riel 4,000

Pursat	3.08	1.40	0.54	0.04	0.33	1.08
Kandal	3.69	3.69	0.94	0.02	0.18	1.70
Kampot	2.32	1.55	2.06	0.29	0.07	1.26
Average	3.31	2.21	1.18	0.11	0.19	1.35

Source: Field Survey August 2004

Housing in the NCF seemed to be better than in the CF. The value of a house varied among locations and among provinces. In Kandal, the value of a house reached up to 28 million Riel. This figure was higher than the other two provinces. In Pursat and Kampot, the value of houses was about 24 and 16 million Riel, respectively. However, on the average, the value of a house tended to be highest in a coastal province than in inland provinces. The average cost of house in Pursat was about 3.31 million Riel; in Kandal it was about 3.63 million Riel; and reached up to 4.78 million Riel in Kampot. For the rest of the country, value of a house was about 3.91 million Riel.

Land is the other asset of the household members in the NCF. The cost of land was lower in Pursat and was estimated at about 0.23 million Riel compared with Kandal (3.70 million Riel) and Kampot (4.14 million Riel). Average cost of land asset of each family in NCF was about 2.69 million Riel.

Boat also provided valuable contribution to the household assets. Respondents in Kampot tended to have high-value boat (4.76 million Riel) than in Kandal and Pursat. The value of a boat in Pursat was about 1.45 million Riel, while it was valued only at about 0.72 million Riel in Kandal. However, the average value of a boat as material asset of each respondent was about 2.31 million Riel.

Household appliances had a range of value among locations. It was estimated at about 90,000 Riel for respondent in Pursat, about 20,000 Riel in Kandal, and about 190,000 Riel in Kampot. The average cost of household appliances was about 100,000 Riel. In terms of electronic appliances, the cost was estimated at about 0.55 million Riel by the respondents in Pursat, about 0.24 million Riel in Kandal, and about 0.17 million Riel in Kampot. Hence, the respondents in Pursat tended to have more expensive electronic appliances than in the other two provinces. However, on the average, the cost of electronic appliances was only about 0.32 million Riel.

On the other hand, the household assets of respondents in NCF was estimated at about 1.87 million Riel. The cost of household assets in Kampot tended to be higher than in Kandal and Pursat. Kampot's respondents had household assets costing about 2.81 million Riel. The estimated values were about 1.13 million Riel for respondents in Pursat, and about 1.66 million Riel in Kandal. The average value of household assets in the NCF was about 1.8 million Riel (Table 3.14).

Table 3.14. Household Assets of Respondent from the NCF.

	Household asset in Million of Riel					
	House	Land	Boat	Household Appliances	Electronic Appliances	Average
Pursat	3.31	0.23	1.45	0.09	0.55	1.13
Kandal	3.63	3.70	0.72	0.02	0.24	1.66
Kampot	4.78	4.14	4.76	0.19	0.17	2.81
Average	3.91	2.69	2.31	0.10	0.32	1.87

Source: Field Survey August 2004

The housing assets of respondents in the CF seemed to be less valuable than in the NCF. Furthermore, land holding, boat and electronic appliances were also less valuable in CF than in the

NCF (through comparison of monetary values). Similarly, the values of household appliances values in the NCF appeared to be higher than in the CF. However, the cost of household assets of NCF was greater than in the CF. Hence, the assets of the household were related mostly on location rather than on other factors.

3.1.4 Households Income

Annual income of each household is varied not only among locations but even among families as well. In Pursat, the income of respondents varied from about 0.11 million Riel to 34.80 million Riel. In Kandal and Kampot, the income varied from 0.05 million Riel to 120.00 million Riel, and from 0.10 million Riel to 50.40 million Riel, respectively. However, the average income of all CF sites was about 5.44 million Riel. Respondents of the CF in Kandal appeared to have the highest annual income than Pursat and Kandal. Average annual income of Kandal's respondent was about 8.30 million Riel. This was higher compared with only 3.79 million Riel in Pursat and 4.24 million Riel in Kampot. The annual income among respondents in each community indicated much variation. Standard deviation of the means of income of Kandal CF was very high, which made the variation of annual income also very divergent. In the CF of Pursat, annual income seemed to be a bit lower than the other two locations; however, it was still higher than the minimum income of some households. Furthermore, the SDs of the means were also higher than averages of all locations.

In the NCF, the annual income varied from 0.13 million Riel to 31.52 million Riel, with the SD of the mean calculated at 6.21 million Riel. The highest income of 6.24 million Riel appeared in Pursat, while the lowest one (4.22 million Riel) emerged from Kandal. With highest income, Pursat also obtained the highest SD of the mean. The average income of the rest of provinces was about 5.12 million Riel, with SD of the mean at 6.21 million Riel (Table 3.15).

Table 3.15. Annual Income of Respondents in Million Riel.

	Minimum		Maximum		Mean		Std. Deviation	
	CF	NCF	CF	NCF	CF	NCF	CF	NCF
Pursat	0.11	0.17	34.80	46.80	3.79	6.24	5.03	8.07
Kandal	0.05	0.10	120.00	17.76	8.30	4.22	17.06	4.77
Kampot	0.10	0.12	50.40	30.00	4.24	4.88	6.70	5.80
Average	0.09	0.13	68.40	31.52	5.44	5.12	9.60	6.21

Source: Field Survey August 2004

Overall, in the CF, the average income of each province was quite low. Given this variation of average income, the SD of the mean also fluctuated from 5.03 million Riel to 17.06 million Riel. Hence, it was assumed that there was a big gap in the distributions of household's annual income, which can make the poor people become poorer. In CF sites, Kandal province registered the highest annual income, and had also the highest standard deviation. Among the NCF sites, the highest annual income was obtained in Pursat, rather than in Kandal; the SD of the mean of Pursat was also the highest. The minimum annual income of the three provinces were quite similar. The maximum income, however, greatly varied. The distribution of average annual income of these three provinces fluctuated substantially in the CF sites, but there was little fluctuation in the NCF sites. Moreover, minimum, maximum and SD followed similar pattern to the situation of average annual income distribution. Although the average income of these two sites was similar, the SD of CF sites was about double if compared to the average annual income. The condition is quite contrary in the NCF sites. The SD of income was just a bit higher than the average. Consequently, the condition of the respondents in NCF sites is relatively better than in CF sites.

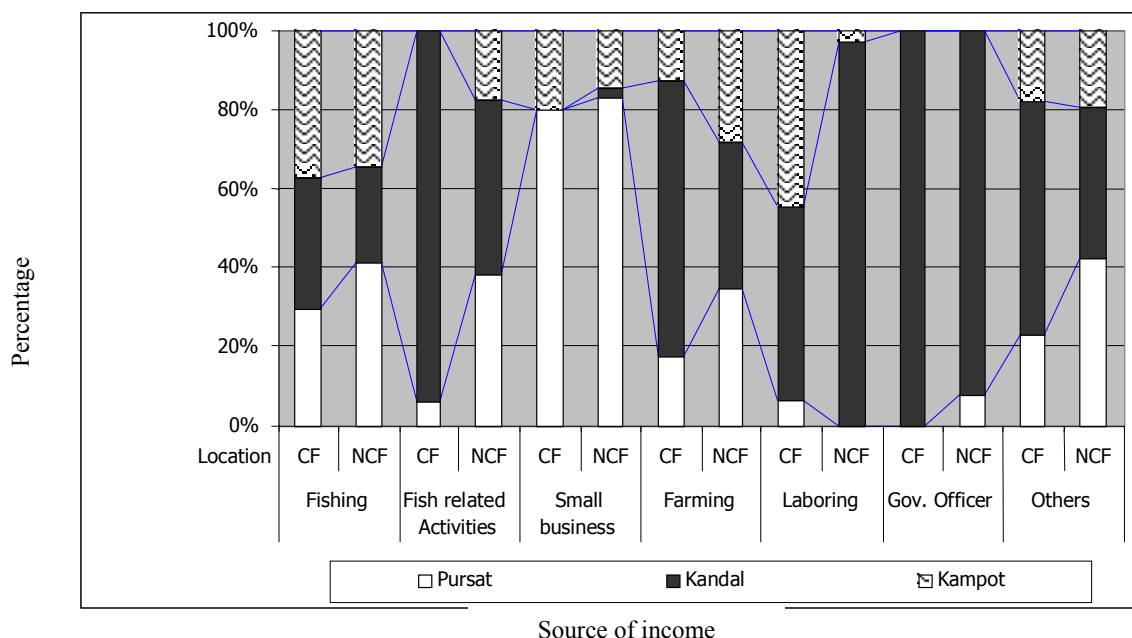
- Source of Income

Although there were many sources of income in the study sites, this research selected only the most significant sources which contributed substantially to household income. Fishing was the main source of household income. It was contributed about 68% to the total income of the CF sites.

The second main source of income was fisheries-related activities. These include fish trading, fish/seaweed culturing and fish processing. Fisheries-related activities contributed up to 23% of the total income. Farming ranked third in terms of contribution to the household income. It contributed about 8% to the total income. Trading or activities related to small business accounted only to about 6%. Government job or NGO work ranked as the fifth source of income. These activities contributed very little economically, though, which was only about 0.3%. Income from fishing in Kampot was comparatively high, which contributed to about 87%. The contribution of fishing in Kandal was about 40%. Income from fisheries-related activities contributed up to about 41% of the total income in Kandal. Furthermore, income from farming was also highest among the inland provinces.

Similarly, fishing was the main source of annual income in the NCF sites. It contributed to about 85% of total income in Pursat, 75% in Kandal, and about 91% in Kampot. Besides fishing, farming was a supplementary source of income to the household respondents of the rest of NCF sites. About 5 % of household income of Kandal respondents came from farming and about 8% came from laboring. Kampot's respondents claimed to have obtained about 6% of annual income from small business. Small business accounted only for 0.2% in Kandal and 1.4% in Kampot (Figure 3.4).

Figure 3.4. Sources of Income by Locations.



Source: Field Survey August 2004

Given the circumstances in these rural provinces, fishing was the main source of household income of the respondents. Fisheries-related activities became a second source of income for the CF sites. These contributed to about 23% while only 2.4% for the NCF. Farming also provided substantial supplementary income to the respondents.

3.2 Resources and Fishing Ground

3.2.1 Fishing Ground

Community fishery members preferred to fish in their own fishing grounds rather than in other areas. About 93% of the CF respondent in Pursat fished inside the community areas. Only about 20% were fishing in open access areas. A small proportion (about 2%) were fishing in fishing lots. In Kandal, about 64% of fishers fished inside the community sites, and about 51% fished in open access areas. About 7% and 9% fished outside the community and fishing lots, respectively. The

case is different in Kampot, which had no fishing lots. Few of them fished in protected areas; 60% of them fished inside the community lots; and about 33% fished in open access areas. On the average, about 73% fished inside the community and about 35% fished in open access areas. Only few, especially in freshwater areas, fished within fishing lots.

In the NCF, where the respondents had no community fishing areas, they mostly fished in open access areas. About 6% fished inside the CF sites. Some 18% of respondents in Pursat fished in protected areas, while about 16% of the respondents from Kandal fished in fishing lots (Table 3.16).

Table 3.16. Sources of Fishing Grounds.

	Inside the community		Outside the community		Open access		Protected Areas		In fishing lots	
	CF	NCF	CF	NCF	CF	NCF	CF	NCF	CF	NCF
Pursat	42 (93.3)	3 (6.7)	0 (0.0)	2 (4.4)	9 (20.0)	44 (97.8)	0 (0.0)	8 (17.8)	1 (2.2)	0 (0.0)
Kandal	29 (64.4)	1 (2.2)	3 (6.7)	0 (0.0)	23 (51.1)	44 (97.8)	0 (0.0)	0 (0.0)	4 (8.9)	7 (15.6)
Kampot	27 (60.0)	4 (8.9)	3 (6.7)	0 (0.0)	15 (33.3)	42 (93.3)	1 (2.2)	0 (0.0)	---	---
Average	33 (72.6)	3 (5.9)	2 (4.4)	1 (1.5)	16 (34.8)	43 (96.3)	0 (0.7)	3 (5.9)	3 (5.6)	4 (7.8)

Source: Field Survey August 2004

Note: Numbers in parenthesis are percentages

The respondents in CF preferred to fish in their CF sites. Respondents from the NCF, which had no authorized fishing areas, fished in open access areas. A few of them from Pursat and Kandal fished in side fishing lots. No one fished in protected areas from CF respondents in Pursat and Kandal. Some respondents from NCF sites fished in protected areas. The distribution of respondents who fished outside the community was from the NCF of Pursat rather than CF places. However, the choice for fishing grounds was not related to the sites of communities.

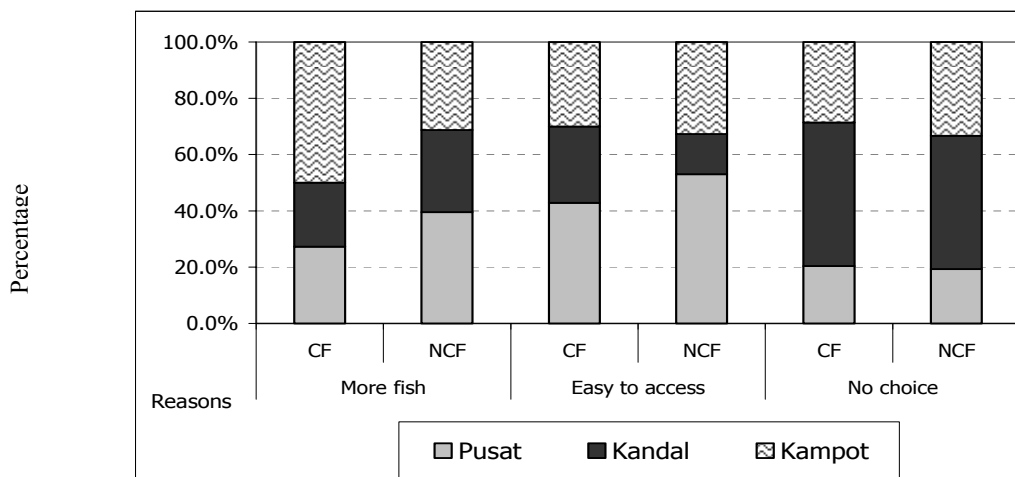
3.2.2 Reasons for fishing on a particular ground

The CF respondents cited three reasons for fishing in particular fishing grounds. These reasons were: (1) more fish, (2) easy to access and (3) no alternative. Easy to access was the primary reason cited by the fishers in Pursat and Kampot. The same argument was given by 42% of fishers from Kandal. No choice was the main reason given by the respondents in Kandal. The lack of alternative fishing ground was ranked second by about 38% on the average. However, about 18% of fishers in the three locations mentioned the abundant stocks of fishes in those fishing grounds.

The situation is different in the NCF. Fishers traveled to fish in those locations because there was no alternative place for fishing. In Pursat, however, about 60% of respondents mentioned easy to access as the primary reason. About 60% and 41% of respondents in Kandal and Kampot, respectively, mentioned no alternative as the main reason, rather than more fish and easy to access (Figure 3.5).

³ Data is not available because coastal areas did not have any fishing lots

Figure 3.5 Reasons for Fishing in those Particular Areas.



Source: Field Survey August 2004

Reasons

The figure suggests that the respondents in the CF were fishing inside the CF grounds because of easy access, rather than the lack of alternative places to fish. The case is different for the fishers in NCF. They were mostly fishing in open access primarily because of no alternative fishing ground. There were only about 18% of CF and 32% of NCF respondents who mentioned that they were fishing in those particular areas because of abundant fish supply. In addition, the decision to fish in those areas was not related neither to CF sites nor to the provinces.

3.2.3 Benefits Aside from Fish

Aside from fish, the fishers could also generate some other economic benefits from their fishing grounds. Respondents from the CF of Kandal mostly (80%) collected vegetables. About 64% collected firewood, about 38% used the water for drinking and cooking, and about 22% collected medicinal products from their fishing grounds. In Pursat, the case is different, where about 96% collected firewood and about 64% used the surrounding waters for drinking and cooking. About 32% and 33% collected vegetables and medicines, respectively. About 47% of the CF respondents in Kampot collected vegetables from their fishing grounds. About 13% collected both medicine and firewood, equally. However, aside from the fisher respondents in those areas, about 70% collected vegetables, about 58% gathered firewood, and about 51% used the waters for drinking and cooking purposes. Only about 7% collected some woods and poles from the fishing grounds as house construction materials and about 23% collected medicine.

For the respondents in NCF, about 58% collected firewood, about 49% collected vegetable, and about 42% used the fishing ground waters for drinking and cooking. Only 2% collected some housing construction materials, and about 22% collected medicine. Specifically for the NCF in Pursat, about 98% collected firewood and about 91% used water from the fishing grounds for drinking and cooking. Some 58% collected vegetables and 42% collected medicine. In the case of Kandal, about 69% of NCF respondents gathered vegetables and about 53% collected firewood. Only about 36% used water for drinking and cooking, and 20% gathered medicine. However, all respondents in the NCFs of Pursat and Kandal did not collect any housing construction material from their fishing grounds. About only 47% of respondents in Kampot mentioned some additional benefits obtained from the fishing grounds, while the remaining 53% did not mention anything. In addition, about 20% collected vegetables and about 22 % collected firewood, while about 4% collected some medicines. Nevertheless, about 2% collected housing materials, which was not mentioned in the other two locations (Table 3.17).

Table 3.17. Benefit from Fishing Grounds Aside from Fish.

	Vegetable		Medicine		Fire wood		Housing		Water	
	CF	NCF	CF	NCF	CF	NCF	CF	NCF	CF	NCF
Pursat	37 (32.2)	26 (57.8)	15 (33.3)	19 (42.2)	43 (95.6)	44 (97.8)	0 (0.0)	0 (0.0)	29 (64.4)	41 (91.1)
Kandal	36 (80.0)	31 (68.9)	10 (22.2)	9 (20.0)	29 (64.4)	24 (53.3)	5 (11.1)	0 (0.0)	17 (37.8)	16 (35.6)
Kampot	21 (46.7)	9 (20.0)	6 (13.3)	2 (4.4)	6 (13.3)	10 (22.2)	1 (2.2)	1 (2.2)	--	--
Average	31 (69.6)	22 (48.9)	10 (23.0)	10 (22.2)	26 (57.8)	26 (57.8)	3 (6.7)	1 (2.2)	23 (51.1)	19 (42.2)

Source: Field Survey August 2004

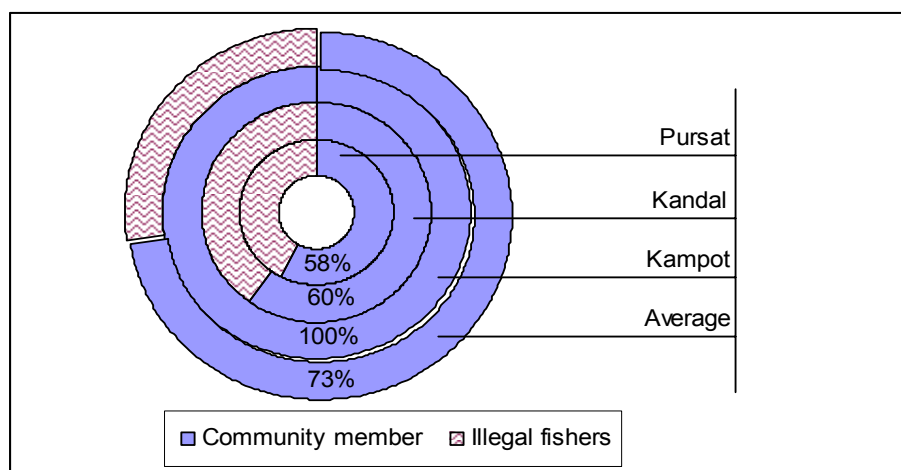
Note: Number in parenthesis are percentages

In summary, the respondents in the CFs seemed to have gained more additional benefits than the NCF respondents. Such benefits included vegetables, medicine, firewood and housing construction materials. However, the surrounding waters remained as the main source for drinking and cooking for the people in the CF rather than in the NCF.

3.3 Effects of Fishery Rules and Regulations

Community fisheries in Pursat, Kandal and Kampot are managed by the local governor through *prakas*. This *prakas* has jurisdiction over community members, which included about 73% of total respondents. Furthermore, 100% of the respondents in Kampot mentioned about the effectiveness of the *prakas* to the community members. About 60% and 58% of the respondents in Kandal and Pursat, respectively, agreed to such assessment. About 40% of respondents in Pursat mentioned about its effects to the illegal fishers. Almost the same percentage was mentioned by the Kandal respondents the same (Figure 3.6).

Figure 3.6. Effects of Fisheries Rules and Regulation on Fishers.



Source: Field Survey in August 2004

- Effectiveness

The effectiveness of rules and regulations (*prakas*) on CF members and on illegal fishers were assessed at three levels. The first was very effective; the second was effective; and the third was not effective. Results from the field showed that about 49% of respondents in Pursat and about 51% in Kampot said that the *prakas* was not effective to CF members, as well as to the illegal fishers. Only about 7% mentioned of its effectiveness. About 53% in Kandal mentioned that the *prakas* was very effective on community members and illegal fishers, and about 18% in Pursat claimed the same perception. No one among the respondents in Kampot mentioned that the *prakas* was very effective. Majority stated that the *prakas* was effective: 49% from Kampot, 40% from Kandal, and about 33% from Pursat. On the average, about 24% said that *prakas* was very effective, about 41% mentioned that it was effective, and about 37% mentioned that it was not effective at all (Table 3.18).

Table 3.18. Level of Effectiveness of Rules and Regulations.

	Level of effectiveness		
	Very effective	Effective	Not effective
Pursat	8 (17.8)	15 (33.3)	22 (48.9)
Kandal	24 (53.3)	18 (40.0)	3 (6.7)
Kampot	--	22 (48.9)	23 (51.1)
Average	16 (23.7)	18 (40.7)	16 (35.6)

Source: Field Survey August 2004 Note: Numbers in parenthesis are percentages

The answers of respondents varied among locations. The entire respondents, however, mentioned that government officers should take the lead in implementing the rules and regulations. Furthermore, the respondents claimed that the rules and regulations, which were stated in the *prakas*, were not highly effective to the fishers, as well as to the community members.

3.4 Fishing Before 2001

3.4.1 Fishing Gears Used

In the CF of Pursat, about 87% used gillnet, 44% used hooked line and about 20% used fish trap. Few of them used seine net. Only about 7% used others fishing methods, which included scooping net and spear. However, about 11% put *samras* in the water for fish collection. It was different in

the case of Kandal. About 80% used gillnet, only 4% of respondents there used fish trap, and no one used cast net. No one used *samras* and other fishing methods. However, the respondents in Kampot tended to use fish trap (42%), gillnet (69%) and other gears (27%). Some fishing methods were not used by any fishers in Kampot, such as cast net, hooked line, *samras* and seine net. Generally, gillnet was ranked first as the most widely-used gears by many respondents. Hooked line and fish trap were ranked second and third, respectively.

In the NCF sites from Pursat, about 93% of fishers used gill net, about 58% used *krasom/samras* and about 33% used fish trap. About 13% used cast net while some 9% used hooked line. No one among the respondents in the selected provinces used seine net for fishing. Respondents in Kandal predominantly used gillnet (80%) and hooked line (50%). Less than 10% used fish trap (7%) and other fishing gears (9%), such as spear and scooping net. Eighty nine percent of respondents in Kampot used gillnet. Fish/shrimp trap and other fishing methods were used by 11% and 16%, respectively. On the average, there was about 87% of respondents who used gill net, while only 19% used hooked line (Table 3.19).

Table 3.19. Fishing Gears Used by the Respondents in 2001.

	Fish Trap		Cast Net		Gill Net		Hooked Line		Samras/Krasom		Seine Net		Others	
	CF	NC F	CF	NC F	CF	NC F	CF	NC F	CF	NCF	C F	NC F	CF	NCF
Pursat	9 (20.0)	15 (33.3)	9 (20.0)	6 (13.3)	39 (86.7)	42 (93.3)	20 (44.4)	4 (8.9)	5 (11.1)	26 (58.7)	1 (2.2)	0 (0.0)	3 (6.7)	3 (6.7)
Kandal	2 (4.4)	3 (6.7)	0 (0.0)	0 (0.0)	36 (80.0)	36 (80.0)	23 (51.1)	22 (48.9)	0 (0.0)	0 (0.0)	1 (2.2)	1 (2.2)	0 (0.0)	4 (8.9)
Kampot	19 (42.2)	5 (11.1)	0 (0.0)	0 (0.0)	31 (68.9)	40 (88.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	12 (26.7)	7 (15.6)
Average	10 (22.2)	8 (17.0)	3 (6.7)	2 (4.4)	35 (78.5)	39 (87.4)	14 (31.9)	9 (19.3)	2 (3.7)	9 (19.3)	1 (1.5)	0 (0.7)	5 (11.1)	5 (11.1)

Source: Field Survey August 2004 Note: Numbers in parenthesis are percentages

To summarize the above figure, the fishers in the NCF were likely to use gillnet, rather than the other fishing gear. Hooked line ranked second while fish/shrimp/crab trap ranked third. Respondents in Pursat tended to use *samras/krasom*, which was not used by the fishers in Kandal and Kampot. Respondents in Kandal were likely to use seine net, and other unlisted gear such as electric fishing (interview during field survey). Net can collect more fish in a short period of time. Fishers claimed that electric fishing was very easy to use, cheap and be easily obtained everywhere within the province.

3.4.2 Fish Production/Volume of Catch

Fishers (in pair) in the CF of Pursat tended to go to fishing for about five times per week. They spent about 6 hours per fishing trip. The average catch was about 2.3 kg per trip given with SD of

26 kg. Respondents in the CF of Kandal spent about 13 hours and 40 minutes for every fishing trip. The fishers went out five times per week. There was only one fisher per trip. The usual catch was about 2 kg with a SD of 4 kg. Respondents in the CF of Kampot went fishing 6 times per week. Two persons were often involved and the mean fishing was about 6 hours 10 minutes. The average catch at the CF in Kampot was about 3.9 kg while SD was about 14 kg/hr. On the average, the respondents went to fish about 5 times/week with 2 persons in about 8 hours and 20 minutes each period. Fishers can catch about 2.7 kg/hr. The minimum was 1 kg, maximum of 53.3 kg and SD of 41 kg.

In the NCF of Pursat, the respondents tended to spend fishing 7 times per week. The boat crew consisted of 2 fishers who fished for about 7 hours and 30 minutes. The average catch of respondents in Pursat was about 4.1 kg, with an SD of about 35 kg per fishing trip. Fishers in Kandal went fishing only for about 5 times per week, with each fisher spending 13.17 hr per fishing trip. Fish catch per trip was about 2.2 kg (SD of 6 kg). For NCF site in Kampot, 3 fishers were involved in fishing trip for a period of 10.5 hr. They usually went fishing 5 times per week. Average fish production for respondents in Kampot was about 7.7 kg, with about 21.1 kg of SD per trip. For the rest of samples in the NCF sites, respondents were inclined to spend about 6 trips per week involving 2 fishers staying for 10.33 hr on the average. The volume of catch was about 4.7 kg on average. The minimum catch was of 1.2 kg, the maximum was 80 kg, and the SD was 20.7 kg (Table 3.20).

Table 3.20. Numbers of Times, Fishers, Period and Amount of Catch (Before 2001)

	Time/week (in hr)		Person/time		Period/time (hr)		Amount caught (kg/hr)			
	CF	NCF	CF	NCF	CF	NCF	CF		NCF	
							Mean	SD	Mean	SD
Pursat	5	7	2	2	5.85	7.67	23.1	88.1	29.1	46.8
Kandal	5	5	1	1	13.28	13.50	11.3	8.9	10.5	9.9
Kampot	6	5	2	3	6.20	10.66	18.0	26.0	33.6	41.3
Average	5	6	2	2	8.45	10.00	17.5	41.0	24.4	32.7

Source: Field Survey August 2004

Legend: SD = Standard Deviation

Given the above table, the respondents in CF of Pursat are inclined to travel for less fishing hours than in NCF with the same number of fishers. However, respondents in CF spent longer period than in NCF site. The production volume was also higher, associated with a higher SD of the mean.

3.5 Fishing from 2003 – 2004

3.5.1 Fishing Gear Used

Fishing gears used by the respondents are very different between the coastal province and the inland provinces. About 89% of respondents in the CF of Pursat used gillnet for fishing while gillnet users accounted for about 82% in Kandal and about 73% in Kampot. Hooked line ranked second which is used by about 42% of the respondents in Pursat and about 44% in Kandal. This gear was not used in the coastal province of Kampot. Cast net was also popular for some respondents in Pursat, to about 11% of respondents in Kampot, and only to about 2% of respondents in Kandal. *Samras*, even though it is an illegal fishing method, was practiced by about 16% of respondents in Pursat. Seine net and other fishing methods - such as electro fishing and scooping basket - were used by a few fishers (Table 3.21).

Similarly for the respondents in the NCF sites, about 92% used gillnet, about 18% used fish trap, and about 16% used cast net for fishing. There was a very small percentage of respondents who used *samras/krasom*, seine net and other fishing methods. The respondents in Pursat and Kampot tended to use gillnet more than the respondents in Kandal. Furthermore, fish trap was used by about 38% of respondents in Pursat, about 11% in Kampot, and only about 7% in Kandal. Nevertheless, respondents in Kandal did not use any cast net. This gear was used by about 22% of respondents in Pursat and about 9% of the respondents in Kampot. About 36% of respondents in Kandal and about 11% in Pursat used hooked line. This gear was not used by respondents in Kampot. *Samras* is an illegal fishing method but it was used by about 65% of respondents in Pursat. Seine net is a medium scale fishing gear that was used exclusively by the respondents in Kandal.

Table 3.21. Fishing Gears Used by the Respondents.

	Fish Trap		Cast Net		Gill Net		Hooked Line		Samras/Krasom		Seine Net		Others	
	CF	NCF	CF	NCF	CF	NCF	CF	NCF	CF	NCF	CF	NCF	CF	NCF
Pursat	10 (22.2)	17 (37.8)	12 (26.7)	10 (22.2)	40 (88.9)	42 (93.3)	19 (42.2)	5 (11.1)	7 (15.6)	29 (64.4)	1 (2.2)	0 (0.0)	2 (4.4)	0 (0.0)
Kandal	1 (2.2)	3 (6.7)	1 (2.2)	0 (0.0)	37 (82.2)	40 (88.9)	20 (44.4)	16 (35.6)	0 (0.0)	0 (0.0)	1 (2.2)	5 (11.1)	0 (0.0)	1 (2.2)
Kampot	24 (53.3)	5 (11.1)	5 (11.1)	4 (8.9)	33 (73.3)	42 (93.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (6.7)	3 (6.7)
Average	12 (25.9)	8 (18.5)	6 (13.3)	4.7 (10.4)	37 (81.5)	41 (91.8)	20 (28.9)	7 (15.6)	2.3 (5.2)	10 (21.5)	1 (1.5)	2 (3.7)	2 (3.7)	1 (3.0)

Source: Field Survey August 2004

Note: Number in parenthesis are percentages

Based on the above table, the respondents of both CF and NCF sites often used gillnet more than any other gears. *Samras/krasom* was used mainly in Pursat (both CF and NCF) while seine net was mainly used in Kandal. The fishers in Kampot did not use hooked line as their main fishing gear. It was very common, however, for fishers in Pursat and Kandal (inland water areas). Respondents in Kandal tended to use illegal fishing gears, such as electric fishing and mosquito net, much more than other two areas.

3.5.2 Fish Production Caught

Respondents in Pursat went fishing for about 5 times per week consisting of about 5 hours and 21 minutes per trip. The minimum volume of catch was about 0.5 kg and the average was about 2.3 kg with a high SD of 26 kg. Two people in the household went for fishing trips 5 times per week. In Kandal, the number of fishing trips was the same in Pursat, but the number of fishers was only one instead of two. With only one person engaged in fishing, the respondent tended to fish for a longer period. The maximum fishing time was up to 13.7 hr per trip. The average catch in Kandal was about 2 kg. The minimum catch was 1 kg, while the maximum was 15 kg and an SD of 4 kg. Respondents in Kampot tended to fish more times than the other sites. They fished up to 6 times per week, involving 2 fishers and 6 hours per trip. The average fish production was about 4 kg. It ranged from a minimum of 1 kg, maximum of 45 kg, and an SD of 14 kg. On the average, the respondents in CF went fishing for about 5 times per week involving 2 fishers per trip. The fishing period was 8.38 hr. The average production was about 2.7 kg per trip. There was 1 kg minimum, 53.3 kg maximum and 14.7 kg SD.

Fishers in NCF from Pursat tended to fish for the whole week. This was equivalent to 7 times per week with 2 fishers and about 7.5 hr for each trip. The average production was about 4.1 kg per trip (SD of 35 kg). Respondents in Kandal tended to fish with less time compared with Pursat. They spent only 5 times per week with only 1 fisher and about 13.18 hr per fishing trip. The average amount of catch was about 2.2 kg per trip accompanied by only about 6 kg of SD. The NCF respondents in Kampot fished with about the same time as Kandal respondents. They went fishing for 5 times per week with 3 people and the average period was about 10.5 hr. In Kampot, the average amount of catch was about 7.7 kg, given a minimum of 0.5 kg and a maximum of 70 kg. The SD of fish production was about 21 kg. In the rest of the sites, the average amount of catch was about 4.7 kg accompanied by about 21 kg of SD (Table 3.22).

Table 3.22. Average Number of Time, Fishers, Period and Production Caught (2003-2004).

	Time/week (in hrs)		Person/trip		Period/trip (hr)		Amount caught (kg/hr)			
	CF	NCF	CF	NCF	CF	NCF	CF		NCF	
							Me an	SD	Me an	SD
Pursat	5	7	2	2	5.33h	7.5h	2.3	26	4.1	35
Kandal	5	5	1	1	13.66h	13.16h	2	4	2.2	6
Kampot	6	5	2	3	6.16h	10.5h	3.9	14	7.7	21.1
Average	5	6	2	2	8.33h	10.33h	2.7	14.7	4.7	20.7

Source: Field Survey August 2004

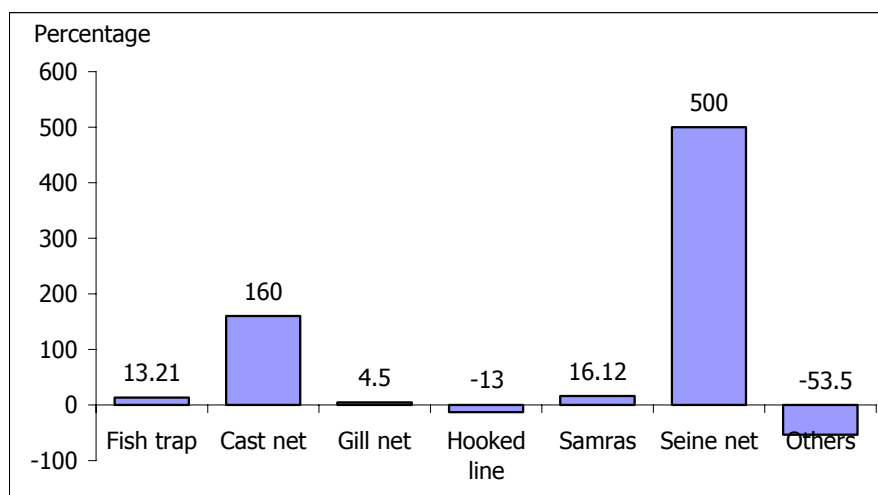
The above table shows that the respondents in NCF sites tended to spend about 6 times per week for fishing. The fishing period seemed to be lesser than in CF sites, which accounted for about 10.33 hr. Fish production per trip was greater in NCF accompanied by a high SD. The ANOVA test showed that there was a significant difference between CF and NCF in terms of fish production at 95% confidence level ($p=0.000$). However, this production was not related to other factors, such as the gender of the household head and age of respondents.

3.6 Trend in Fishing of 2001 and 2003-2004

3.6.1 Fishing Gears

Fish trap use was increased by about 13% if compared to the period before 2001. Cast net, which was used by a few people in 2001, increased up to 160% in 2003-2004. Gill net, which was commonly used as fishing gear increased only marginally (about 4.5%). Furthermore, seine net, which was used by few people (1.1%) before 2001 had increased by about 500%. *Krasom/samras*, was used by about 5.2% in 2001, increased only by about 16% in recent years. Conversely, hooked line and other fishing methods decreased in 2001 by about 13% and 53%, respectively (Figure 3.7).

Figure 3.7. Trend in Common Fishing Gears Used Before 2001 and During 2003-2004.



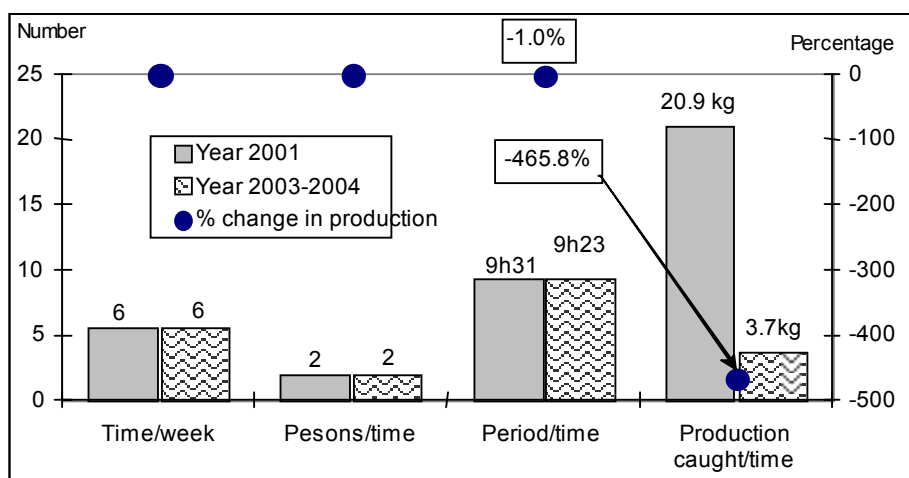
Source: Field Survey August 2004

The above figure suggests that seine net, which is a gear used by medium scale fishers, had increased in numbers more than other gears. Cast net, which is also a medium scale fishing gear, increased in numbers by about 160% from 2001. Moreover, *samras*, which is an illegal fishing method, is more practiced at present than before the implementation of the fisheries administration reform. On the other hand, hooked line, which is used by small-scale fishers, had decreased dramatically from 26 % before 2001 to 22% in 2003-2004 (decreased by 13%).

3.6.2 Fish Production Caught

The number of fishing trips per week and the number of people who traveled for fishing did not change from 2001 to 2003-2004. The number of fishing hours per trip increased by about 7 minutes. Generally, the catch per trip of respondents decreased dramatically from about 21 kg in 2001 to about 4 kg in 2003-2004 (decreased by about 17 times). Furthermore, the SD of the mean of catch also increased 76 times when compared to the 2001 figures. It was only about 37 kg in 2001 with a mean of 21 kg. Currently, the SD increased to about 18 kg to a mean of about 4 kg (Figure 3.8).

Figure 3.8. Trend in Fish Production between 2001 and 2003-2004.



Source: Field Survey August 2004

3.7 Price of fish

3.7.1 Freshwater Fish Price

Fish price varies according to species and size. The fish species are classified according to three groups. High value species is highly priced in both local and international markets. The high value species is consumed by rich people and are also sold for export. The size of fish for this group is quite big and the species possess more meat than bone. Medium value species are not too highly priced and are usually consumed by the middle class; these are sold for exports. Low value species are small fish or bony fishes, which are consumed largely by the poor, in both rural and urban areas. These species are low priced and are easy to catch. Some species of these fishes are used for fish paste (call *Prahok*), which is a delicacy among Cambodians. Table 3.23 enumerates some of the common fish species caught by the fishers during 2003-2004.

Table 3.23. Common Freshwater Fish Species Caught during 2003-2004.

High value species		Medium value species		Low value species	
Scientific Name	Khmer Name	Scientific Name	Khmer Name	Scientific Name	Khmer Name
<i>Scleropages formosus</i>	Trey Kraport	<i>Helostoma temmincki</i>	Trey Kantrawb	<i>Pseudambasis notatus</i>	Trey Kanhchanh Chras
<i>Ompok bimaculatus</i>	Trey Kramam	<i>Parambassis wolffi</i>	Trey Kantrang Preng	<i>Mystus sp.</i>	Trey Kanh Chos
<i>Chitala ornate</i>	Trey Kray	<i>Borbodes altus</i>	Trey Krahe	<i>Biota sp.</i>	Trey Kanh Chhrouk
<i>Channa micropeltes</i>	Trey Chhdor	<i>Kryptopterus moorei</i>	Trey Kampleav	<i>Trochogaster microlepis</i>	Trey Kampleanh
<i>Oxyeleotris marmorata</i>	Trey Damrey	<i>Cirrhinus mrigala</i>	Trey Krawlang	<i>Amblyrhynchthys truncatus</i>	Trey Kambot Chramos
<i>Ompok hypophthalmus</i>	Trey Ta Oan	<i>Anabas testudineus</i>	Trey Kranh sre	<i>Osteochilus hasselti</i>	Trey Kros
<i>Boesemania microlepis</i>	Trey Prama	<i>Morulus chrysophekadion</i>	Trey Kaek	<i>Pangasius conchophilus</i>	Trey Pra Ker
<i>Channa striata</i>	Trey Ros	<i>Hampala macrolepidota</i>	Trey Khman	<i>Dangila lineata</i>	Trey Khnang Veng
<i>Wallago attu</i>	Trey Sanday	<i>Osteochilus melanopleurus</i>	Trey Krum	<i>Rasbora myersi</i>	Changva
<i>Micronema apogon</i>	Trey Kes	<i>Puntiolites proctozysron</i>	Trey Chrakeng	<i>Carcharinus leuca</i>	Trey Chhlam
		<i>Setipinna melanochir</i>	Trey Chmar	<i>Coilia lindmani</i>	Trey Chanluonh mann
		<i>Macrogathus siamensis</i>	Trey Chhlonh	<i>Pangasius pleurotaenia</i>	Trey Chhviet
		<i>Hypsibarbus pierrei</i>	Trey Chhpin	<i>Pengasianodon hypophthalmus</i>	Trey Pra
		<i>Mystus nemurus</i>	Trey Chhlang	<i>Xenentodon cancila</i>	Trey Phthoung
		<i>Cyclocheilichthys enoplos</i>	Trey Chhkok	<i>pangasius larnaudiei</i>	Trey Pou
		<i>Macrochirichthys macrochirus</i>	Trey Dang Khleung	<i>Henicorhynchus caudimaculatus</i>	Trey Riel
		<i>Mystus filamentus</i>	Trey Tanel	<i>Thynnichthys thynnoides</i>	Trey Linh
		<i>Leptobarbus hoeveni</i>	Trey Proloungthom	<i>Cyclocheilichthys apogon</i>	Trey Sroka Khdam
		<i>Notopterus notopterus</i>	Trey Slat	<i>Langiculter siahi</i>	Trey Sloeuk Russei
		<i>Claria macrocephalus</i>	Trey Andeng Tun	<i>Dangila spilopleura</i>	Trey Ach Kok
				<i>Macrobrachium lanchesteri</i>	Kampoeus

Because of the limited time for the study, the calculation was focused on the average price of Pursat and Kandal provinces for freshwater fish and Kampot province for marine fish species. The most commonly caught fish species during the survey was Trey Riel (*Henicorhynchus*

caudimaculatus), which was stated by about 96% of respondents. This was followed by Trey Kros (*Osteochilus hasselti*) that was mentioned by about 94% and then by Trey Chhpin (*Hypsibarbus pierreii*) that was identified by about 89%. The high value species, such as Trey Kes (*Micronema apogon*) and Trey Ta-Oan (*Ompok hypophthalmus*) constituted only about 12% (Appendix 1). Only one high value species, Trey Ros (*Channa striata*), was caught by the fishers. This was followed by some medium value species, and the rest were low value species.

The price of a high value species (*Trey Ros*) was about 2,100 Riel in 1995. This went up to about 4,500 Riel (1.1 times increase) in 2003-2004. For the medium value species, such as Try Slat (*Notopterus notopterus*) and Trey Chhpin, the price increased from 1,700 Riel to 4,250 Riel (1.5 times increase) and from 1,100 Riel to 2,900 Riel (1.6 times increase), respectively (Table 3.22). The low value species, such as Trey Kanh Chos (*Mystus* sp.) and Trey Riel, increased by about 3 times when compared with the 1995 constant price. Furthermore, for some common fishes, such as Trey Kampleanh (*Trochogaster microlepis*), the price increased from 300 Riel to 1,300 Riel (about 3.3 times increase). However, for low value species, which are consumed by the poor fishers, the prices increased similarly to the high value species (Table 3.24).

3.7.2 Marine Fish Price

Shrimp was the highest-valued species among the catch. The shrimp price was about 11,700 Riel in 2003-04, which increased by about 0.7 times if compared to the 1995 constant price. The medium value fish species is locally called Trey Kamoy (*Anodontostoma chacunda*). Similarly, the price of crab and other shrimp and lobsters in 2003/04 increased by about 0.7 times from 1995. Conversely, the price of fish consumed by the poor fishers, as well as the poor people in coastal area, also increased by up to about 1.3 times (Table 3.25).

Table 3.24. Price change of Top-ten Freshwater Fishes before 2001 and in 2003-2004.

No.	Scientific name	Khmer name	Respondent		Price (Riel/Kg)		Price increase (in Riel/kg)	% Increase
			Frequency	%	before 2001	2003/2004		
1	<i>Channa striata</i>	Trey Ros	53	58.9	2,100	4,500	2,400	1.1
2	<i>Channa micropeltes</i>	Trey Chhdor	24	26.7	1,700	3,900	2,200	1.3
3	<i>Notopterus notopterus</i>	Trey Slat	45	50.0	1,700	4,250	2,550	1.5
4	<i>Helostoma temmincki</i>	Trey Kantrawb	48	53.3	1,050	3,000	1,950	1.9
5	<i>Anabas testudineus</i>	Trey Kranhsre	70	77.8	850	2,500	1,650	1.9
6	<i>Puntioplites proctozysron</i>	Trey Chrakeng	75	83.3	1,050	3,000	1,950	1.9
7	<i>Hypsibarbus pierrei</i>	Trey Chhpin	79	87.8	1,100	2,900	1,800	1.6
8	<i>Claria macrocephalus</i>	Trey Andeng Tun	21	23.3	2,000	4,600	2,600	1.3
9	<i>Mystus sp.</i>	Trey Kanh Chos	46	51.1	600	2,400	1,800	3.0
10	<i>Osteochilus hasselti</i>	Trey Kros	85	94.4	400	1,500	1,100	2.8
11	<i>Henicorhynchus caudimaculatus</i>	Trey Riel	86	95.6	400	1,600	1,200	3.0
12	<i>Trochogaster microlepis</i>	Trey Kampleanh	47	52.2	300	1,300	1,000	3.3
13	<i>Macrobrachium lanchesteri</i>	Kampoeus	31	34.4	700	1,500	800	1.1

Source: Field Survey, August 2004

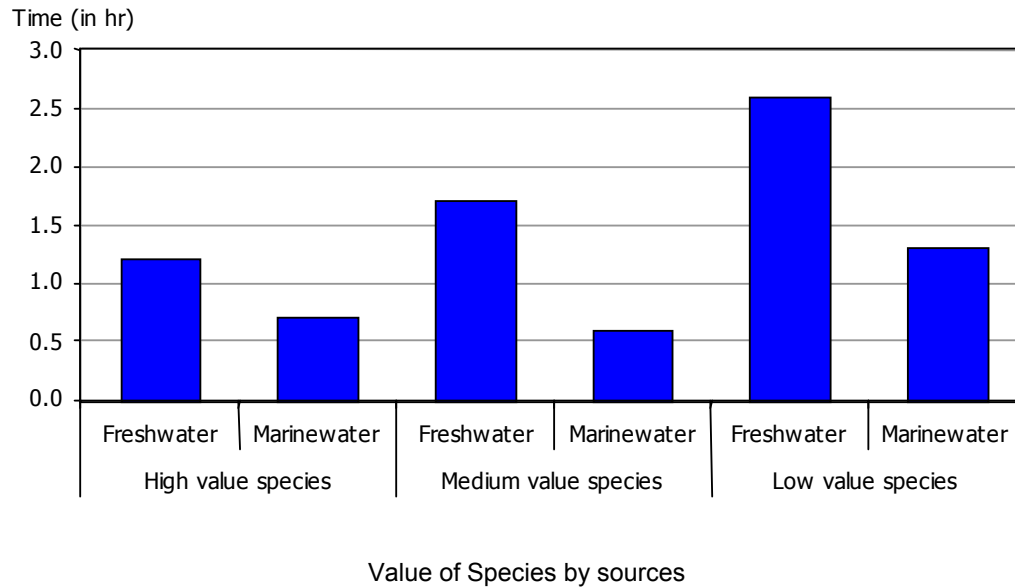
Table 3.25. Price change of Top-ten Marine-water Fish before 2001 and in 2003-2004.

No.	Scientific name	Khmer name	Respondent		Price (Riel/Kg)		Price Increase (in Riel/kg)	% Increase
			Frequency	%	before 2001	2003/2004		
1.	<i>Penaeus setiferus</i>	Bangkear Chhebuoy	31	34.4	7,000	11,700	4,700	0.7
2.	<i>Eriphia sebana</i>	Khdam Phkorlan	27	30.0	4,950	8,400	3,450	0.7
3.	<i>Penaeus latisulcatus</i>	Bangkear Nilong	20	22.2	2,750	4,850	2,100	0.8
4.	<i>Octopus dollfusi</i>	Moeuk Ping Peang	24	26.7	2,600	4,350	1,750	0.7
5.	<i>Scelicdon walbeehmi</i>	Trey Chhlam Pruy Khmao	9	10.0	2,300	3,600	1,300	0.6
6.	<i>Siganus canaliculatus</i>	Trey Kantang Ploeung	43	47.8	1,700	2,600	900	0.5
7.	<i>Plotosus anguillaris</i>	Trey Andeng Pouy	9	10.0	1,500	2,200	700	0.5
8.	<i>Liza vaigiensis</i>	Trey Kabak Khmok	9	10.0	1,300	2,200	900	0.7
9.	<i>Hemirhamphus far</i>	Trey Pthoung Phkar	13	14.4	1,300	2,150	850	0.7
10.	<i>Lethrinus nebulosus</i>	Trey Krab Khnol	13	14.4	1,250	2,100	850	0.7
11.	<i>Rastrelliger brachysoma</i>	Trey Kamong	37	41.1	800	1,850	1,050	1.3
12.	<i>Anodontostoma chacunda</i>	Trey Kamoy	24	26.7	800	1,800	1,000	1.3

Source; Field Survey, August 2004

Given the above two tables, it implies that the price of freshwater fish fluctuated higher than the price of marine fish. For instance, the high value species of chevron snakehead increased by about 1.1 times while the highly-valued shrimp increased in price by about only 0.7 times. Similarly, the price of medium-valued freshwater fishes increased by only about 1.3 to 2 times, whilst the increase was only about 0.5 to 0.8 times for marine fish. Furthermore, the price of poor value species, such as cyprinidae (carps) in freshwater areas also increased higher than the marine species. The price of Trey Kampleanh, Trey Kros and Trey Riel, which are highly in demand among the poor consumers, increased by about 3 times. The increase was about only 1.3 times for low value marine species (Figure 3.9).

Figure 3.9. Trend in Fresh and Marine Water Fish price by Value of Species from before 2001 -2003/04



Source: Field Survey August 2004

3.8 Perception on the Condition of the Fisheries

In the CF sites, all respondents (100%) of inland water provinces had mentioned about the decrease in volume of fish catch. Such decrease was mentioned by only 93% of respondents from the coastal province of Kampot. The remaining 2% and 5%, respectively, pointed out an increase and stable fish catch.

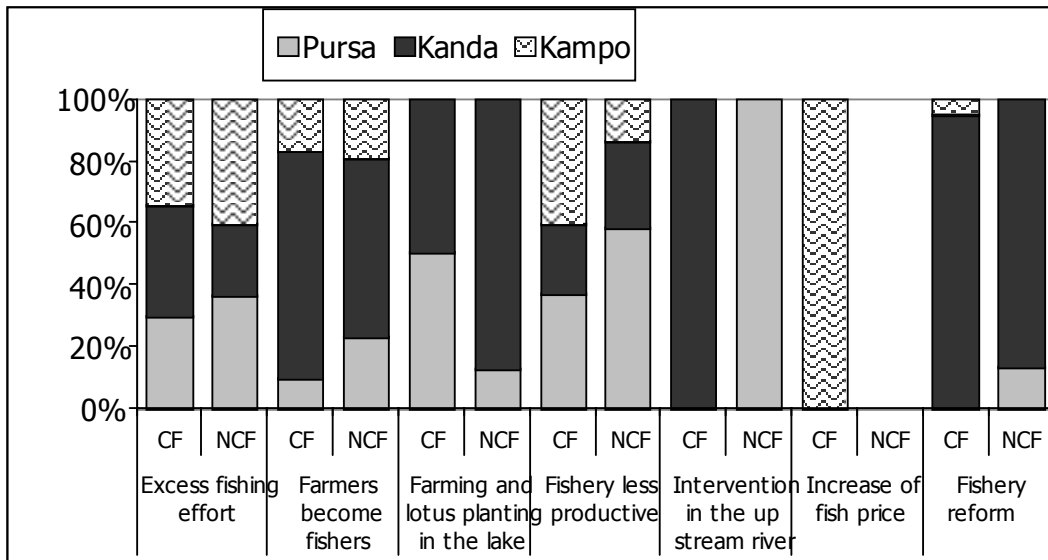
In the NCF sites, 100% of the respondents from Pursat mentioned about a decrease in fish production. This decline in catch was mentioned by only about 98% of Kandal and 91% of Kampot interviewees. The other 2% of Kandal's respondents, and about 9% of Kampot fishers, stated that the volume of catch increased as compared with the last year's production.

- Reasons for the Changed

Seven reasons were given by the respondents concerning the decline in production: (1) excess fishing effort, (2) farmers becoming fishers, (3) farming and lotus planting in the lake areas, (4) fishery less productive, (5) intervention in the upstream river system, (6) increase of fish price, and (7) fisheries reform. The most commonly-stated reason related to the decrease in production as identified by the respondents was the excess fishing effort in each area. About 91% and 87% of respondents in Kandal and Kampot, respectively, mentioned this reason. The second highest mentioned reason was 'farmers becoming fishers'. This was stated by about 49% of respondents from Kandal. The third highest reason given was 'fishery less productive', which was mentioned by about 22% and 24% of respondents in Pursat and Kampot, respectively. About 42% of respondents from Kandal cited 'fisheries reform effect' as a contributing factor.

Similarly, in the NCF sites, the main reason cited for the decrease in fish production was 'excess fishing effort' in the areas. This was followed by 'farmers becoming fishers' and 'fishers less productive'. The highest excess in fishing effort was estimated in Kampot and Pursat. Fisheries reform had significant impacts to the respondents in Kandal, which was stated by about 58% of respondents in that province (Figure 3.10).

Figure 3.10. Reasons for the Change in Fish Production.



Reasons for decreasing production

Source: Field Survey August 2004

Given the above figures, it implies that 'excess of fishing effort' in the areas was the most critical reason for the decrease in fish production. The second reason was 'farmers become fishers'. However, some respondents in Kandal, specifically mentioned that the 'fishery administrative reform' was also an important factor related to the decrease in volume of catch.

In support of the above statements, 87% of respondents in the CF sites stated that the number of fishers in the areas also increased day-by-day. This in turn is related mostly to population increase and lack of alternative livelihood options. Furthermore, the increase in fisher population is also related to migration and fisheries administrative reform. The decrease of fish production was mostly due to 'farmers becoming fishers' (stated by about 49% of respondents from Kandal). Nevertheless, the migration of farmers was also cited as the main reason for the increase of fishers in some locations.

3.9 Conflicts and Suggested Resolutions

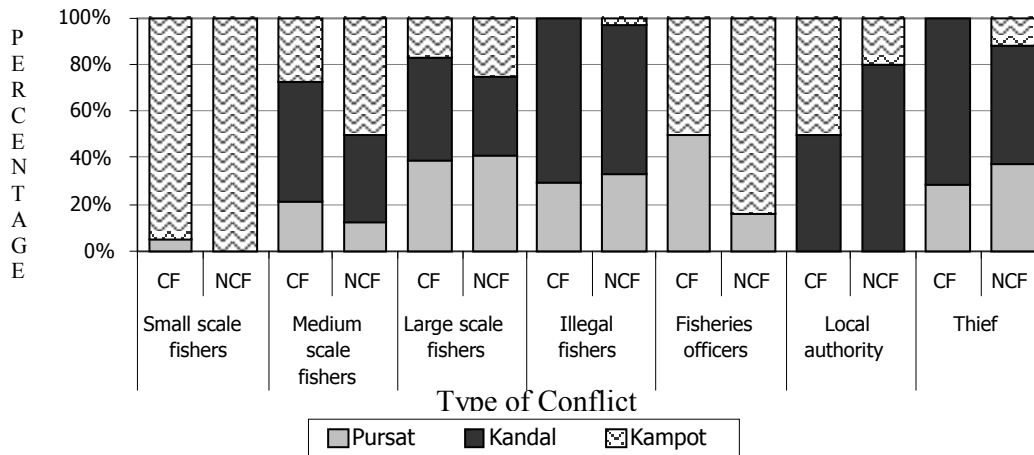
3.9.1 Conflicts Arising in the Study Areas

Seven types of conflicts were identified in the study areas: (1) small-scale fishers, (2) medium-scale fishers, (3) large-scale fishers, (4) illegal fishers, (5) fisheries officers, (6) local authority, and (7) thief. However, the conflicts varied from locations to locations. The respondents in the CF of Pursat tended to face conflicts with large-scale fishers (fishing lot owners) and medium scale fishers. The same situation was experienced by the respondents from Kandal. Conflict in the CF of Kampot was largely among small-scale fishers. To a lesser extent, conflict also arose between large and medium scale fishers. The conflict of fishers with provincial fisheries officers happened in Pursat and Kampot CFs, but not in Kandal's CF. Conflict with thief happened very often in CF of Kandal rather than in the CF of Pursat; however, it did not happen at all in the CF of Kampot.

In NCF sites, the conflict was mostly between large-scale fishers and illegal fishers who were mostly newcomers. In the NCF of Pursat, about 82% of respondents faced conflicts with large-scale and illegal fishers, rather than with medium-scale fishers and local fisheries officers (Figure 3.12). This figure is similar to those claimed by the respondents in NCF of Kandal, but different from the view of respondents from Kampot. Significantly, respondents from Kampot had

confrontations mostly with medium and large-scale fishers. Furthermore, respondents from Kandal also tended to face conflict with local authority (Figure 3.11).

Figure 3.11. Type of Conflict Identified in the Study Areas



Source: Field Survey August 2004

Furthermore, 14 types of conflicts in the fisheries sector were stated by fisheries officers and participants during the National Workshop on “Fish Fight over Fish Rights—Managing Exit from the Fisheries and Security Implication for Southeast Asia”. These conflicts included: (1) fishers and fishers; (2) fishers and local authority; (3) fishers and lot owners; (4) provincial fisheries officer and local power men; (5) community members and community committee members; (6) local fishers and outside fishers; (7) local fishers and foreign fishers; (8) fishers and seaweed culture; (9) fishers and fish culturist; (10) farmers and lotus farmers; (11) institutional conflicts; (12) flooded forest and inundated forest cutting; (13) environment conflicts between countries; and (14) ethnic group conflicts. These conflicts were broader in scope than the survey result. The conflict between fishers and fishers, fishers and local authority, fishers and lot owner fishery, fishers and fisheries officers, and fisher with lotus planters were already stated in the earlier paragraphs. Here, the discussion would focus on some conflicts, which were not cited by the interviewees.

The main conflict, which arose in Kandal and Pursat, was between community member and community committee on selling fishing ground, including deep fishing areas. The second most highlighted conflict was between local fishers and outsiders (migrants) who were competing for the same resources. Generally, outsiders used illegal-fishing practices in community fishing areas. They even used illegal fishing methods in non-community areas, which were documented especially in Pursat. Local fishers and foreign fishers’ conflicts occurred usually in the coastal areas. This was because foreign fishers do poaching activities using mostly modern fishing gears. Poaching purposes were only intended to maximize profit. Such activities were not intended to sustain the fishery resources. Besides conflicts with foreigners, small-scale fishers also have some conflicts with seaweed culturists. The conflict is because seaweed culturists occupy some marine spaces for their culture, and these areas also serve as their fishing grounds. Furthermore, fishers had also conflicts with aquaculturists who collect fish seed and feed from the wild. The collection of fish seed and feed hamper the regeneration of fish stocks.

The causes of conflicts between fishers and lotus farmers were due to competition for fishing areas and increase of sedimentations. Planting of lotus may need some specific inundated areas. The areas required for lotus may reduce the same water areas that are being used by the fishers. Besides conflict with lotus planters, the fishers had some conflicts also with flooded forest cutter for shrimp farming. They also had conflicts with those involved with charcoal production; fuel wood gathering, farming and poaching wild animals. These economic activities have destroyed fish habitats, especially the breeding and spawning grounds. Lately, fishers had also encountered some conflicts with ethnic fisher groups who were using the same fishing grounds.

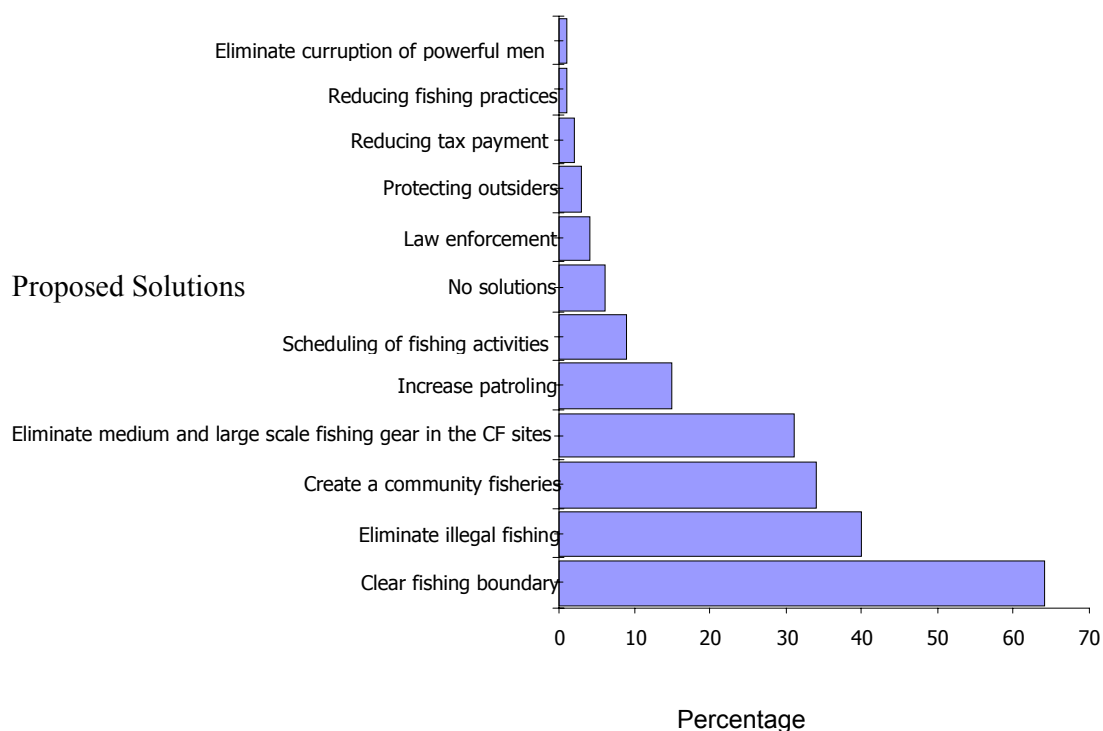
Environmental degradation caused by hydropower dam construction at the upstream areas threaten the fish habitats and the fishers' livelihood. Lastly, the institutional conflict between fisheries institution and the Ministry of Environment (MoE) and the Ministry of Land Titles (MLT) provide further constraints to improving fishery resources management.

3.9.2 Level of Seriousness of Conflicts

The conflict among the small-scale fishers in Pursat seemed to be very serious. In Kampot, this was classified as somewhat serious. With regard to the conflict among medium-scale fishers, the level of seriousness ranged from violent to somewhat serious. About 22% of respondents from Pursat tended to cite that the conflict among fishers was very serious. About 53% of respondents from Kandal mentioned that the conflict was violent. About 29% of respondents in Kampot claimed that the conflict with medium scale fishers was just serious. Conflict with large-scale fishers or lot owners in Pursat was viewed as violent, while in Kampot, this was considered as very serious. Furthermore, in Kandal, the conflict of fishers with local authority and thief was also perceived very serious to the fishers in both the CF and the NCF sites.

3.9.3 Suggested Resolutions to the Conflicts

About 14 suggested resolutions were given out by the fishers in both CF and NCF, as well as by the other interviewees in inland and coastal provinces. The solution that was most cited is to clarify the fishing boundaries for small, medium and large-scale fishers. The second recommendation was to eliminate illegal fishing practices. The third proposal solution was to create community fisheries at the NCF sites. The fourth solution was to eliminate medium and large-scale fishing gears in CF sites. This was because according to the law, the CF sites are not allowed for medium and large-scale fishing. Furthermore, increasing of patrol in CF sites, scheduling the fishers to fish at different times (night time and day time), intensifying law enforcement and protection of outside fishers were also ranked high in the solutions that were enumerated. Few respondents did not provide any solution at all (Figure 3.12).



Source: Field Survey August 2004

Figure 3.12 Suggested Resolutions to the Identified Conflicts.

The level of seriousness for additional conflicts varied from level 1 to level 4. Level 1 has serious effect to security. Level 2 has moderate effect, level 3 has medium effect, and level 4 has slight effect to security. The conflicts between fishers and local authority, between fishers and lot owners, between provincial fisheries officer and powerful men, between local fishers and foreign fishers and environmental conflict between countries have very serious effect to fish securities in the country. These conflicts have also serious effects to the livelihood of the fishers. Conflicts that are regarded to have moderate effect to fish security and livelihood of the fishers are those between fishers and fish culturist, institutional conflicts, loss of inundated and mangrove forest and ethnic group conflicts. Conflicts between community members and committer members related to selling the fishing ground, as well as, conflicts of fishers with outsider (migrants) have medium effect to fisheries security and livelihood of the fishers. Slightly, effect happen when the conflicts appeared between fishers and fishers, fishers and seaweed culturists and fishers and lotus planters.

3.10 Plan for the Next Five Years

3.10.1 Commitment to Stay

About 60% and 56% of respondents from CF of Pursat and Kandal, respectively, were willing to continue fishing because most of them did not have other alternative jobs and few of them have choices. Furthermore, some of them wanted to stay because fishing provided only supplementary income to them. About 58% from Kampot were keen to stay in fishing because they had no alternative jobs; they had also no farmlands. About 18%, 20%, and 22% of respondents from Pursat, Kandal, and Kampot, respectively, were not sure. They reasoned out that the fisher resources are already degraded and it only provides supplementary income. However, about 24%, 22%, and 20% of elderly respondents from Kandal, Pursat and Kampot, respectively, would not continue to fish any more. The reasons given were the degradation of fishery, and being old people, they have no more strength to fish. Those who preferred to move out of fishing reasoned out that they have other alternative jobs, such as agricultural activities and small business. Table 3.26 describes the future plan of the respondents regarding their fishing practices.

In the NCF sites, about 70%, 62% and 71% in Pursat, Kandal and Kampot, respectively, were willing to continue their fishing occupation. They cited that they have no other alternative jobs and some have no choices (especially respondents in Kandal and Kampot). Furthermore, a few respondents who were keen to stay in fishing either said they had no capital to invest in other jobs, or fishing just provides a supplementary income. Nevertheless, about 13%, 22% and 18% of respondents respectively, were undecided. The respondents who were not sure cited that because of fishery resources degradation, it was not easy for them to decide. Besides these, about 15% of respondents from NCF had decided not to continue fishing at all. Knowing that the fishery resources have already been degraded, they cannot earn enough money for their livelihood.

Table 3.26. Plan to Stay in Next 5 Years for Respondents.

	Stay		Not sure		No	
	CF	NCF	CF	NCF	CF	NCF
Pursat	27 (60.0)	31 (68.9)	8 (17.8)	8 (17.8)	10 (22.2)	6 (13.3)
Kandal	25 (55.6)	28 (62.2)	9 (20.0)	7 (15.6)	11 (24.4)	10 (22.2)
Kampot	26 (57.8)	32 (71.1)	10 (22.2)	5 (11.1)	9 (20.0)	8 (17.8)
Average	26 (57.8)	30 (67.4)	9 (20.0)	7 (14.8)	10 (22.2)	8 (17.8)

Source: Field Survey August 2004

Note: Number in parenthesis are percentages

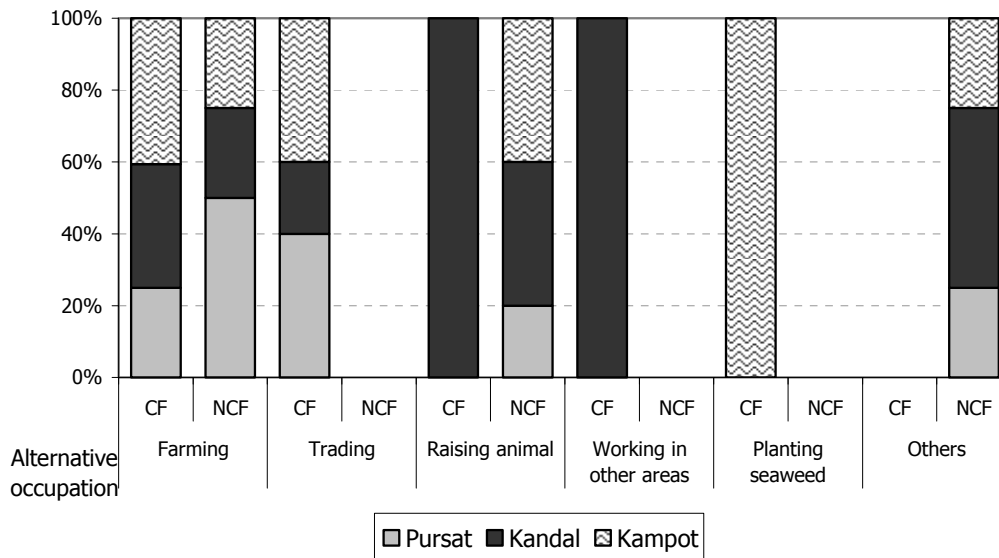
3.10.2 Reasons for Exit

In CF sites, the respondents who wanted to quit fishing have planned to do farming, small business, raising animal and work at the other available areas. The Kampot respondents planned to do seaweed cultivation. For the inland fishers, about 80% and 67% of respondents from Pursat

and Kampot, respectively, were willing to do farming. Another 20% wanted to start small business. About 11% of respondents in Kampot intended to plant seaweed, whilst about 55% of respondents in Kandal wanted to do farming. Besides farming and seaweed culture, some of them (27%) were willing to work in other areas to earn income. Only 9% were keen to engage in small business. Figure 3.13 summarizes the intentions of respondents who would not continue to fishing in the next five years.

Three reasons were cited by the NCF respondents as exit strategy from fishing in the next five years (Figure 3.13). These were farming, raising animal and others activities. About 75% of respondents who were willing to exit from fishing in Pursat preferred to do farming. This was followed by about 12% who were keen to raise animals. Some 13% of them wanted to work in other areas for income generation. About 43% of those planning to exit from fishing in Kandal were willing to do farming. Some 12% wanted to raise animal and another 13% preferred to work in other areas to earn a living. Forty percent of respondents who planned to get out of fishing in Kampot were willing to do farming, followed by 40% who wanted to raise animal, and only 20% who intended to work in other areas.

Figure 3.13 Alternative Livelihood Activities to Exit from Fishing.



Source: Field Survey August 2004

The above figure implies that most of the respondents who were willing to exit from fishing wanted mostly to undertake farming-related activities, rather than other occupations. There was a very small percentage of them who intended to raise animals and engage in culture of seaweed.

3.11 Suggested Exiting Strategies and Reaction

3.11.1 Suggestion for Exit Strategies (ways of reducing fishing pressure)

Five suggested exit strategies discussed during the surveys were: (1) establish community fisheries; (2) provide some training; (3) provide land for agriculture activities; (4) find some alternative occupations; and (5) others (open for respondents). The respondents in CF of Pursat preferred to be given some pieces of land for agricultural practices, rather than request for training courses. This preference was likely the same sentiments of the respondents in CFs of Kandal and Kampot. However, the strategy of finding some alternative jobs was claimed by only very few respondents in Kandal. The creation of community fisheries contributed to very little in reducing fishing pressure in the areas. Provision of some skills training is a key development. This was suggested by about 44% and 56% of respondents in Pursat and Kandal, respectively. Only about 27% of respondents in Kampot recommended this option.

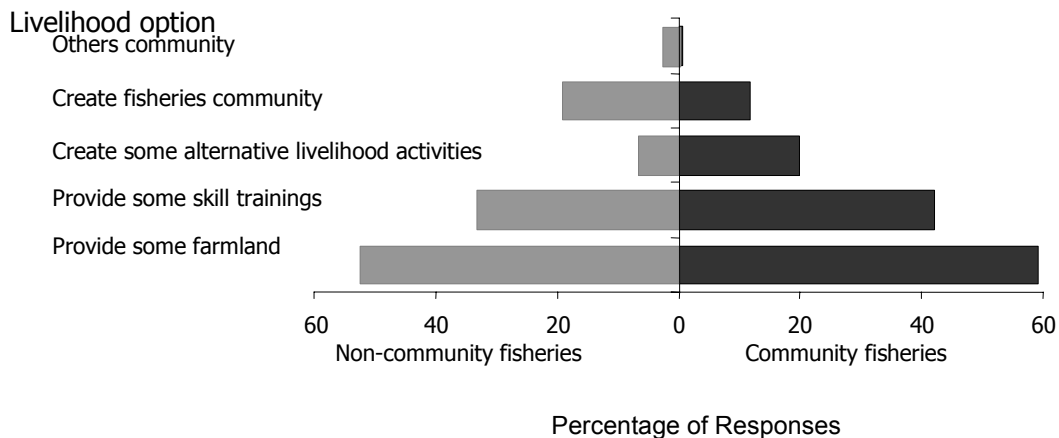
For the NCF respondents, they tended to avail also to avoid some farmlands for agriculture, which was the same sentiments of the respondents in the CF sites. About 38% of respondents in Pursat were willing to undergo some skills training, and about 29% requested for farmlands. Only about 4% preferred the establishment of community fisheries. About 69% and 60% of respondents from Kandal and Kampot, respectively, preferred to acquire some farmlands. Some 40% and 22% in the same sites, respectively, requested for some skills training. Only about 4% and 11% required some alternative livelihood activities (Table 3.27).

Table 3.27. Suggestions Strategies for Reducing Fishing Pressure.

	Establish community fisheries		Provide some skill training		Provide some farmland for agriculture		Create some alternative livelihoods activities		Others	
	CF	NCF	CF	NCF	CF	NCF	CF	NCF	CF	NCF
Pursat	1 (2.2)	2 (4.4)	20 (44.4)	17 (37.8)	24 (53.3)	13 (28.9)	4 (8.9)	2 (4.4)	0 (0.0)	4 (8.9)
Kandal	9 (20.0)	14 (31.1)	25 (55.6)	18 (40.0)	37 (82.2)	31 (68.9)	5 (11.1)	2 (4.4)	1 (2.2)	0 (0.0)
Kampot							18			
	6 (13.3)	10 (22.2)	12 (26.7)	10 (22.2)	19 (42.2)	27 (60.0)	(40.0)	5 (11.1)	0 (0.0)	0 (0.0)
Average	5 (11.9)	9 (19.3)	19 (42.2)	15 (33.3)	27 (59.3)	24 (52.6)	9 (20.0)	3 (6.7)	0 (0.7)	1 (3.0)

Note: multiple response ; Source: Field Survey August 2004

The above table suggests that the respondents in both CF and NCF sites preferred to have farmlands for agricultural uses, rather than other livelihood options. However, skills training was also stated by many respondents in both sites, which is very much needed to improve the human resources. The creation of some alternative livelihood activities was identified by some respondents from the CF sites; however, it was mentioned by very few respondents from the NCF sites. Nevertheless, the respondent from NCF sites were willing to establish community fisheries which they think may reduce some fishing pressures. This option was not mentioned much by the respondents in CF sites. Furthermore, the respondents from CF sites confined their suggestions largely with the above four livelihood options (Figure 3.14).



Source: Field Survey August 2004

Figure 3.14. Suggested Strategies for Reducing Fishing Pressure.

3.11.2 Reactions to the Suggested Strategies to Reduce Fishing Pressure

Five suggested strategies were rated by the respondents during the survey as follows: (1) ban use of some fishing gears; (2) set maximum limit on amount of catch according to scale of operation; (3) nobody should fish during non-fishing season (for inland water only); (4) reduce number of all types of fishing lots for inland water or large-scale fishing ground for marine waters; and (5) relocate and find land-based jobs for marginal fishers.

-In Community Fisheries

Banning the use of some fishing gears was strongly agreed by most of respondents in Pursat and Kandal. This option was only moderately agreed by respondents in Kampot. The reason for agreeing to this strategy was they thought that some gears being used are destroying the fish stocks (mentioned by about 93 % of respondents).

Setting maximum limit on amount of catch according to scale of operation (strategy number 2) was slightly disagreed by various respondents. Limiting the amount of fish that they can catch would not provide them enough food to eat. Some of them mentioned that if this strategy will be implemented, they would die because they are currently very much dependent on fishing.

The third strategy of 'nobody should fish during non-fishing season' (for inland water) was strongly opposed in both CF and NCF sites. This is because if small-scale fishers will not be allowed to fish during part of the season, most of them will have no food to eat. About 63% of the respondents stated this reason.

Reducing the number of all types of fishing lots (in freshwater areas) and of large-scale fishing ground in marine waters and convert them into conservation areas, respectively, was strongly agreed and moderately agreed by most respondents in all three provinces. The respondents reasoned out that lot owners have destroyed fish stocks and the sizes of existing fishing lot areas are too large. Furthermore, lot owners caught too much fish while using illegal fishing methods in their lots.

Strategy number 5 of relocating and finding land-based jobs for marginal fishers was strongly agreed by many respondents. This is because in the current condition, fishing is more difficult than farming. Lastly, fish production has also decreased dramatically, almost day-by-day. This situation makes it very difficult for them to catch enough fish and earn a decent living.

-In Non-Community Fisheries

Similar to the CF, most of the respondents from NCF tended to strongly agree in banning some fishing gears. This is because the use of some fishing gears in small water bodies is destroying the fish stocks. This reason was stated by about 96% of respondents.

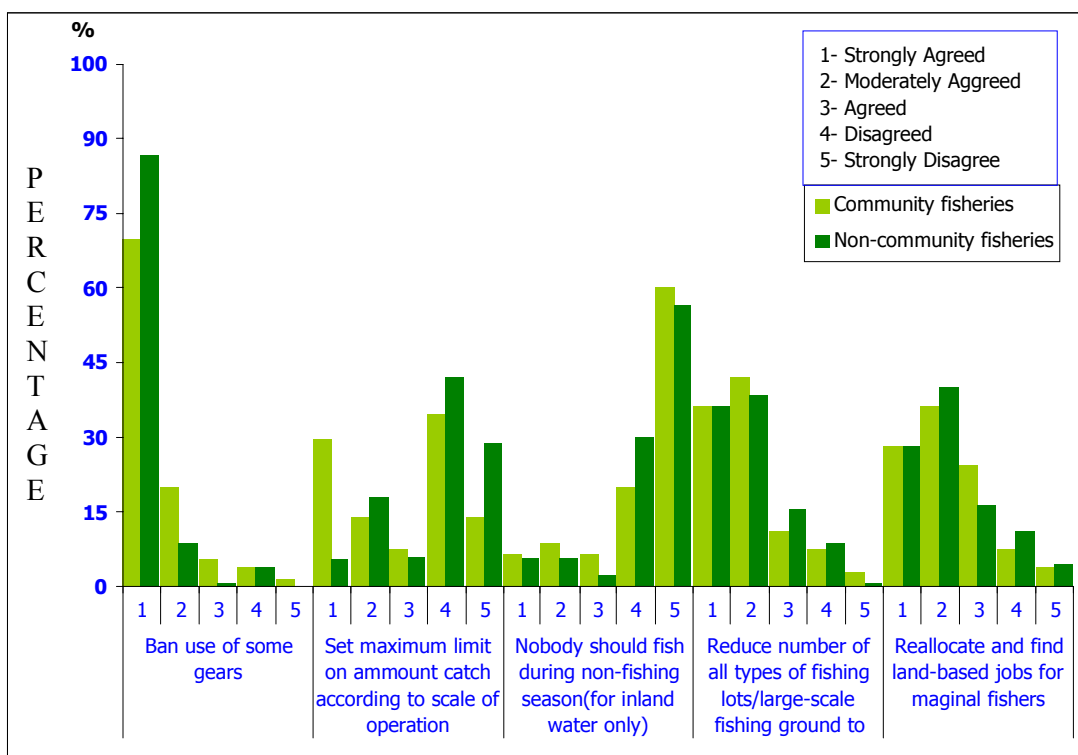
The respondents strongly disagreed to set maximum limit on the amount of fish that they can catch according to the scale of operation. This is because most of them would not have enough food for daily consumption. If some cannot catch some surplus, they would not be able to pay their debts. Hence this strategy would make them more impoverished than before.

Furthermore, they also strongly disagreed and disagreed on not allowing even small-scale fishers to fish during closed season. They reasoned out that their way of life is based on fishing. Hence, having a closed season would lead them to starvation. Legally, the closed period for small-scale fishers was also not stated in the law.

However, most respondents either strongly agreed or moderately agreed in converting some fishing lots and fishing grounds into conservation areas. They felt that the lot owners, as well as large-scale fishers, have been destroying the fish habitats and fish stocks. Further, large-scale fishers and lot owners catch too much fish.

The strategy of relocating and finding land-based jobs for marginal fishers was strongly agreed and moderately agreed by most of them. Right now, the fishery resources are being degraded and fishing activities could not earn enough money to buy food for their family needs. Further, the fish stock is also decreasing day-by-day. Hence, some are willing to undertake rice planting rather than

do fishing (Figure 3.15).



Exit strategy

Source: Field Survey August 2004

Figure 3.15. Reactions to the Suggested Strategies for Reduce Fishing Pressure.

3.12 Assistance to Exit from Fishing

The respondents in both CF and NCF identified seven activities to exit from fishing. In CF, about 36% of respondents in Pursat were willing to have technical training assistance. This was followed by about 33% in Kampot. Only about 7% of respondents in Kandal requested technical assistance to enable them to move out of fishing. Most of them (53%) were willing to acquire land for farming purposes. Some respondents requested for micro credit financing. A few, especially respondents in Pursat and Kandal, wanted to get some skills training. Nevertheless, only about 11% of respondents in Kampot were keen to give provision for children education. Market information was also requested by few respondents in Pursat.

Similarly in the NCF sites, about 13% and 16% of the respondents in Pursat and Kampot, respectively, were willing to undergo some technical training assistance. Moreover, about 27% of respondents in Kandal were also willing to gain some technical training assistance for them to exit from fishing. Further, about 53% and 51% of the respondents in Pursat and Kampot, respectively, were eager to acquire lands for agriculture uses. Some of them were willing to provide education to their children. However, about 24% and 22% of respondents in Kandal and Kampot, respectively, wanted to get credit facilities. Only about 7% and 2% of the respondents in Pursat and Kandal needed market information, respectively (Table 3.28).

Table 3.28. Assistance Needed for Exit from Fishing.

Assistance	Pursat		Kandal		Kampot		Average	
	CF	NCF	CF	NCF	CF	NCF	CF	NCF
1. Technical training assistance	16 (35.6)	6 (13.3)	3 (6.7)	12 (26.7)	15 (33.3)	7 (15.6)	11 (25.2)	8 (18.5)
2. Land for farming	18 (40.0)	24 (53.3)	35 (77.8)	19 (42.2)	18 (40.0)	23 (51.1)	24 (52.6)	22 (48.9)
3. Provide credit	9 (20.0)	5 (11.1)	5 (11.1)	11 (24.4)	6 (13.3)	10 (22.2)	7 (14.8)	9 (19.3)
4. Skill for people	3 (6.7)	5 (11.1)	2 (4.4)	0 (0.0)	0 (0.0)	6 (13.3)	2 (3.7)	4 (8.1)
5. Children education	0 (0.0)	0 (0.0)	0 (0.0)	3 (6.7)	5 (11.1)	15 (33.3)	2 (3.7)	6 (13.3)
6. Market information	1 (2.2)	3 (6.7)	0 (0.0)	1 (2.2)	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.0)
7. Others	1 (2.2)	2 (4.4)	0 (0.0)	0 (0.0)	1 (2.2)	0 (0.0)	1 (1.5)	1 (1.5)

Note: multiple response; Source: Field Survey August 2004

The above table shows that in CF sites, about 53% of respondents were willing to have land for agricultural uses. About 25% wanted to have technical training assistance and some 15% were keen to get credit services. Few of them wanted to undertake skills development for people, education for children, and access to market information. For the respondents in NCF, only about 49% were eager to have land for agriculture, while only about 19% were willing to have technical training assistance. Up to about 20% prefer to get credit. Provision for children's education seemed to have been preferred more by about 13% more in NCF, rather than in CF sites. Furthermore, the provision of skills for people was mentioned by 8% more in the NCF than CF sites.

3.13 Conclusion and Recommendation

3.13.1 Conclusion

Most of the respondents in the study area had ages ranging from 40 to 59 years old. Young ages (range from 20 to 39) in CF seem to be of higher proportion than in the NCF by about 6%. Household heads who ages ranged from 60 to 79 in CF seemed to have less proportion than in NCF. This figure appeared to be similar to the data from the NIS that undertook a census in 1998. Male-headed households dominated in both CF and NCF sites. Female-headed households accounted only to 25% in CF and about 13% in NCF. Female-headed households were residing more in Pursat and Kampot than in Kandal. However, the respondents in Kandal had more number of widowers than the other two provinces.

About 54% of respondents in both CF and NCF sites had completed primary school. Only about 4% reached secondary school. Illiteracy was still high, comprising about 20% in CF and NCF sites. The education levels of household heads were closely linked with the gender of household heads. It means that the male-headed household tended to have higher education than the female-headed ones ($p= 0.008$). The mean of number of male's schooling was about 4 years, while the female's average was about 2.2 years. This data was not surprising because it was similar to the statistics from NIS, which stated that literacy of adult females was much lower than adult males.

Fishing is the principal occupation in both CF and NCF sites. Farming is practiced more in CF than in NCF sites. In CF, farming was practiced by about 16% while only about 1% undertook it NCF.

Besides that, small business was also implemented by about 2% in CF and 1% in NCF. In addition to the main occupation, five secondary occupations were implemented in those provinces: fish-related activities, small business, farming, laboring and government/NGOs workers. Farming is very popular for respondents in both CF and NCF. There were very few who were involved in government/NGOs workers. Male-headed households tended to have more secondary occupation than female-headed households.

Most of the respondents live in their current villages for more than 10 years. Some are living for more than 30 years. About only 9% of total respondents in CF and NCF was living for less than 10 years in their current villages. With long time residency in their current villages, a large proportion of them had family members ranging from 1 to 5. These accounted to about 41% of respondents. There were very few households who have members greater than 11. Although the number of people in the households ranged from 1 to 5, the manpower or labor forces in the households were only between 1 to 3 people. The manpower engaged in fishing had a ratio ranging from 3 men per 1 woman (3:1) up to 14 men per 1 woman (14:1). As an average for all respondents, there were 5 men per 1 woman (5:1) who are engaged in fishing.

Besides manpower in the household, capital asset is also an essential element. There are five main capital assets identified by the respondents. House is a great capital asset, which contributed to a very high proportion of the total household assets. The cost of house varied from location to location. House price of respondents in CF tended to be lower than in NCF. This is because most of the respondents in CF live on water, rather than on land. Among small-scale fishers, the households who live on water tended to be poorer than those who reside on land. Furthermore, the CF's land holdings, boats and electronic appliances were also lower in value when compared with NCFs. Hence, the value of the assets of the households was related mostly on location, rather than on any other factors. This result was shown by the t-statistic at 95% confidence level ($p=0.00$).

Income of the household respondent is also another important factor. In CF, the income was lowest in each province was highly worsted. On the average, the household income varied from 5.12 to 5.44 million Riel. The income of the household in CF tended to be higher than in NCF. This amount of income cannot represent the entire population because the SD of the mean was too high, and fluctuating from 5.03 million to 17.06 million Riel. With this SD, the distributions of household's annual income had a big gap, suggesting that the poor are in worse condition. In CF, Kandal province had the highest annual income together with the highest SD. In the NCF sites, the highest annual income was recorded in Pursat rather than in Kandal, and the SD of the mean of Pursat was also the highest. Distribution of average annual income of these three provinces fluctuated in the CF but a bit smooth in NCF. Although, the average income of these two sites was similar, the SD of CF sites looked about double if compared to the average annual income. In the NCF sites, the SD of income was just a bit higher than the average. Consequently, the socio-economic condition of the people in NCF is better than in CF sites.

There were many sources of income but this research selected only the few sources which contributed most significantly to household income. Fishing was the main source of household income. It contributed to about 68% of the total income among the respondents in CF and about 84% among the respondents in NCF. The second of income was fish-related activities which included fish trading, fish/seaweed culturing and fish processing, etc. These activities contributed to about 23% of the total income in CF while contributing only to 2.4% for the NCF's income. Farming also provided substantial supplementary income to the respondents.

Fishers were fishing mostly in CF sites for CFs and open access for NCFs. Few of CF fishers (0.7%) went fishing in protected areas compared with about 6% of total NCF respondents. The reasons for fishing in those areas were because of easy to access for CF residents and easy to access and no alternative fishing grounds for NCF respondents. Aside from fish, those fishing ground were also providing other goods, such as vegetables, water and fuel wood. Only some of them mentioned about getting other benefits, such as medicine and housing construction material.

The fisheries rules and regulations which were recognized by the local governor through *parkas* (declaration) in CF affected community members. Besides community members, it affected illegal fishers as well. Before 2001, respondents customarily used gillnet as a fishing method. Some of them used hooked line and a few use seine net. Respondents in CF sites tended to use gillnet less

than in NCF wile. Hooked line was greatly, however, in NCF sites. Furthermore, CF respondents used more fish trap and seine net than their NCF counterparts. Conversely, the NCF respondents tended to use *samras/krasom*, which are illegal fishing methods more than in CF sites.

Through the use of these various fishing methods, the fish catch, number of fishing trips per week, and the number of people went fishing varied from fishers to fishers. Generally, fishers in CF went fishing for about 5 times per week, whilst NCF fishers went fishing 6 times per week. The number of people who went fishing was about 2 persons per fishing trip. Fishers in CF tended to fish fewer periods than in NCF that was only about 8.45 hr and 10.58 hr, respectively per fishing trip. The reason for this was because fishers in CF sites catch fish only in CF sites. Fishers in NCF went to fish in open access, which may be far from the village where they like. The amount of fish catch also depended on the areas, whereby respondents in CF sites claimed to have less production than in NCF sites. This was because they fished only within their limited areas. The average fish catch per trip was about 17.5 kg for CF fishers and about 24.4 kg for NCF fishers. These figures are equivalent to about 4.55 tons and 7.6 tons, respectively per annum. However, these production values of both CF and NCF cannot represent the whole population because the SDs was very high when compared to the means. The SD of fish production for respondents in CF was about 41 kg and in NCF it was only about 32.7 kg per trip. With these two high SD, it can be assumed that the fish production of these two sites may be able to reach up to 58 kg for CF and about 57 kg for NCF for each trip. These figures may translate to about 15 tons and 17.8 tons per annum, respectively.

The data in 2003-2004 was similar to the data obtained before 2001. Fishing methods like fish trap increased to about 13% followed by cast net which increased by about 160% and gillnet by about 4.5 %. Significantly, seine net increased to about 500% or 5 times more than in 2001. Hooked line and other fishing methods decreased to about 13% and 53%, respectively. The number of fishing trips and people went fishing change from the 2001 figure. The period of fishing trip, however, was slightly reduced by about 8 minutes. Unexpectedly, the production per fishing trip decreased from 21 kg per trip to only 4 kg. The change in fish production was about 466% or about 5 times from 2001. In 2003-2004, the average production per trip was about 2.7 kg for CF fishers and about 4.7 kg for NCF fishers. These translate to about 702 kg and 1,466 kg per annum, respectively. However, this production value of both CF and NCF sites cannot represent the whole population because the SD of the mean of these two productions was very high when compared to the means. The SD of fish production for respondents in CF was about 14.7 kg and in NCF was about 20.7 kg per trip. Given these two high SDs, it can be assumed that the production of these two sites may be able to reach to about 17 kg for CF and about 25 kg for NCF for each trip or about 4.4 tons and 7.8 tons per annum. Even though, the fish production caught in 2003-2004 still declined to about 71% in CF sites and about 56% in NCF sites.

Although the fish production decreased by about 64% from 2001, whereas, the price of freshwater fish also increased. Such increase was about 1.2 times for high value fish price and about 1.7 times for medium value species. The low value species, which are mostly consumed by the poor, also increased by about 2.6 times since 2001. Conversely, the price of marine water fish which contribute very little to the livelihood of the people in the country also increased. The price of high value species increased by only about 0.7 times followed by medium value species that increased by about 0.6 times, and the low value species was about 1.3 times.

Through the above results, it can be assumed that fish production decreased dramatically from 2001 while the price of fish increased rapidly. This result was the same to the perceptions given by the respondents in both CF and NCF. Furthermore, they mentioned that fish production decreased spectacularly because mainly of excess fishing effort and some farmers have become fishers after fisheries administration was reformed in the late 2000. In addition to these, some fishers speculated that the decline in production may also be attributed to some people who do farming and lotus culturing in the lake. Some stated that the decline in fishery may be due to some economic activities in the upstream river and the increase of fish price. When fish price is increased, fishers try to catch fish as much as they can to generate high income for their families. Moreover, the increase of fish prices means that the prices of their basic daily need increases. Hence, to cope with those increasing prices of basic commodities, fishers try very hard to catch more fish to pay for their high expenditures.

Because of the increasing fisher population and excess in fishing effort, small scale fishers are faced with many conflicts during their fishing. Most of the time they had conflict among themselves,

as well as, medium scale and large scale fishers. Sometimes, they encountered conflicts with illegal fishers, fisheries officers and local authority. These conflicts were sometimes serious, sometimes somewhat serious and sometimes not serious at all. However, all conflicts that arose in the areas were never become violent.

In order to solve these critical issues and conflicts, the respondents suggested resolutions. First is the clarity of the fishing boundaries among small scale, medium scale and large scale fishers. Right now, fishers are mostly unclear about their fishing boundaries which make them go fishing almost everywhere. Sometimes, when the fishers were close to the fishing lot, the lot owners would not allow them to fish. The second suggestion was to eliminate illegal fishing practices. This has already been incorporated in the fisheries law. Create a community fishery was also stated by the respondents in NCF sites as the third solution. Eliminate medium and large scale fishing gears in the CF sites was the fourth suggested solution to mitigate the resource use conflicts. The last suggested resolution was to eliminate corruption of powerful men in both CF and NCF sites. This suggested strategy was given by only few fishers.

Though these conflicts and resolutions, about more than 58% are still committed to stay in fishing and about 18% were not sure, while about 19% would not stay in fishing anymore. The reasons given to exit from fishing were: (1) fish production is declining, and (2) they have the other livelihood opportunities, such as farming, seaweed culture (for coastal province) and small business. Furthermore, some of them would like to exit from fishing, but they would need some assistance. These would include some skills training, farmland for agriculture and creation of some alternative livelihood activities. Most of the respondents were keen to have some farmlands for agriculture. Some of them would like to undergo skills training, and a few of them requested the creation of alternative livelihood activities.

Besides exit strategies, there were some proposals for reducing fishing pressure in both CF and NCF sites. The highest agreed option for reducing fishing pressure was to ban the use of some fishing gears. Relocate and find land-based job for marginal fisher was the second most agreed option given by the respondents. Conversely, setting a maximum limit on the amount of catch according to the scale of operation was not accepted. The proposal that nobody should fish during non-fishing season (for inland water) was also rejected by the respondents.

3.13.2 Recommendation

There were about eight recommendations given during the national workshop. One is to review the impact of land reform to fishers, and how land ownership could encourage exit from fishing. Two is to identify appropriate skills and training needs that are suited to the area. Three is to provide information on other existing non-fishing jobs among fishers so that these could be enhanced when deemed relevant as an exit option. Four is to identify appropriate income-generating activities. Five is to improve market information to help decision-making among fishers. Six is to undertake more biological studies to support decisions to establish fish conservation areas. The seventh recommendation is further study of fishers perceptions and willingness to exit. Eight is to undertake integrated (inter-sectoral) and inter-temporal analysis of impacts of suggested livelihood options.

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Appendix 1: Questionnaire for Survey

**Fish Fights over Fish Rights:
Managing Exit from Fisheries and Security Implications for Southeast Asia**

Ford Foundation-WorldFish Center Project
Implemented by the DOF/IFReDI in Cambodia

Date: _____ 2004

Questionnaire for community/fishing households

(Please collect or draw a map of the commune and locate the selected village with the fishing ground/water area).

Village _____ Commune _____ District _____
Province _____

Name of the Community Fishery Organization (if there is any) _____

Profile of the household head/respondent

1. Name _____ 2. Gender: Male; Female 3. Age: _____
4. Number of years fishing _____
5. Marital Status: 1. Single, 2. Married, 3. Divorced, 4. Widow/er, 5. Other _____
6. Number of years in school _____
7. Ethnicity: 1. Khmer, 2. Chinese, 3. Vietnamese, 4. Cham
8. Religion: 1. Buddhist, 2. Christian, 3. Muslim, 4. Hindu
9. Primary Occupation of the household head/respondent:

<input type="checkbox"/> 1-Fishing,	<input type="checkbox"/> 2-Fish processing	<input type="checkbox"/> 3-Fish trading,
<input type="checkbox"/> 4-Motor taxi/car/engine boat driving	<input type="checkbox"/> 5-Net/gear making,	
<input type="checkbox"/> 6-Farming,	<input type="checkbox"/> 7-Laborer	<input type="checkbox"/> 8-Small business
<input type="checkbox"/> 9-Money lending	<input type="checkbox"/> 10-Fuel wood collection	<input type="checkbox"/> 11- Fish culture,
<input type="checkbox"/> 12-Government/NGO job	<input type="checkbox"/> 13-House keeping	
<input type="checkbox"/> 14-Teaching	<input type="checkbox"/> 15-Other _____	
10. Number of years in the principal occupation _____
11. Secondary occupation of the household head/respondent:

<input type="checkbox"/> 1-Fishing,	<input type="checkbox"/> 2-Fish processing	<input type="checkbox"/> 3-Fish trading,
<input type="checkbox"/> 4-Motor taxi/car/engine boat driving	<input type="checkbox"/> 5-Net/gear making,	
<input type="checkbox"/> 6-Farming,	<input type="checkbox"/> 7-Laborer	<input type="checkbox"/> 8-Small business
<input type="checkbox"/> 9-Money lending	<input type="checkbox"/> 10-Fuel wood collection	<input type="checkbox"/> 11- Fish culture,
<input type="checkbox"/> 12-Government/NGO job	<input type="checkbox"/> 13-House keeping	
<input type="checkbox"/> 14-Teaching	<input type="checkbox"/> 15-Other _____	
12. Number of years of stay in current village _____
13. Place of birth:

<input type="checkbox"/> 1. Same village and commune;	<input type="checkbox"/> 2. Difference village but same commune
<input type="checkbox"/> 3. Difference commune but same province;	<input type="checkbox"/> 4. Difference provinces
<input type="checkbox"/> 5. Difference countries	

Profile of the household members

14. Number of household members: Male _____ Female _____

15. Number of eligible household members (Age >10 who can read and write): _____
16. Number of working age members in the household (Age >10): Male: ___ Female: ___
17. Number of household members engaged in fishing: Male _____ Female: _____
18. Value of household assets (Riel):
- 1- House..... _____
 - 2- Boat..... _____
 - 3- Land..... _____
 - 4- Household appliances (furniture)..... _____
 - 5- Electronic appliances (TV, Radio, fan, battery)..... _____
19. Monthly household income by source (Riel)

No.	Source of income	Closed season (2004) (Riel/month)	Open season (2003) (Riel/month)
1.	Fishing		
2.	Fish trading		
3.	Fish processing		
4.	Cage culture		
5.	Farming		
6.	Trading		
7.	NGO/Govt job		
8.	Wage income		
9.	Remittance income		
10.	Other (specify): _____		

Resources and Fishing Ground

20. Describe your category as a fisherman: (check one category): _____
- | | Closed Season (2004) | Open Season (2003) |
|-----------------|-----------------------------|---------------------------|
| 1. Small scale | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Medium-scale | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Commercial | <input type="checkbox"/> | <input type="checkbox"/> |
21. Do you pay any tax or license fee for fishing right or gear use? Yes, No
22. If yes, how much (Riel) _____ Period (month) _____
23. Are you a member of the fisheries community organization? Yes, No
24. If yes, what is your role? _____
25. Where do you normally go for fishing? (Multiple answers are acceptable)
- | | |
|--|---|
| <input type="checkbox"/> 1. Inside community fishing | <input type="checkbox"/> 2. Outside community fishing |
| <input type="checkbox"/> 3. Open fishing ground fishing ground | <input type="checkbox"/> 4. Protected |
| <input type="checkbox"/> 5. Inside fishing lots | <input type="checkbox"/> 6. Others _____ |
26. Please explain why do you fish in that/those area/s?
- | | |
|--|--|
| <input type="checkbox"/> 1. More fish | <input type="checkbox"/> 2. Easy to access |
| <input type="checkbox"/> 3. No alternative | <input type="checkbox"/> 4. Others _____ |
27. Aside from fish, what other uses or benefits do you/your family gets from the fishing area?
- | | | |
|---|--|---------------------------------------|
| <input type="checkbox"/> 1. Vegetable | <input type="checkbox"/> 2. Medicine | <input type="checkbox"/> 3. Fire wood |
| <input type="checkbox"/> 4. House construction material | <input type="checkbox"/> 5. Water (drinking, using, cooking) | |

6. Others _____

28. What fishery rules and regulations are enforced in your community?

Rules and regulations	Who implements the rules?	Who are affected?	Effectiveness*	Comments

* 1=Very effective; 2=Effective; 3=Not effective

Indicators of Over-Capacity

29. Please recall your fishing activities by type of gear used in the following periods.

Present (2003/2004)

No.	Gear type	No. of trips per week	No. of members per trip	Number of hours per trip	Average catch per trip (kg)	Period of use (from - to)
1						
2						
3						
4						
5						
6						
7						

Before fisheries reform of 2001

No.	Gear type	No. of trips per week	No. of members per trip	Number of hours per trip	Average catch per trip (kg)	Period of use (from - to)
1						
2						
3						
4						
5						
6						
7						

30. Do you think that on the average, the size of fish has been changing (declining/increasing) over the years? If yes, please name some of the important species that declined most?

No.	Species	Size of fish compare to before fisheries reformed		
		smaller	bigger	No change
1		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

31. Do you think that on the average, the price of fish has been changing (increasing/decreasing) over the years?

- Yes No

32. If yes, please name some of the important species that increased in value most?

No.	Species	Average price in Riel/kg	
		Before 2001	2003-2004
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Perceptions on the Condition of the Fishery

33. Based on your fishing experience, what is your perception in the volume of your catch over time?

- Increasing Decreasing No change

34. What could be the reason for the changes in the volume of catch over time?

- 1.Excess fishing effort 2.Farmers becoming fishers
 3.Farming and lotus planting in the lake area 4.Fishery is less productive
 5.Intervention in the upstream river system 6.Prices of fish
 7.Fishery reform 8. Other (specify _____)

35. What is your opinion about changes in the number of fishermen in your community over time?

1. Increasing 2. Decreasing 3.No change

36. What is the reason/s for the change in the number of fishermen in your community?

- 1.Migration 2.Population increase in the fishing community
 3.Lack of alternative livelihoods 4.Fishery reform
 5.Other reason (specify _____)

Conflicts and expected solution

37. What fishery conflicts exist in your community? How serious it is? How much it affected? Who are involved in each conflict?

No.	Type of conflict	Level of seriousness ^a	Affected ^b	Involvement ^c
1				
2				

3				
4				

^a 1. Violent, 2. Very serious, 3. Serious, 4. Somewhat serious, 5. Not serious

^b 1. Most affected, 2. Very affected, 3. Affected, 4. Somewhat affected 5. Not affected

^c 1. Community, 2. Your individual, 3. Others _____

No	What was the cause of the conflicts?	In your opinion, what could be the solution?
1		
2		
3		

VII. Plans and Aspirations

38. Knowing the problems in the fishery, do you still see yourself fishing in the next five years?

- Yes No Undecided

39. Why? _____

40. If answer to Question 38 above is yes - Do you still see yourself fishing forever?

- Yes No Undecided

41. Why? _____

42. If answer to Question 38 above is no - What are your plans? _____

—

VIII. Reactions to Exit Strategies

43. What are your suggestion(s) for ways in reducing fishing pressure?

1. Establish community fisheries 2. Improving skill
 3. Provide land for agriculture activities 4. Finding the possibility occupation
 5. Others _____

44. What is your opinion or reaction to the following ways to reduce fishing pressure and sustain the fishery? Please rate your answer as follows:

1=Highly agree 2=Moderately agree 3=Agree 4=Disagree 5=Strongly disagree

Strategy	Rate	Why?
1. Ban use of some gears	_____ —	_____ — _____
2. Set maximum limit on amount of catch according to scale of operation	_____ —	_____ — _____
3. Nobody should fish during non-fishing season	_____ —	_____ —

		-

		-
4. Reduce number of all types of fishing lots to increase conservation area	_____	_____
	-	-

		-
5. Relocate and find land-based jobs for marginal fishers	_____	_____
	-	-

		-

IX. Needs and Assistance for Exit

45. What are the alternative skills you and your household members have that you may pursue today or in the future?

Relationship with the household head	Gender (M/F)	Age (Years)	Schooling (Yes/no)	Skills aside from fishing

46. What kind of assistance do you need, or expect to enable you to leave the fishery?

- 1. Technical training on _____
- 2. Provides land for agriculture activities
- 3. Livestock raising
- 4. Skill for _____
- 5. Other _____

Name of the Interviewer: _____ Verified by: _____