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Fisheries Organization and Management Review

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I. Introduction

1. Geography and population

Cambodia is rich in aquatic resource, especially fresh water fish, in South East Asia Countries. International borders are shared with Thailand, Laos and Vietnam. The total area of Cambodia is 181 035 km², which water body consists of 2.69%. About 30% of Cambodian's land area is seasonal flooded and it is very important for capture fisheries.

The water bodies consists mainly of, Mekong River which originates at Tibe and flows through the eastern country along the provinces of Stung Treng, Kratie, Kampong Cham, Kandal and Prey Veng, and Tonle Sap river that originates in the Great Lake in the west and flows through Kandal province. The great Lake is the largest and most productive freshwater lake in South-East Asia (Bardach, 1959). Located in the middle of the country's northwest plains and is surrounded by Siem Riep, Banteay Meanchey, Battambang PurSat, Kampong Chnang and Kampong Thum province. The lake occupies an area of 3000 km² in the dry season with an average depth of 0.8-1 m. During the monsoon, it expands to more than 15,000 km² area (Fily and Aubenton, 1962-63). The Mekong and the Tonle Sap Great Lake create a vast inland water system, comprising numerous river and lakes, extended into flooded forest, grasslands rice fields and swamps, which support an extensive, capture fisheries.

The country has coastline of 435 km and extensive mangrove stands, some of, which are relatively undisturbed.

The total population living in the whole country is about 11 million, and 85-90% of total population lives in the rural area (FAO, 1993). Currently, the country has an estimated rate of population growth of between 2.5-3 percent per annum (World Bank, 1992). Among 21 provinces, 13 are considered as fishing provinces, six of which surround the lake with a population of nearly 3 million. Most of the people live in the area along national roads surrounding the lake. There are as many as 170 villages in and the inundated forest. About 88% of the inhabitants rely on natural fishing related activities (FAO, 1993).

2. Role of fish in Cambodian diet

Fish plays an important role in Cambodian diet. Cambodian people like eating fish very much because fish is cheaper than other animal meat. On average, fish and fishery products are believed to account for 40-60% of the protein intake of the population (Nam, 1999). However, in some areas such in villages in close approximately to inland water bodies and along the coastline) the relative importance of fish as a source of protein is higher (approx. 70-75%) (Ahmed et al., 1998).

Fish consumption has traditionally been high in Cambodia, with the level of 20-25 kg per capital in 1970 (Lagler, 1976), but has drastically fallen to 13.3-16 kg per capital in 1990 (MRCs, 1992) according to various estimates probably due to environment degradation, increased population (annual growth rate: 2.5-3%) (World Bank,1992).

The national rate of fish consumption per capita is 23-31kg per annum (MRC/DOF, 1998/1999). However, fish consumption is changed according to the location and year of

research as 13.5kg (Csavas, 1994) in the South and 38 kg (APHEDA, 1997) in the South-West Cambodia, 71kg/capita/annum in floating area and 32kg/capita in the up-land area of Siem Riep province. (Hy, 1995). Beside the consumption from fishery products people eats also the fish production from aquaculture. As the report from Nam (1999) a capita consumption from aquaculture is about 1.2 kg per annum.

The Prahoc and Tuk Trey constitute the main in gradient in Cambodian dishes. They can also be eaten directly with plain rice and vegetable or combined with other source of meats and vegetable to make a number of pure Cambodian delicious soups.

According to the estimation by Nam (1999) if annual per capita fish consumption increased to 48.8kg (optimal fish protein intake), 584,425 tons of fish would be required in 2000; 771150 tons in 2010.

3. Role of fishery in the National Economy

Cambodia is an agrarian society with approximately 85 percent of the workforce engaged in forestry crop, livestock and fisheries (CCPP, 1995). Fisheries contribute some ten person of the sector's total output. If considering to the estimation from While Zalinge and Nao Thuok (1999) and Ahmed et al., (1998) the annual freshwater fish is 300,000-400,000 tons, the fisheries contributes 8.8-10.3% of GDP. According to the report of DOF (2000) the total inland fish production in the whole country is ranging from 279,000 to 441,000 tons; which consists of 115,000 to 140,000 tons of Family fisheries, 45,000 to 110,000 tons of Rice field fisheries, 34,000 to 91,000 tons of Large and 85,000 to 100,000 tons of Middle scale fisheries., Beside the above production, Marine fisheries production contributes 36,000 tons and Aquaculture also contributes 15,000 tons. The contribution of fishery products to the GDP is therefore Riels 572.52 billion. With the current of GDP of riels 10,750 billion (Ministry of Economic and Finance, 1999), the contribution is thus 7.21% of GDP.

If taking inland capture fisheries in to consideration, the production in 1999-2000 (DOF, 2000), consider to GDP, the contribution would be about 4.5 %. This indicates the importance of fresh water fish capture in daily life of people, their employment as well as in the national economy.

II. Review of Fisheries Management

1. The need for Fisheries management

Fisheries have substantial social and economic importance. In Cambodia, it is estimated that 139,490 people are employed in activities related to fishery exploitation and aquaculture and the value fish traded has been estimated at riels 572.52 billion in year of 1999-2000. The total production from capture fisheries and aquaculture during the same period reaches to a total mass of 397,600 tons.

However, at present, a large proportion of the exploited fish stocks is fully exploited, over-exploitation, depleted and many are affected by environmental degradation, particularly in the

inland and coastal areas. The importance for fisheries management is to realize that when resources are being over-exploitation or exploited in an irresponsible manner, a failure to act will have negative consequences in the future.

There are generally accepted definitions of fisheries management. A working definition, for the purpose of this document, may be taken as:

The integrated process of information gathering, analysis, planning, consultation, decision-making, allocation of resources and formulation and implementation, with enforcement as necessary, of regulations or rules which govern fisheries activities in order to ensure the continued productivity of resource and accomplishment of other fisheries objectives.

2. Aquatic resource management

2.1 Inland capture fisheries

Inland capture fisheries have been divided in two parts on basis of location and water source, the Great Lake/Tonle Sap fisheries and the Mekong/Bassac inundation zone fisheries. The Great Lake/Tonle Sap account for 60% of inland fish production (FAO, 1993). The inundated forest of the great lake, and to a lesser extent the inundated forest of the Tonle Sap and Mekong river, are important for fish stock, spawning and breeding. The white fish are more dominated in Great Lake and important economically and followed by 3 black fish of 2 murrel and a climbing perch species.

The fishermen in inland capture area use quite a large number of fishing gears and methods, each adapted to the environment conditions and to the species. However, some endangered species are protected and recruited to wild. The Fishery Department (1999) describes 718 gears have been used in inland fisheries for industrial fisheries. Among these industrial gears Barrage trap (Thnours) is dominant, which reaches 599 and followed by Bag Net (93 gears: Bag net for fish and for fresh water prawn). Barrage trap is a large scale fishing gear formed by barrage fixed across the stream or small rivers in the precinct of fishing lots, (Dominant fishing gears used in Great Lake). Beside the fishing gear used for industrial fisheries, seine net, gillnet, cast net, hooked line and bamboo traps have been used for Middle Scale Fisheries, and spear, cast net (<5m), small gillnet, single hooked line and bamboo traps have been used for family small scale fisheries.

According to the law and regulation of Fishery Department, capture fisheries has been regulated on tree level. Each level has to follow the regulation regarding the type and size of equipment used, the location of fishing, yield, length and width of nets or fish traps, size and number of hooks etc.

- Fishing with Industrial Fishing Gear: takes place in lots, which are auctioned every second year. The lots are located at the periphery of the Great Lake and Tonle Sap and Mekong/Bassac rivers down to Viet Nam border. From 1999 till date there are 270 lots, which 135 are lake-stream fishing lots, 63 bag net fishing lots, 8 bag net fishing lots for white lady carp only, 13 bag net fishing lots for prawn, 31 bag net fishing lots for Pangasius seed, and 20 sandbank fishing lots. Among of these fishing lots, 31 fishing lots for Pangasius seed have

been inactive. Beside the 270 fishing lots, which have been operating, another 13 fishing lots have been regulated as reservoir and research. In the Great Lake the average size of lot are about 15-25 km long and 5-10 km wide (includes inundated forest), (FAO, 1993). Large scale fishing gear used is allowed but there are certain limits placed by the DOF on each lot. The fishing licenses and burden books are issued by the DOF with approval of the MAFF. The fishing lot operation does not active during closed season (during spawning season, October-May).

- Fishing with middle scale fishing gear: Regarding the regulation, fishing with middle scale fishing gear takes place out size the fishing lots and in the middle of the Great Lake and rivers. The operation can be done has to be issued by DOF and has to respect the regulation, especially, this operation will be inactive during closed season.

- Small scale family fishing: This type, for subsistence purposes, can take place anywhere in fisheries domain. The family fishing is not regulated and is permitted year round. According data reported by DOF (2000) the total production of family fishing accounted about 50% of total inland capture production.

2.2 Marine Capture fisheries

Location of Cambodian sea namely Gulf of Thailand is sharing the internal border to Koh Kong province, Sihanouk Vill, Kampot province and Kep Ville, and external border to Vietnam in the south and to Thailand in the north. The coastline of 435 km is stretched between Vietnamese border to Thailand border of which: 237 km in Koh Kong, 105 km in Sihanouk Vill, 64 km in Kom Pot and 26 km in Kep Ville. The country has an Exclusive Economic Zone (EEZ), the area from the shore to 200 nautical miles offshore covering 55,600 sq.km (World Recourse Institute, 1994). According to report of Wetlands International and ICLARM (1998), the total area of mangrove in Cambodia is 83,600 ha, of which 63,200 ha. in Koh Kong, 7,300 ha. in Kampot and the remaining 13,200 ha in Sihanouk Ville.

Marine resources of the Gulf of Thailand are divided into two groups: pelagic and demersal. The pelagic zone is riche in important species of mackerels, scads, anchovies, sardiness, small tunas and pomfrests (FAO, 1993). The important demersal fish are threadfin breams, croakers, big-eyes, lizard fishes, hairtails, flatfishes, snappers, barracudas, grouper shark and conger. Beside the fish species detailed above, invertebrate catch is dominated by penaeid shrimp, followed by short neck clams, cuttlefishes and squids, green mussel, octopuses, sergestid shrimp, sand crab, jelly fish and mud crab. The Gulf of Thailand is a productive sea due to its shallowness (20-87 m). (DOF, 1993). Regarding to the data reported by DOF (2000) shows that the total marine production during the first semester is 19,000 tons. Comparing to the total marine production during the first semester last year (19,500 tons), it indicates that the stocks in Cambodian waters are in a stable.

All type of marine fishing can be done have to be issued by the DOF and with approval of the MAFF except family fishing. A range of vessels and gears are used in the marine fisheries. But in order to stabilize the stock and catch in equivalent, the DOF limits the area for fishing operation (start from 20 m deep) and prohibits the illegal fishing gears and vessel (See Fishery

Law). The marine capture fisheries can be done year round except fishing with mackerel species, which prohibited from 15 January to 31 March.

2.3 Aquaculture

Aquaculture in Cambodia had been redressed since 1984 after a long disruption since 1975. Due to the abundance of wild fish in Cambodia, aquaculture in the past did not play an important role in the volume of fish supply. However, cage and pen fish culture has originated in Tonle Sap Great Lake region before 1950 due to available seed supply from the wild especially *Pangasius* catfish. Presently, cage and pen fish culture is becoming increasingly popular and most of them locate in the Great Lake and Mekong/Bassac rivers (77%) and less in the lakes itself (23%).

Fishpond culture has originated after origination of cage. Some aquaculturist use large scale and some use small-scale system. With large-scale system farmer stock with *Pangasius* catfish, which is collected from the wild, while with small-scale system farmer stock with 4 or 5 exotic fish species (polyculture) or sometime mix with indigenous fish species. Integration fish farming with rice, pig, duck or vegetable has also been increasingly popular in rural area. Most small-scale fish culture have been supported by NGOs, especially they provide food to farmer to dig the fishpond. Due to the absence of an organized and controlled financial system, farmers are either unable to get the required finance or when they are able to borrow locally, the interest rate charge is very high (in excess of 50% per year). NGOs (Non-Government Organizations) have been assisting the people with credit, but a large section of the population remains uncovered. This is one of the obstacles, which should be overcome by the Government soon.

Although coastal aquaculture development is not significant, environment problem have been found in some areas during attempts to develop aquaculture, especially shrimp farming which is a activity initiated since 1988 in coastal areas covering two provinces and one city, namely Koh Kong, Kompot province and Sihanouk Vill, respectively. This activity cause large destruction of mangrove forests, either for shrimp farm construction or charcoal production. Recent reports indicate that area of mangrove forests, estimated at nearly 37,000 ha, could have been reduced by as much as 50% (Nam, 1999).

According to the fishery law the admission license is needed from the Department of Fisheries when pond size is larger than 0.5 m² or cage size is larger than 15 m². The Department of Fisheries and relevant ministries are concerned with issue related to large-scale fish culture in pond, cage culture and shrimp farming. According to the law of fisheries, all these activities need to be licensed.

3. Management Review of Administration

Management of fishery administration comprises of 3 levels. There is one central administration (published by Fishery Department and approval by MAFF), 22 provincial administrations (approved by DOF), and 4 municipal administrations.

3.1 Central management

Fisheries management entails a complex and wide-embracing set of tasks, aimed at ensuring that the optimal benefits and stable fish production are obtained for the local user, State or region from sustainable utilization of the living aquatic resource to which they have access. To do this, Fishery Department can be taken to include the following:

3.1.1 Fishery Management Policy

Since 1979, the main policy of Fishery Department was to supply sufficient fish to people through exploitation of natural fisheries to meet the need of the country and at the same time, to protect and conserve the resource for sustainable use in future.

To the present, the national fisheries policy is still concerning on managing and conserving the natural aquatic resource in order to supply sufficient food to people. As the mention in the First Socio-Economic Development Plan stated that:

- To improve fishery products to supply sufficient foodstuff for home consumption and promote export to contribute to the national budget; and
- To manage, conserve, protect and develop sustainably the fisheries resources.

According to the report of Fishery Department (2000) the fresh fish consumption per capita has increased to an average of 25-30 kg. The respect and implementation of Fishery Law have improved and the illegal fishing has been reduced.

3.1.2 Fishery Management Plan

The Department of Fisheries creates fishery Management Plan and the Ministry of Agriculture Forestry and Fisheries approve it. This plan is prepared for short-term training (1 year), Medium-term planning (5- years) and/or long term planning (10 years).

For medium-term planning (1999-2003) is strongly concentrated to the sustainable fishery environment. In this 5-year period, the development of fishery sub-sector would notably be followed by the strategic guidelines such as the maintenance and improvement of fishery environment resulting, the sufficient supplies of a higher protein to the population to be ensured.

The priority program consists of arrangement and deliverance of fishery resource protection and management to the fishing communities; revision and improvement of the existing laws, which are fitted to the social and natural environment; strengthening of law compliance and involvement from the people and the prevention of illegal fishing activities, the full operation of all fishery research stations including marine fishery research station establishment.

With long term planning are to maintain sustainable natural resources, develop aquaculture, inland and marine fisheries research. These activities would provide the higher fishery outputs to share in the Gross Domestic Products, improve the living standard of people and National

Economy as well. The reforestation and restoration of the natural inundated forest and aquaculture will be strongly promoted and undertaken.

3.1.3 Implementation and strategy

To be able to accomplish the above stated policies, the Department of Fisheries had set up the following strategies:

- To supply sufficient food and nutrition to all Cambodian;
- To protect and conserve the natural fisheries resources for sustainable use and for the future generation;
- To revise the exiting fisheries law;
- To improve management of capture fisheries;
- To develop inland and marine aquaculture;
- To develop fish processing, packaging, handling and marketing technologies;
- To develop scientific and extension on fisheries; and
- To involve local people to participate in the fisheries management, conservation and development.

3.1.4 Fishery Law (Registration)

Fishery Law is very important for managing the fisheries including fresh and marine water. In this includes the improvement and conservation of fishery domain, protection and conservation of fishery resources, improvement of fishery exploitation through the suitable technology, encouragement of family fisheries, improvement of fishery exportation, improvement of data collection and development of aquaculture.

Cambodia's fisheries legislation, Fiat-Law on Fishery Management and Administration, was issued by the Council of State on 9 March 1987. Together with its two sub-law (made by the Council of Ministry in 1988) and regulation (made by proclamation or circular principally by the Ministry of Agriculture and also by the Ministry of Justice), the regulation is extensive and detailed.

The Fiat-Law (1987) is divided into six chapters and 44 articles covering definitions; exploitation of inland fisheries, aquaculture and processing of freshwater fishery products; exploitation of marine fisheries, aquaculture and processing of marine products; component authorities for solving fishery violations, penalties, and final order. The Fiat-Law includes also the two-sub law, which concerns on the transportation of fishery products and rental of inland and marine water for fishery purpose. Another two sub-law, details procedures for the conduct of auctions of fishing lots and the quantity of fish 'fixed' for calculating fishing taxes in certain inland and marine waters.

The regulation under the Fiat-Law (1987) classifies and addresses the gear use (such as small scale fishing gears, middle scale fishing gears and industrial fishing gears) and restrictions, demarcation of inland fishing lots and fish sanctuaries, limits of the forest belonging to the inland and marine fisheries, issuance of fishing permits, fish processing, violations, fishing record, export of fish, collection and distribution of fish, fishery inspection, and research. The

proclamation of several other regulations, including one relating to marine shrimp culture and another concerning fish exports are reportedly under consideration.

However, this current legislation is lacking of some important thing including the consideration of environmental and ecological issue. Currently DoF does not have legislation relating to marine environment protection, and that is possible that the coastal environment could be rapidly degrade, especially through intensive marine aquaculture development, if legislation is not provided. It is suggested that the DoF should revise all existing aquaculture legislation and make appropriate recommendations for improving the regulatory framework of inland and coastal aquaculture, especially shrimp farming.

In addition to these current legislation is not including the management of the protected flood area, development of the marine fishery domain and jurisdiction and evidence.

Although the fisheries legislation is comprehensive and geared primarily towards resource conservation and control and enforcement, it is probably not well understood by most fishermen and perhaps evens by some fisheries officials. The poor enforcement of the country's fisheries legislation is a major constraint in achieving long –term sustainable resource use. However, legislative revision alone will not automatically lead to improved enforcement. This will require a package of supporting measures designed to implement and administer the legislation within the administration.

3.1.5 Human Resource Development

In striving to strengthen capacity to better manage and develop the fisheries sector, a primary focus must be human resource development. Indeed, a shortage of well-qualified and experienced staff in the central and provincial administration is one of the most critical issues facing fisheries administration in Cambodia.

According to FAO (1992), human resource development is needed at all level and in all areas of the central and provincial fisheries administration. Both education and training is required by way of education at the undergraduate level, at the post-graduate level, at the diploma and at both short and long training skill in both country and oversea.

Specialized fisheries education is provided at two institutions in Cambodia. These are the Royal University of Agriculture and Prek Leap Agricultural College. Beside these, the general economical specialization in aquaculture is provided at the Economical Institute. All Institutes suffer from lack of well-qualified staff, equipment and teaching material. For the future these institutes need to be upgraded.

The Royal University of Agriculture provides 4-year bachelor degree. It consists of five faculties: agronomy, animal husbandry, fisheries, forestry and mechanics. This University reopened in 1984 with teaching assistance from the former Soviet Union after it was closed during Khmer Rouge regime (1975-1979). After leaving of Soviet assistance (1990), and since 1991 a new modified curriculum was introduced.

The Prek Leap Agriculture Collage offers 3-year certificate level fisheries training. A new curriculum for the fisheries course was proposed in the Shetty Report (Shetty 1992).

Revision of the fisheries education curriculum has been identified as a matter requiring early attention. Before 1999, the DoF was taking 25-30 graduates each from the Royal University of Agriculture and Prek Leap Agriculture Collage per year and other graduates are absorbed by provincial and municipal fisheries services. . All graduates could directly become the fisheries Officer, while after 1999 they have to pass the examination before becoming the staff of Fishery Department.

To qualify the effective fisheries management and the careful development of inland aquaculture to avoid failure, curriculum revision for the institute should emphasis applied and particle aspects of fisheries management and development. More objectives relating to aquaculture such as fish breeding, feed and feeding strategies, larval rearing, fish nutrition, fish genetics, pond dynamics, aquaculture engineering, fish production and live food production should be lectured to student. In addition to biological subjects, economics, sociology, marketing, preservation, gear technology, basic mechanics and engineering, management, etc., should be emphasized.

Both short-term and long-term training is required by fisheries/aquaculture administration. It is preferable that training be conducted in the country in order to reach a large target group in surrounding familiar to trainees. However, oversea training particularly for more special skill development is likely necessary. The assessment of post-graduate education needs should be considered. Currently several post-graduated fishery student have been attending several countries in Asia, Europe and Australia and at the present the DoF has 33 post-graduated staff already.

For supervisory staff organizational management training should be undertaken. This training, of a short-term nature and covering general, financial and personnel management, will strengthen the administration's management capacity. While capacity enhancement at the technical level is critical, some gains could be lost if the DoF is poorly managed.

Beside the need of fishery graduates, DoF need some staff who graduates from Economical Institute, especially the person who graduates in agricultural economics. At the present time the DoF is taking 3-5 economists per year.

An essential component of human resource development is the drawing-up of career path development profile for staff. This planning approach has district benefit both for the administration and employees. For the administration, such planning enables a better matching of organizational needs and staff development programs. It also provides a mechanism for monitoring staff progress and performance. If well implemented staff have a clearer understanding of proposed education and training programs and progress through the administration. An important feature of such planning is that staff training in specific areas is more likely to stay in those areas after the completion of training.

The development of career path profiles for professional staff requires close liaison with technical units to ensure that technical needs are met. The profile requires periodic revision to cater for changing situation within the administration and to take account of work performance and the personal needs of staff.

Table 1. Staffing and Qualification of DOF and PFO Personal, 2000

Qualification	Department of Fisheries (DoF)	Provincial/municipal Fisheries Office (PFO)	Total
Master Degree			33
Fisheries	30	03	33
Others	0	0	0
Bachelor Degree	217	93	310
Fisheries	176	81	257
Others	41	12	53
Diploma	137	135	272
Fisheries	112	124	236
Others	25	11	36
Certificate	59	150	209
Fisheries	50	93	143
Others	9	57	66
Skill Staff	6	15	21
Fisheries	0	0	21
Others	0	0	0
Sub total	449	396	845
Unskilled Worker	253	459	712
Total	702	855	1557*

Remark: * Total staff 1557: male 1323 and female 235

3.1.6 Management data and information requirement and use

The collection of data and information is not an end in itself but is essential for informed decision-making. It is therefore important for DoF to ensure that the data collected are analyzed correctly, disseminated to where they can best be used, and used appropriately in decision-making. Information is also needed to assure the public at large that resources are managed responsibly.

For DoF, data and information are required at three levels, policy formulation, formulation of management plans, and the determination of management actions to implement the policy and plans. Different types of data collection are needed in different ways. The methods to validate include:

- . Sampling catches for species composition
- . Interview with fishers

- . Checking record books
- . Observer schemes
-

Approaches to collecting data for fisheries management vary substantially, depending on the nature of fishery, the quality staff and facilities available, and the social and economic importance of the fishery. While at this present, quality staff and facilities are not available for data collection this leads that the risks of collecting erroneous or inappropriate data are very high without careful and statistically valid design and monitoring of sampling approaches.

3.1.7 Monitoring, Control and Surveillance

Enforcement of legislation, regulations and policies is a general problem in Cambodia. The problem in fisheries sector was broadly defined to include the abuse of fishing reserves, inundated forests in the inland fishery and mangroves in marine areas, and illegal fishing in the EEZ.

Three factors can be identified as contributing to the deterioration of inland and marine fisheries enforcement. These are limited and inadequately trained staff, scarcity of proper surveillance resource, especially in the marine sector, and the uncontrolled availability and use of weapons by civilians.

Regarding to present fishing activities the use of illegal fishing methods (e.g., fixed and mobile gears and explosives), fishing operation in restricted areas (e.g., inland fishery reserves), and the non-supervision of fish exports are still on-going. Moreover, it should notes that fisheries officers in Cambodia are in a prime position to benefit financially from unethical dealings if they permit fishermen and fisheries entrepreneurs to act unlawfully.

However, Fishery Department has been trying to achieve and improve the inspection strategies in order to against all illegal fishing in both inland and marine areas. Truly, according to report of DoF (first semester, 2000), 1530 illegal fishing cases were prevented (fresh water 739 cases and marine water 791 cases). If compare to first semester last year it is 950 cases higher.

There are 196 people employed in the DoF's four inspection units: one marine and three inland. 63 inspection service employees are employing in the marine unit and the remainder in the inland units. Beside the inspection unit from DoF, in each province and municipal (province and municipal with fishing activities) have also the inspection unit. On the general issue concerning the lack of delineation of responsibly between central, provincial and municipal fisheries administrations, sometime these administrations have overlapping MCS responsibility.

A. Inland fishery

The DOF has three inland inspections units: the Great Lake Inspection Unit, the Mekong River Inspection Unit, and the Chaktomuk Inspection Unit. In the inland fisheries sector the principal inspection activities relate to (i) the enforcement of gear restrictions (e.g., prohibition on the use of mobile gear, removal of fixed gears during the closed season, prevent the use of

Electro-fishing, and fishing with explosives) and, (ii) prohibitions on fishing in the 13 inland fish reserves (usually with mobile gear by fishermen and with explosive by demobilized soldiers).

Small craft (6-9 m) powered by inboard and outboard engines are used for surveillance and enforcement. These craft, of wooden construction, operate as 'day boats'. They are equipped with light arms and portable radios. No other equipment was observed, nor is it likely to be required. Each craft would carry six people.

B. Marine fisheries

The DOF's marine fisheries inspection (MCS) unit is based in Sihanouk Vill). The DOF operates three vessels for marine surveillance and enforcement: two of which are of steel construction and one of wood. The vessels are about 14-15 m in length and have maximum speeds of about 12-15 Knots. They are unable to match the speed of newer foreign vessels operation legally and illegally in the EEZ. Crewing levels on the vessels appears to be about five or six persons.

The marine inspections unit is responsible for surveillance and enforcement along the 435 km of coastline and the EEZ. According to the DOF's report (first semester, 2000), despite its inadequate MCS facilities, the marine unit secured fines totaling Riels 96.61 million.

3.2 Provincial and Municipal administration

Provincial and municipal fishery office is a fishery agency who directly implement in the fishery domain. This agency has no right to create the national fishery work plan or policy but they receive the work plan and policy from the DOF to implement. However, they can take part in creating fishery work plan and policy in DOF. In general the provincial management of provincial/municipal fishery office is depending on whether or not the province has fishing lot or fishery domain. The provincial fishery office of some provinces around Tonle Sap Great Lake, Mekong river basin and Bassac river the activities of fishery office is focusing mainly on inspection and controlling exploitation as well as fish culture in cage. While some provinces such as Kampong Speu, Svay Rieng, Pras Vihea, Mondolkiri where lack of fishery domain, the main activities are focusing on aquaculture.

III. Fishery Cooperation

There are a large number of NGOs that directly, or indirectly, have an involvement with the fisheries sector. In term of their fisheries activities most NGOs have focused on small-scale aquaculture. For technical and other reasons, not all activities have achieved high success rates. Nonetheless, the contribution made to food security by NGO fisheries programs is acknowledged.

MRC Program for Fisheries Management and Development Cooperation comprises the following objectives for the support of the two main sub-sectors (Source report: Annual report of The MRC Program for Fisheries Management and Development Cooperation, 2000)

1. Capture Fisheries and Aquatic Resources: Fisheries management systems established ensuring sustainable economic utilization of the bio-diversity, and national research development institutions meeting the needs for planning, research, management and information dissemination in order to sustain these achievements in a regional cooperation.

Capture Fisheries and Aquatic Resources are reached through a number of Components:

- Management of Fisheries Capture Fisheries of Cambodia
- Management of Reservoir Fisheries in the Mekong Basin
- Assessment Mekong Fisheries – Migration and Spawning and Impact of Water Management
- Strengthening of Inland Fisheries Information Systems

2. Small-Scale Aquaculture Development: Farmers' income raised through development of the potential for economic and sustainable small-scale fish production, and national fisheries institutions meeting the needs for aquaculture planning, research, development and extension in a regional cooperation in order further pursue this goal.

Small-Scale Aquaculture Development are reached through two component:

- Rural Extension for Aquaculture Development in Mekong Delta
- Aquaculture of Indigenous Mekong Fish Species

AIT (Asian Institute of Technology) Outreach: Funding for the implementation of Activities have been secured by the AIT Aqua Outreach Program from the Swedish International Development Co-operation Agency, (Sida).

The wider objective of this project is to increase fish supplies for poor Cambodian families who have to an aquatic resource.

The two immediate objectives are; (i) to strengthen the DOF Aquaculture Office in planning, implementation, monitoring and co-ordination of small-scale aquaculture and rice field fisheries research and development in Cambodia; and (ii) to increase the capacity of the DOF Documentation and Extension Office to produce, collect, store and disseminate information relating to fisheries and Aquaculture in Cambodia.

FAO (Food and Agriculture Organization) involve in participatory Natural Resource Management in Tonle Sap Region Phase I.

SCALE Integrated Aquaculture Programme involve in development of small-scale aquaculture in rural area. Presently, SCALE has been researching the indigenous fish breeding in Tourl Krasang station.

Other NGOs such as PADEK, ADRA and APHEDA is also involving small-scale aquaculture development in some provinces of Cambodia.

IV. Fisheries Organization

1. Establishment of the Department of Fisheries

The agency of the Royal Government of Cambodia currently responsible for the management of the fishery resource is the Department of Fisheries (DOF), under the Ministry of Agriculture, Forestry and Fisheries (MAFF).

The Department of Fisheries is led by a Director who is responsible for the overall strategic management of the Department of Fisheries including technical and management responsibility, and assisted by two Vice-Directors.

2. Role and function of Fisheries Department

The key role and responsibility of DOF is "To management both the freshwater and marine capture fisheries and aquaculture development of Cambodia to meet anticipated and actual market requirements on a long term economically viable and ecologically sustainable basis"

This key role can then be broken down into separate parts:

- Managing operations (which includes implementation, monitoring and evaluation of activities and projects);
- Managing people (which includes recruiting people, developing co-operation between people, and allocating, monitoring and evaluating work);
- Managing resource (which includes the management of finances and resource such as boats and fuel);
- Managing information (which apart from general operational information includes research: the identification of information needs and the subsequent collection, storage and analysis of information, used to policy making i.e. decisions on how to manage the Department).

The functions and responsibility of the Department of fisheries are to:

- Conserve, manage and sustainably develop all fisheries resource in fishery domain;
- Implement of national social-economic plan and government policy;
- Prepare and implement fishery management and fishery development;
- Prepare legislative draft and norm as may be required and control implementation of international obligation, and review and revise this law appropriate;
- Create statistic system relating fisheries;

- Conduct, cooperate or arrange for research and extension on fishery science economics, socio-culture, and technical and other aspect of fishery management;
- Coordinate and manage fishery monitoring, control and surveillance and enforcement of this law;
- Cooperate economics, science and fishery techniques with other agencies, non-government organizations, international organizations in country and in the world;
- Provide fishery skill to government officers, fishermen and aquaculturists;
- Manage and develop aquaculture;
- Formulate procedures for inland fishing lots including bidding system, burden book, determining cost of rental fishing lot and determining rental cost of protecting freshwater fishery domain and rental cost of marine fishery domain;
- Determine all live or death of aquatic animal species and aquatic plants in fishery domain;
- Determine demarcation line, manage, improve, protect and determine the regions, where allow to use in fresh and marine water fisheries domain;
- Monitor and control the use of fishery domain as being appropriate;
- Control the exploitations, transportation, trade and import and export of fish and fishery products, processing places, selling places of fishery products, aquaculture farms and inundated forest in fishery domain;
- Search illegal fishing and solve all illegal fishing with a special case and law, oppose illegal fishermen and oppose or destroy all illegal evidences;
- Protect endangered species of fisheries resource;
- Issue licenses and other permissions for fishing activities;
- Income from rental of fresh and marine fishery domain, fine, selling evident gears of illegal fishing and from productions, exploitations, trades of fishery products;
- Carry out other function necessary to implement this law.

3. Organization Chart of DOF

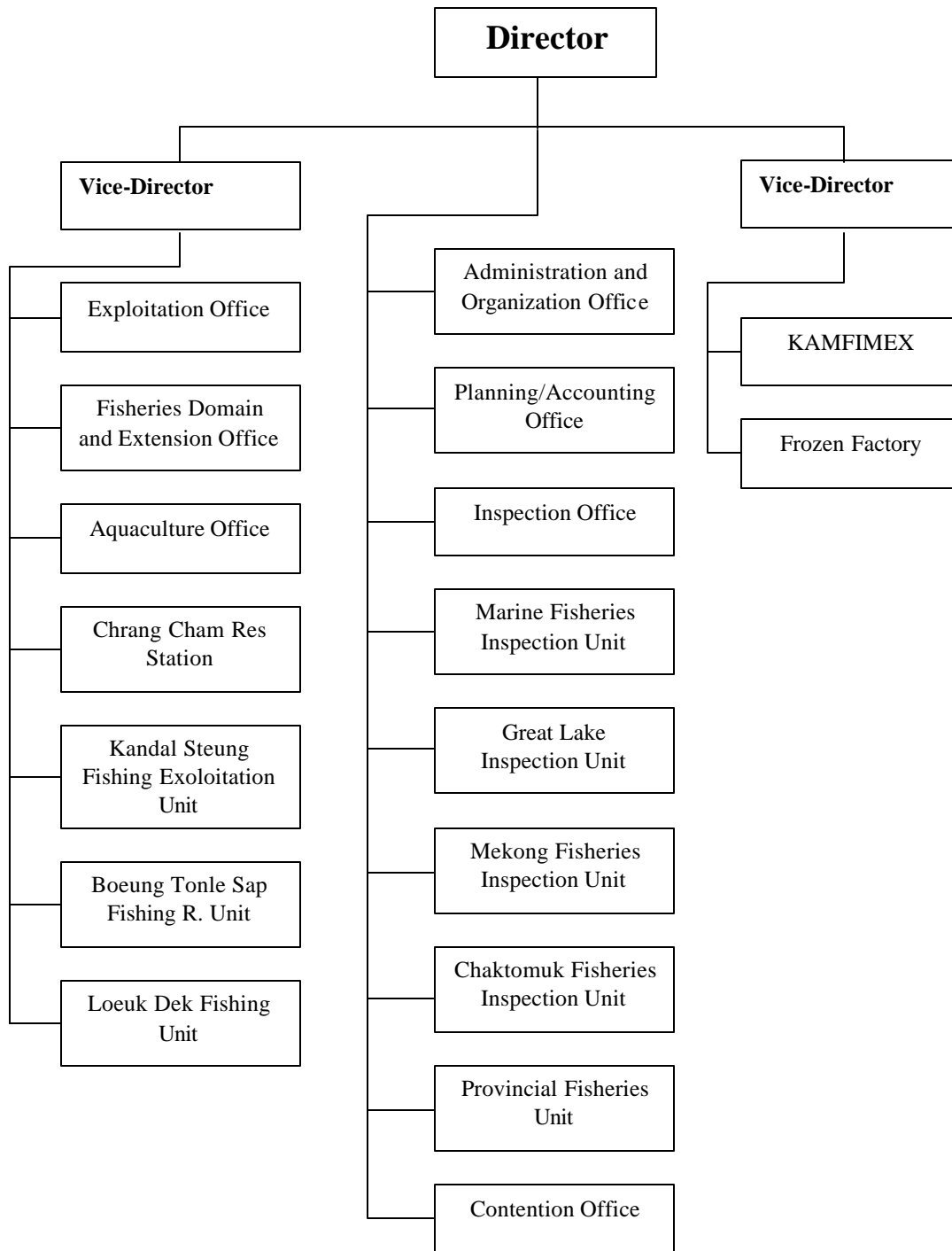
Ministry of Agriculture Forestry and Fisheries (MAFF) has recently undergone restructuring and is now headed by Minister who is assisted by a 2 Secretary of State and 6 Under Secretary of states, one of which is responsible for fisheries.

The Department of Fisheries is headed by a Director and assisted by two Deputy-Directors. The Department of Fisheries is subdivided into 7 offices for management and administration, 1 Fisheries Research Station, 1 Fisheries Import Export Company (KAMFIMIX) and a number of state enterprises dealing with fishing exploitation. The 6 officers, the research station and the Fishery Company are:

- 1- Personal and Organization Office
- 2- Planning and Accounting Office
- 3- Fisheries Exploitation Office
- 4- Contention Office
- 5- Inspection and Law Enforcement
- 6- Fisheries Domain
- 7- Aquaculture Office
- 8- The Chrang Cham Res Fisheries Research Station; and
- 9- The KAFIMEX (Kampuchea Fishery Import Export Company)

Each of office has a chef of bureau and is assisted by 2 to 3 vice-chiefs. Individually, the Aquaculture Office has a Vice-Chief only because this office has just been created, however, this vice-chef will be promoted soon as bureau chief.

With regard to control and law enforcement responsibility, the Fisheries Department divides into 4 inspection units: the Marine Inspection Unit, including 6 coastal provinces (Koh Kong, Kampot and Sihanouk ville), The Mekong Inspection Region (Kratie, Steung Treng, Kampong Cham), The Chaktomuk Inspection Region (Phnom Penh, Kandal, Prey Veng, Svay Rieng, Takeo and Kampong Speu) and Great Lake Inspection unit (Kampong Chhnang, Pursat, Battambang, Banteay Meanchey, Siem Riep and Kampong Thom).



Organization Chart of the Department of Fisheries

According to the Chart of DOF, The Director directly control some offices such as:

- Administration and Organization Office;
- Planning and Accounting Office;
- Contention Office;
- Inspection Office;

- Provincial Fisheries Office

Vice-Director is an assistant of Director and is given some responsibilities. Among of two Vice-directors, one Vice-Director is responsible for technical fisheries section such as:

- Exploitation Office
- Fishery Domain Office
- Aquaculture Office

- Fishery Research Station
- Kandal Steung Fishery Exploitation Research Unit
- Boeung Tonle Sap Fishery Exploitation Research Unit
- Leuk Dek Fishery Exploitation Research Kandal Steung Fishery Exploitation Unit

Other Vice-Director is responsible for Fishery Exploitation Section such as:

- Import - Export Company
- Frozen Factory N. I

4. Roles and Function of Individual Office and Unit within DOF

4.1 Role and function of individual offices within DOF

4.1.1 Administration and Procurement Office

Role:

Manage all resource (other than financial) within the DOF in other to achieve the key role of the DOF.

Function and Responsibility:

- Assign the process of formal letter in and out;
- Prepare and organize meeting, training, workshop and ceremonies;
- Prepare work schedule of DOF and help and challenge all implementations;
- Summarize the meaning of different document for submitting to leaderships;
- Copy official letter and disperse
- Manage internal affaire within offices and relation institution;
- Care and repair building, transportation way and equipment used in DOF;

- Supply office material; living's officers, staff and workers in DOF; and address all guests;
- Control the use of stationary and consumable materials used within the DOF;
- Maintain and control all reports and documents;
- Monitor and control cleaning service within properties of DOF to maintain hygienic for staff;
- Create, monitor and control internal role and security;
- Manage and monitor the on-going implementation of offices and unit;
- Control all offices, staff and workers in DOF and other Units;
- Plan and propose plan within DOF;
- Manage salary.

Structure

Administration/procurement is divided in sections:

- Formal section
- Supply and maintenance section
- Security section
- Procurement and training section
- Salary section

Administration/procurement Officer

Total fishery officers under the Administration office are 35 (male 23 and female 12)

- Post-graduate :03 people
- Under-graduate :08 people
- Diploma : 01 person
- Certificate :08 people
- Skill-worker :03 people
- Unskilled-worker :12 people

4.1.2 Planning, Accounting and cooperation Office

Role

- Manage all operational finance within the DOF in order to achieve the key role of the DOF.

- Audit all activities carried out within the DOF to achieve its key role;
- Facilitate the cooperation between the DOF and national and international bodies in order to achieve the key role of the DOF.

Functions and responsibilities

The function and responsibility of Planning/accounting office are:

- Make report of fishery activities;
- Make plan for all fishery offices and institutions;
- Manage and control fishery statistics;
- Determine cost for fishery instruments and materials and for fishery products;
- Monitor and note down the cost of fishery products and fishery instruments in private market in and out countries;
- Search and control all contracts of units within DOF;
- Manage construction of Fishery Department and units within DOF;
- Manage and coordinate cooperation with internal or external units;
- Manage equipment, materials and fuel;
- Monitor and control input and output of materials, equipment and fuel of the department, its unit-enterprises and provincial/municipal fisheries office;
- Advise and control the activities of the accountant and financial affairs of the Department and its units-enterprise and the provincial urban fisheries officers;
- Manage and inquire the inventory of the Department;
- Sum the accountant statements of the Department and its units-enterprise;
- Charge rental of fishery domain and debts;
- Examine the file of stocking licenses, permission to establish the fishery shop and transportation licenses; and
- Manage traffic of fishery products.

Structure

Planning and accounting office divide into four sections:

- Statistic report section
- Planning section
- International cooperation section
- Financial section
- Accounting section

Fishery Officer of planning / accounting office:

Total government officers, staff and workers of planning/accounting office are 60 (male 40 and female 20):

- Post-graduate : 07 people
- Graduate : 42 people
- Diploma : 06 people
- Certificate : 02 people
- Unskilled : 03 people

4.1.3 Exploitation Office

Role

Manage all operational aspects of fishing exploitation activities

Functions and responsibilities

Exploitation office has functions and responsibilities as following below:

- Prepare document procedures of each fishing lot;
- Study and publish burden book for each fishing lot;
- Fix the rental of fishing lots for bidding;
- Set price for fish catch in protected freshwater fishery domain by type and size of gear;
- Draft the announcement of the fishing lot auction and organize auction;
- Examine the auctioning report;
- Examine the renting and re-renting contract for fishing lots;
- Check payment of fishing lot;
- Examine and resolve other conflicts with respect to fishing operation within fishery domain;

- Study and research the exploitation condition within fishery domain; and
- Examine the file of fishing license and permission to use fishing boats.

Structure of the exploitation office

Exploitation office divides into three sections:

- Exploitation of Tonle Sap Great Lake section: includes Kampong Chhnang, Pursat, Battambang; Bantheay Mean Chey, Siem Riep and Kampong Thom province.
- Exploitation of Mekong River section: includes Phnom Penh, Kandal, Kampong Speu, Prey Veng, Svay Rieng, Cratie, Steung Treng, Takeo and Kampong Cham province.
- Marine exploitation section: includes Kampot province, Sihanuk vill, Kep vill and Koh Kong province.

Exploitation Officer

The total Government officers, staffs and workers of Exploitation office are 56 (male 32 and female 24):

- Post-graduate : 06 people
- Under-graduate : 32 people
- Diploma : 14 people
- Unskilled : 04 people

4.1.4 Fishery Domain and Extension Office

Role and responsibility

1. Fishery domain section has role and function as showing below:

- Study and research the establishment or cancellation of fishing lots, reserve fishery area for people, reserve area for spawning and inundated forest of the fishery domain;
- Study, draw and adjust the fishery map, and demarcate the boundary of the inland fishery domain and inundated forest of the marine fishery domain;
- Study and research the geographic condition of the fishery domain and its relevant canal systems;

- Repair and plant forest in the fishery domain;
- Prepare the reconstruction of the fishery domains where is shallow;
- Prepare places for fish feeding ground and fish spawning;
- Study and research lands which allow to cultivate in the fishery domain;
- Check proposal of rice cultivation, garden or constructions.

2. Research section:

- Explore and stop factors that cause water pollution in both fresh and marine water in order to improve fishery stock;
- Identify the name of fishing gear;
- Research type, size, and number of fishing gears allowed for appropriate exploitation in the fishery domain;
- Study and research fish processing technology for export;

3. Extension section:

- Publish and extension document technology of fishery science by poster, booklet or newsletter;
- Make fishery calendar;
- Manage library of fishery science document;

Structure of fishery domain and extension

The office divides into 3 sections such as:

- Fishery domain section
- Research section
- Document and Extension section

Fishery officer under fishery domain and extension office

The office has totally 70 staff (male 62 and female 08):

- Post-graduate : 05 people
- Under-graduate : 52 people
- Diploma : 07 people
- Certificate :01 people

- Unskilled : 05 people

4.1.5 Aquaculture, documentation and extension Office

Aquaculture office is a new office formulated by DOF. Before the year of 2000 this office was a part of domain fishery office. The office is divided into three sections such as Research and development section, planning and cooperation section, and training, extension and information.

Role and functions of Aquaculture office

- Research and development section
 - Achieve and develop freshwater aquaculture, brackish water aquaculture and marine water aquaculture;
 - Research aquaculture technologies;
 - Research area where is allowed for aquaculture activities;
 - Research and control waste, toxicity and inorganic material from aquaculture farms;
 - Research on aquatic animal and plant in both indigenous and exotic species for aquaculture;
 - Experiment and analyze fish disease, aquatic animal disease and plant disease;
 - Control and analyze the qualitative products.
- Planning and cooperation
 - Make relationship on experience and research with fishery stations;
 - Plan for all type of aquaculture development;
 - Collaborate with national and international institutions and organizations involving in aquaculture;
 - Control permission letter that allow to do aquaculture and process of aquaculture products;
 - Control and manage aquaculture exploitations; and
 - Achieve the implementation of aquaculture law.
- Training, extension and information

- Publish and make extension the technical report;
- Organize training on scientific technology of aquaculture;
- Collect data and information of aquaculture;
- Do extension and develop the management of fish in rice field and reservoirs; and
- Make and announce the official letter that relates aquaculture management.

Fishery Officer of Aquaculture office

The number of staff in Aquaculture office is totally 46 (male 38 and female 8), and this number is divided in different grade such as:

- Post-graduate :9 people
- Under-graduate :28 people
- Diploma : 6 people
- Certificate : 2 people
- Skilled : 0
- Unskilled : 1 people

4.1.6 Contention Office

Role and function of Contention office

The role and function of contention office are as following below:

- Register all the accused file of the delinquents;
- Execute and push the execution of the decision on the punishment of a fine and on welling the confiscated proof;
- Sum the statistics of fishery violation solution, income from the fine and selling the proof confiscated;
- Advise the provincial-urban fishery offices on the procedure to solve the transgression;
- Formulate a file of the accusation of delinquent for punishing by fining or sending to the court;
- Examine all the files of the fishery law violations and resolve them

Structure of contention office

The contention is divided in two sections such as:

- Moderation section
- Record section

Fishery officer of contention office

The contention office has totally 19 staff (male 06 and female 13):

- Under-graduate : 05 people
- Diploma : 05 people
- Certificate : 03 people
- Unskilled : 06 people

4.1.7 Inspection OfficeRole and function of inspection office:

- Research the fishery violation in the Kingdom of Cambodia;
- Inspect all type of fishery exploitations within freshwater and marine water fisheries domain, processing places, and aquaculture farms;
- Inspect the transportation, storage and shop of fishery products;
- Inspect the transportation, storage and shop of forest product in fishery domain;
- Record about the fishery law violation;
- Arrest delinquent and withdrew or destroy all proofs in case of authentic deed;
- Advise and control activities of the fishery inspection unit on inspection of fishery law violation;
- Sum the fishery law violations

Structure of inspection office

Inspection office is divided in 2 sections such as:

- Freshwater inspection section
- Marine inspection section

Fishery officer of inspection office

The total number of government officer, staff and worker of the inspection office are 64 people (male 58 and female 06). The number is classified by the grade as showing below:

- Under-graduate : 14 people
- Diploma : 29 people
- Certificate : 05 people
- Skilled : 0
- Unskilled : 16 people

4.2. Fishery Inspection divisions

Fishery inspection section consists of four units such as: Mekong capture fisheries unit based in Kampong cham, Chaktomuk capture fisheries unit based in Phnom Penh municipal, Great Lake capture fisheries unit based Pursat and Marine capture fishery unit based in Sihanuk municipal.

Role and function

- Inspect all exploitation activities within the DOF freshwater and marine water domain;
- Inspect the transportation, processing places, storage and shop of the fishery and forest products in the fishery domain;
- Make minute on the evident transgression and bulleting of the delinquent biodata;
- Arrest illegal fisherman and withdraw or destroy the evident in case of authentic deed;
- Achieve and control the implementing inspection of the provincial and municipal fishery office; and
- Summarize the activities of the fishery law.

Structure of Fishery Company

The structure of fishery inspection section is divided into two sub-sections such as: inspection and moderation sub-section.

Fishery officer of inspection section

There are 196 staffs in the fishery inspection section and these staff is divided according to the grade and inspection unit such as:

- Chaktomuk Inspection Unit
 - Under-graduate :6 people

- Diploma : 13 people
- Certificate : 13 people
- Skilled : 0
- Unskilled : 14 people

Total officer, staff and worker: 46 people

- Mekong Inspection Unit

- Post-graduate : 0 people
- Under-graduate : 2 people
- Diploma : 10 people
- Certificate : 4 people
- Skilled : 0
- Unskilled : 6 people

Total officer: 22 people

- Tonle Sap Great Lake Inspection Unit

- Post-graduate : 0
- Under-graduate : 6 people
- Diploma : 24 people
- Certificate : 9 people
- Skilled : 1 people
- Unskilled : 25 people

Total officer: 65 people

- Marine Inspection Unit

- Post-graduate : 0
- Under-graduate : 14 people
- Diploma : 10 people
- Certificate : 4 people
- Skilled : 0
- Unskilled : 35 people

Total officer: 63 people

4.3 Fishery Research Station

Freshwater fishery research station is a scientific research section under the DOF and the level of station is equal to fishery office within DOF. The location of the station is in Chrang Chamres, Phnom Penh.

Role and function

- Make plan for the fishery research work and producing aquatic animal and plant seed;
- Make plan for co-operation in research work, the finance and implementation of advanced planning;
- Conduct the training on fishery technologies to all government staff and student;
- Research scientific technology of fisheries in fishery domain;
- Research scientific technology of Aquaculture;
- Produce aquatic animal and plant seed and sell to clients;
- Publish of the research results; and
- Advice to DOF in preparation and improvement of fishery domain and extension of fishery scientific technologies.

Structure of Fishery Research Station

The structure of freshwater fishery research station is divided into 4 sections:

- Administration section;
- Planning and accounting section;
- Research section;
- Aquaculture section

Fishery officer of the station

The total fishery officer, staff and worker of the station is 24 and these is classified according the grade level such as:

- Post-graduate : 0
- Under-graduate : 2 people
- Diploma : 3 people
- Certificate : 3 people
- Skilled : 0
- Unskilled : 16 people

4.4 Exploitation research division

Kandal steung and Tonle Sap exploitation unit is under the DOF and the level of this unit is equal to provincial and municipal fishery office. The location of Kandal steung exploitation unit is based in Prek Phnov commune, Ponhealue district, Kandal province and Tonle Sap exploitation unit is based in Anlong Tnaut commune, Kroko district, Pursat province.

Role and function

- Make plan for exploitation, finance and comply the national plan;
- Research on scientific technology, which is pointed by DOF.
- Organize training on fishery exploitation to worker and officer within unit;
- Provide information of fishery exploitation activities especially illegal fishing within unit to DOF;
- Exploit fish in the main fishing lot in order to control the traffic of fish and preserve the fishery resource.

Structure of exploitation unit

The structure of exploitation unit comprise of:

- Administration unit;
- Accounting and planning unit;
- Exploitation and research unit.

Fishery officer of Kandal steung and Tonle Sap exploitation unit

- Kandal steung exploitation unit: have totally 13 staffs
 - Under-graduate : 1 person
 - Unskilled : 12 people
- Tonle Sap exploitation unit: have totally 27 staffs
 - Unskilled staff : 27 staffs

4.5 Fishery Company (KAMFIMEX)

Fishery Company (KAMFIMEX) is a fishery trade section under direct control by DOF. The chef of this section has the same level as the chef of office within DOF. The location of this section is based in DOF and is led by a chief and two vice-chiefs.

Role and function of Fishery Company

- Plan the fishery business in country and export-import fishery gears and materials from oversea;
- Plan the finance;

- Organize research program for upgrading the quality of fishery products;
- Organize training program for upgrading its own manager, staff and worker in fishery trade;
- Collect and buy the main fishery products from provinces and cities including freshwater and marine water;
- Distribution the fishery products for local demand;
- Export fishery products and exchange the foreign currency; and
- Import the fishing gears and materials for local demand.

Structure of Fishery Company

The structure of Fishery Company is divided into six sections:

- Administration/procurement section
- Planning/accountant section
- Purchase and distribution section
- Transportation section
- Research section
- Storage section

Fishery officer of Fishery Company

The total number of fishery officers of Fishery Company is 69 (male 51 and female 18) and is classified by the graded as showing below:

- Post-graduate : 0
- Under-graduate : 3 people
- Diploma : 9 people
- Certificate : 5 people
- Skilled : 2 people
- Unskilled : 50 people

4.6 Frozen Fishery Industry N^o 1

Freezing factory of fishery product is under the DOF and the level of this factory is equal to the fishery office within DOF.

Role and function

- Make plan for the production of frozen products, the finance and comply the national plan;

- Research on the use of frozen instruments and frozen fishery product technologies;
- Research on preservation quality of fishery product and others;
- Organize the training program for upgrading the own staff;
- Provide service in freezing and storing the fishery products and others;
- Collect, purchase the raw material as fishery products for freezing and sell them to the Fishery company and clients;
- Produce ice for self supply;

Structure of Frozen Industry

The structure of frozen industry consist of seven sections:

- Administration section;
- Planning and accounting section;
- Processing section;
- Machinery section;
- Qualitative control section;
- Collect and sell section; and
- Storage section

Fishery officer of frozen factory

The total officer, staff and worker of the Frozen factory is totally 24 (male 8 and female 16):

- Under-graduate: 2 people
- Skilled staff : 1 person
- Unskilled staff : 21 people

5. General Job Description of Personal within DOF

All fishery office within DOF is headed by a chief of bureau and 2 vice-chiefs and the responsibility of chief and vice-chief are pointed as following below:

- Chief of office is responsible for all activities of own office and report to director of DOF.
- Vice-chief is an assistant of chief and responsible for some activities within own office.

The general job descriptions of personal within office in DOF:

- Role and function of office chief

- Representative of all sections within office;
- Control all sections within office;
- Manage preparation and on-going of all sections within office;
- Control implementation of sections;
- Advice to officers and staff within own office;
- Check work report of sections within own office;
- Report on work activities to high range person of DOF; and
- Organize training on policy and law for upgrading the officer and staff within own office.

- Role and function of vice-chief
 - Representative of chief;
 - Implementation and have a role in decision of some main work;
 - Report on the section activities to chief;
 - Advice and train on policy and law to staff within own office.

- Role and function of section chief
 - Prepare and comply the work within own section;
 - Manage work within own section;
 - Control work activities of staff and worker;
 - Upgrade and resolve life for staff and worker;
 - Advice and train on policy and law to staff and worker within own section;
 - Search and solve case that cause inactive work within section;
 - Develop own section;
 - Report on activities within own section to chief.

- Role and function of staff and worker
 - Direction implementation

6. Structures and Function of Provincial/Municipal Fishery Office

6.1 Structure of provincial/municipal fishery office

Provincial and municipal fishery office locates in province or city and is under the own provincial/municipal agriculture department and under the horizontal line of the DOF. The role of provincial and municipal fishery office is to manage fishery activities within own province/city.

The structure of provincial/municipal fishery office



With the structure showing above the inspection and exploitation section is not include for some provinces where lake of fishery domain area such as: Svay Rieng, Kampong Speu, Pras

Vihea, Mondolkiry and etc. The provincial/municipal fishery office is led by a chief of bureau and assisted by 2 vice-chiefs. These chiefs are nominated by DOF and under the proposal of provincial agriculture department.

6.2 Role and function of provincial and Municipal Fishery Office

The provincial and municipal fishery office has roles and functions as following below:

- Make plan and objectives of fishery development and comply plan of DOF;
- Implement and control all official norms relating with management in provincial or municipal fisheries.
- Prepare, improve and preserve the fishery domain within own province/city;
- Research and do extension of the fishery scientific technologies and processing technologies;
- Organize training on the fishery skill to staff, worker, fishermen and aquaculturist;
- Collaborate with provincial/municipal authorities on fisheries;
- Control type, size and number of fishing gears which are allowed to use in the fishing lot and fishery domain within province or city;
- Inspect and stop the illegal fishing gears;
- Formulate cost of fishing gear, fishing material and fishery product;
- Determine aquatic animal and plant;
- Research and record statistics in relation to fisheries;
- Formulate procedure for bidding the fishing lot and burden books;
- Search the allowable areas in fishing lot for growing flooded forest;
- Research the fishery exploitations and fishery products within province or city;
- Control transportation; storage, selling shop of fishery products and aquaculture farms;
- Control transportation; storage, selling shop of inundated forest in the fishery domain;
- Control the illegal fisheries and resolve illegal fishing, and in a special case and law arrest delinquent and confiscate or destroy proofs;

- Income from renting the fishery domain in both fresh and marine water, fine, selling proofs of illegal fishing and from other activities;
- Advice to sections within own responsibility on fishery skill and control the implementations; and
- Lead directly the sections and control the implementations.

6.3 Fishery officer, staff and worker of the provincial and municipal fishery office

The number of fishery officer, staff and worker is totally 855 and these numbers is classified according to the grade:

- Master :03 people
- Under-graduate : 93 people
- Diploma : 135 people
- Certificate : 150 people
- Skilled staff : 15 people
- Unskilled : 459 people

V. Constrains and further Development of Fishery Management and Fishery Organization

1. Fishery development policy

1. Increase the fishery products through increasing aquaculture aspects in the places, where are suitable for fresh and marine water fish raising in order to bring the adequate production to support food for local people and export in term of increasing the national income.
2. Manage, preserve and develop the fishery resource sustainability through the encouragement of authority and community base to cooperate the management of fishing lot, fishery ground and in order to enhance the endangered fish species.

2. Fishery development plan

The DOF, in its 5-year plan will develop production projection for the fishery sector from 2001-2005 (Table...). In the discussion with officials, it was clear that food security is the cornerstone of national fishery policy, and that the maintenance of production levels in inland fisheries and the development of small-scale aquaculture, are seen as crucial elements of this policy.

Table 2 Projected production in the Five Year Plan

Description	Unit	Year				
		2001	2002	2003	2004	2005
Total production	Tones	304,000	325,000	346,000	365,000	383,000
Freshwater fish		247,000	255,000	263,000	268,000	273,000
- Industrial fisheries	-	72,000	74,000	75,000	75,000	75,000
- Family fisheries	-	128,000	132,000	136,000	138,000	140,000
- Rice field fisheries	-	47,000	49,000	52,000	55,000	58,000
Marine fish	-	37,000	40,000	43,000	47,000	50,000
Aquaculture: - fish	-	20,000	30,000	40,000	50,000	60,000
- Crocodile	Heads	22,000	25,000	28,000	32,000	38,000
Export: - fish	Tones	45,000	50,000	55,000	60,000	65,000
- Crocodile	Heads	8,000	12,000	17,000	22,000	28,000

To succeed this plan what we should identify and correct is concerning on the constraints of the past years of fishery activities and the recommendation of further development plan and policy.

3. Constraint and recommendation

3.1. Inland capture fisheries

Inland capture fisheries production in the backbone of the country's fisheries sector. However, environmental concern and rising levels of fishing effort, partly as a result of population resettlement, are affecting the productivity of inland resource.

The capture fishery is still expanding in terms of boat numbers and illegal fishing gears. The high intensity of fishing pressure on large fish results in large fish species becoming increasingly rare. This can gradually to a decrease in the level of recruitment as it may affect the numbers of mature fish stocks.

Main's impact on land and water environments has increased over the last 100 years (FAO, 1993). The increasing siltation of the Great lake can be seen as a direct result of watershed degradation through deforestation of parts of catchments, conversion of deforested lands to agricultural use, which, especially on marginal lands, increase soil erosion.

Floodplain fishery resource have been subject to over exploitation, which has been further aggravated by poor recruitment of fish due to a number of constraints on the environment such as increase the erosion and destroy the spawning and feeding ground for fish.

Inadequacy of knowledge about the fish behavior, habitats and stocks is another constraints together with little control over the use of gears and poor enforcement of regulation.

Present data collection is not sufficient for scientific management of inland fish stocks. Lack of knowledge of fish biology, ecology, and their dynamics results in a poor understanding of the reasons behind recent changes in fish stocks.

To maintain the sustainability of inland fisheries, and to place fishery management on right way, the FAO (1993) and other authors has identified the recommendation as following below:

- Identify the boundaries of fisheries domain, inundated forest and fishing area for the family scale fisheries exploitation;
- Plan and protect areas of inundated forest for the integrated environmental protection of fish breeding, nursery, and feeding ground;
- Strengthen human resource through training and establishment of an inland fishery research station to coordinate applied research for planning and management purpose;
- Establish the inland fisheries research station;
- Enhance the people for participating in conservation and protection of fisheries resource;
- Strict enforcement of regulation prohibiting of immature or breeding stock;
- Establish the system for monitoring, Control and Surveillance (MCS);
- Research the biological and environmental factors which determine the fisheries production in the Great Lake, Tonle Sap and the Mekong/Bassac system;

3.2. Marine captures fisheries

The DOF recognizes the potential of marine fisheries as a means of generating foreign exchange, providing income for small-scale and industrial fishermen, and of meeting a proportion of the population's protein requirements.

The constraints of management and development of marine fisheries is identified by the following considerations:

- Over-exploitation of inshore resource and little exploitation offshore resource by Cambodian fishermen;
- Unregulated development of coastal areas and environmental degradation (destruction of mangroves);
- Lack of catch, effort and general economic data and a research capacity to support the institution of management measures;

- Weak MCS capacity to provide effective surveillance and enforcement of fishing activities within the EEZ and to ensure that fisheries management measures are observed;
- General non-availability of affordable credit to enable fishermen to re-equip and to shift their operations to offshore area;
- Poor coastal infrastructure to service fishing vessels (e.g., road, port, facilities, fuel, water and ice) and to receive and distribute catches for internal markets and for export. Existing facilities are of a poor standard and generally inadequate.
- Under-developed domestic markets for marine fish and fish products.

(Source of information, FAO, 1993)

To realize the full potential of the marine fisheries sector for the benefit of Cambodia, to secure sustainable resource use and to enhance fishery management, the recommendation from FAO (1993) and other authors believes that consideration should be given to the adaptation of the following measures:

- Maintenance of current gear restrictions being used in the marine domain by supporting the training on fishery law to fishermen, and supporting the new vessels for marine surveillance and enforcement to marine inspector in order to control all fishery activities;
- Creation of strategically located marine reserves where all fishing is prohibited so that fish can breed and have a protected nursery areas;
- Identification of boundary of mangrove forest in province and city along the coastal areas;
- Strengthening of the administration's MCS capacity in maritime areas so as to ensure that illegal fishing practices do not undermine management and development efforts;
- Upgrading the coastal infrastructure to receive, process and distribute marine fish and fishery products currently (e.g., construction of Sihanoukville Marine Fishing Port);
- Enhancement of fisheries data collection, processing and interpretation should be designed to address current data constraints in marine fisheries;

3.3. Aquaculture

The DOF has a policy to push the development of aquaculture as a mean to compensate the low production from the catch. According to the report from DOF from the year 1996 to the

year 2000 the cultured production increased from 9,600 to 15,000 tones. Between 2001 to 2005 the DOF propose to plan the cultured production between 20,000 to 60,000 tones of fish and between 22,000 to 38, 000 heads of crocodiles.

Inland cage culture of high-valued species (Pangasids and Snakeshead and others) is officially encouraged by DOF. However, production will be principally for urban consumption and, in the case of surplus production, for export.

With respect to coastal aquaculture (marine fish cage culture and shrimp culture) the Department of Fisheries is committed to a policy of sustainable production. This is in contrast to intensive production that can have serious environmental consequences as experience in Taiwan or Thailand. Industrial shrimp culture has already been established in Koh Kong, Kampot since 1988 by Thai investors (Nam, 1999 and FAO, 1993). These intensive culture activities cause large destruction of mangrove forests, either for shrimp farm construction or charcoal production. Recent reports indicate that area of mangrove forests, estimated at 37,000 ha, could have been reduced by as much as 50% (Nam, 1999). Moreover, shrimp farming resulted in disease outbreak and self-pollution leading from effluents. Even, there appears to be some disagreement in the administration about benefit and hazards of intensive shrimp culture development, it is generally agreed that the intensive approach should be discouraged because of its strong dependence on external inputs and its irreversible environment impacts in the longer term.

Poor farmer has adopted small-scale fish culture with low input. Efforts are now being made by a number of international organizations (e.g., PADEK, AIT/DOF, SAO, READ-MRC/DOF, etc.) to train farmers in fish culture with emphasis on overcoming the problems commonly encountered. High clay content of the soil, lack of seed, low market price with exotic species and poor knowledge on culture technologies has been faced by farmer. Farmers prefer local species. There are quite a number of local species in the Mekong River, which could be utilized to tap the different types of food available in the pond.

Aquaculture development in Cambodia faces the following major constraints:

- Lack of fish feed/feed ingredient for a significant expansion of traditional cage/pen culture of carnivorous/omnivorous fish species;
- Lack of seed for fish species suitable for low-input pond and rice/fish culture method;
- Inadequate knowledge on the induced breeding and larval rearing methods of indigenous fish species preferred by the local population;
- Most fish seed species is based on wild that cause reduction of wild seed;
- Destruction of mangrove area for shrimp farm and waste from the farm have been discharged into environment;

In terms of strategies, aquaculture development in Cambodia must be a step-by-step

process based on continuing administration support and long-term commitment on part of donor agencies. Intergovernmental and non-governmental implementation agencies must play a substantial role considering the general lack of professionally trained and experienced national experts.

Low-input pond and rice/fish culture systems producing cheap food fish, accessible to the rural poor. Preferred indigenous fish species must be researched and promoted in order to replace the exotic species. The most promising approach is to establish (i) a national applied research and training center for inland aquaculture, (ii) a network of fish seed production centers in key provinces, and (iii) and efficient professional extension capability trained at the national center and attached to the provincial seed production centers.

Chraing Chamres station should be upgraded for researching and providing the new scientific technologies of aquaculture. Bati station and SAO station should cooperate with Chraing Chamres in order to share the activities relating the research work and network. Other medium or small station, which assisted by NGOs, should be upgraded and kept as network of fish seed production center nationwide.

Once the national applied research/training center is upgraded, the technical development work (species selection, stocking density, disease analysis and etc.) can be accommodated. The fish seed for cage based in wild could be replaced by produced seed at the station, this can recruit the wild stock.

Regarding to the coastal aquaculture, social problems and environmental damages must be avoided in Cambodia and the best method to achieve this is through preparation of a multi-sectored coastal development plan, which clearly establishes areas that can be set aside as protected mangrove or marine areas in order to maintain the ecological balance of the coastal zone. The semi-intensive or extensive system is promoted in order to reduce the waste discharge into the environment. Consider to the owner of farm and expert and/or worker, we observe that most are foreign people; they do not care about the environment. What author should suggest to the DOF to make agreement before providing the license to investor.

3.4. Legislation

The fishery legislation that was administrated by DOF since 1987 should be revised. Such a revision is necessary primary for two reasons. There are to reflect political and economic, and update and extend it. However, the DOF have been developing but not yet finish.

A number of constraints were identified by the FAO (1993) that impede the administration of fisheries legislation and reduce its effectiveness as a tool for management and development. These constraints include:

- The decentralization structure of fisheries administration involving central, provincial and municipal fisheries services. The relationship and responsibility between these administrations are not clearly defined. Moreover, the relation does not cater adequately for a decentralized system of administration;

- The efficiency of legislative enforcement is poor and as a consequence, fisheries management is weak;
- A lack of adequate physical means to enforce legislation, especially in the marine sector. This situation adversely affects the morale of fisheries personal, and
- A lack of appreciation and understanding have the rational, and need for, certain key conservation measure of the legislation both by fishermen (e.g., importance for inland reserves), and possibly even by some fisheries personal.

3.5. Fishery administration

The administration that structural and policy change are required to strengthen the capacity of the DOF to better management, control and develop the fishery sector. It is believed the fishery administration is still weak that inhibits the fisheries administration in the execution of its mandate. The constraints include:

- A lack of policy delineation on the roles and responsibilities of the central, provincial and municipal fishery administrations, and sometime duplication of effort;
- Major difficulties in the collection and analysis data. Where data is collected at the provincial level it is often not submitted to the central administration in a timely manner or on a regular basis and some figure is hidden;
- Poor fisheries management performance and a lack of effective enforcement; and
- Poorly qualified staff, even those with tertiary qualification who lack experience, and limited facilities and opportunities for staff development and training.

3.6. Fishery organization

The constraints should be identified is that:

- Some office name could not be recognized by the fishery institution in the world such as: Exploitation office. It seems that the Department of Fishery is doing a business with fisheries, but in the reality this office has the role and function to control all fishing technologies used and fishing lot in term of fishery law. What some authors would suggest is to change from Fishery exploitation office to Fishery exploitation technology office and Fishery domain office to Aquatic resource management office;
- Some activities aim completely different but they are mentioned in the same office. The recommendation should separate the Accounting, planning and cooperation office into two offices, Accounting office and planning/cooperation office, and Administration/procurement office into Administration and Procurement office.

- The unit of inspection (Mekong, Tonle Sap, Chaktomok and Marine inspection unit) should not be separated from the Inspection office within DOF. At the present there are three different inspections within DOF such as inspection unit and inspection office in the DOF, and inspection section under the provincial fishery office, these effect sometime overlap work and/or conflict. Because of this, recently, delinquents killed one fishery inspector. What the author should recommend is that the Inspection unit should be belonged to Inspection office and the Exploitation unit should be belonged to Exploitation office within DOF.
- The roles and functions of office within DOF are not clear and some time these are not implemented.
- Most staff in provincial/municipal fishery office lack of experience or knowledge, and works in some provinces are not clearly clarified and lack of responsibility. To reduce these constraints the Department of Fisheries, NGOs should support and provide the training to them.

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The Agriculture Productivity Improvement Project (APIP)

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