

# Implementation of HACCP in the Fisheries Industry in Indonesia

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## ■ ABSTRACT

*It is well realized that the international market for seafood has become more competitive in this globalization era. The major issues in the fish industry, which are mainly, environment and safety of seafood, have influences on fish trade relations between exporting and importing countries. Those issues have been reflected in various legislation on environmental conservation and seafood applied by developed countries.*

*As a producing country, the Indonesian fishery industry has, inevitably, to keep pace with the requirements imposed by the importing countries. Therefore, equivalence of quality assurance system with the importing countries is very important in facilitating fish trade flow.*

*As far as fish export market development is concerned, the Directorate General of Fisheries has positioned itself to meet all those challenges by implementing a HACCP Program in the fishery industry, which is adopted from FAO-WHO Guidelines of HACCP. The Ministry of Agriculture stipulated the program in 1998 and all fishery industries shall take part in the program for fish handling and processing.*

*To provide quality assurance of seafood safety and to meet equivalence of the system, implementation of the program has been supported by strengthening the fish inspection system through provision of training to instructors, fish inspectors, quality control personnel etc., provision of training workshops to industries, supervision on the application of HACCP, empowering network organization of fish inspection and establishment of legislative support on the application of HACCP.*

*Additionally, on agribusiness-led approach in the fishery industry development policy is taken which is consistent with HACCP, which requires good practices*

*in every subsystem of the agribusiness system. The objective is aimed to maximize the utilization of resources and minimize the "losses" and maintain the safety of seafood production.*

## ■ Introduction

Indonesia is an archipelago comprising about 17,500 islands with a total coastline length of about 81,000 km. It is located on the crossroads between two oceans, the Indian and the Pacific, and bridges two continents, Asia and Australia.

The islands have a land area of over 2 million sq. km and 5.8 million sq. km of marine waters, 3.1 million sq. km of which comprise archipelago and territorial waters. The remaining 2.7 million sq. km is in Indonesia's Exclusive Economic Zone (IEEZ). About 775,000 sq. km of marine waters are coastal areas of less than 200 meters deep.

With her vast area of inland, coastal and marine waters, fishery is considered to play an important role in socio-economic life of the Indonesian population since a long time, especially for coastal community. The sector provides employment for more than 4.5 million fishermen/fish farmers. Currently, while most sectors suffer from the current economic crisis, fisheries demonstrate its sustained contribution to the national economy through significant export growth. In 1998, fisheries generate about US\$2.0 billion from the fish export of more than 700 metric tones.

## ■ Fisheries Resources

### 1. Marine Fisheries

The estimated potential resources of marine fisheries are around 6.19 million tonnes per year and consist of small pelagic fish, large pelagic fish, demersal fish, shrimp, cuttlefish, coral fish, ornamental fish, etc.

Table 1 shows potential of marine fisheries' resources.

The main fishing grounds are the waters of Northern Java, Bali Strait, Malaya Strait, Western Sumatra, Eastern Sumatra, Eastern Nusa Tenggara, Eastern Kalimantan, Western Kalimantan, Southern Sulawesi, Northern Sulawesi, Maluku, Irian Jaya, etc.

**Table 1: Potential of Marine Fisheries Resources**

No.	Variety of Resources	Potential Resources (tonnes/year)
1.	Big Pelagic	977,000
	• Large Tuna	219,000
	• Skipjack	374,000
	• Spanish Mackerel.	127,000
	• Frigate Mackerel/ Eastern Little Tuna	205,000
	• Sharks, Marlin, Sword fish, etc.	52,000
2.	Small Pelagic	3,244,000
3.	Demersal fish	1,786,000
4.	Shrimp	79,000
	Penaeid shrimp	74,000
	Lobster	5,000
5.	Coral Fish	76,000
6.	Squid	28,000
	Total	<b>6,190,000</b>
7.	Ornamental Fish	1.5 billion pieces

## 2. Fish Culture

In fish culture (i.e., freshwater culture, brackish water culture, marine cage culture, open water cage culture), there is still ample opportunity for expansion and development. Indonesia has 4.29 million ha of mangrove. In order to maintain ecological balance, about 830,000 ha or more than 20% mangrove could be developed for brackish water culture. If 30% of the potential area is utilized for polyculture (shrimp and milkfish), 40% for milkfish monoculture, 30% for shrimp monoculture, the potential production is estimated at 810,000 tonnes per year & consist of 358,000 tonnes shrimp, and 452,000 tonnes milkfish including other fish such as tilapia (*Tilapia spp*), mullet (*Mugil spp*) and giant sea-perch (*Lates calcarifer*).

Potential production of freshwater fisheries mainly comprises: (i) part of irrigation system (about 4 million

ha), and (ii) about 1% of open water area of 14 million ha (about 140,000 ha). If for example, 60% of the irrigation areas are utilized for polyculture and 40% for monoculture, the production of freshwater culture is estimated to be about 805,000 tonnes per year.

In open waters (i.e., lakes, rivers, dams, swamps), fish is to be cultured in floating and static cages. The potential production from the areas of 140,000 ha is estimated to be about 350,000 tonnes per year. Paddy field could be also used for culturing fish together with paddy. There are around 1,700,000 ha of paddy field and half of these areas could be utilized for paddy-fish culture. The potential production is estimated about 230,000 tonnes per year.

## 3. Production Trends

Fishery production over the period of 1994-1998 steadily increased. It grew from 4,013,830 tonnes (1994) to 4,761,270 tonnes (1998) by volume with an average increase of 4.37 % per year. Table 2 presents fisheries production by fisheries sub sectors, 1994 – 1998.

The production comprises marine, inland open water, brackish water and freshwater fisheries. In 1998, marine fisheries contributed to 75.95%, inland open water, 7.17%, brackish water fisheries, 9.42%, and freshwater fisheries, 7.46%.

## 4. Trade on Fishery Products

Export of fishery products steadily increased during the period between 1994-1998. Total volume increased by 7.01% from 545,371 tonnes in 1994 to 714,427 tonnes in 1998. By value, it increased by 4.9% from US\$ 1,678,720,000 (1994) to US\$ 2,030,725,000 (1998). During this period, the major importing countries of fishery products were Japan, other Asian Countries, US and European countries. Frozen shrimp and products thereof were the first major contribution to the national revenue, followed by tuna and other products. By value, shrimp accounted for 53.09% of the total export value in 1998.

Import of fishery products decreased by 11.95% (by volume) and increased by 0.97 % (by value) per year in 1994-1998. Fishmeal was the major imported fishery product during this period. Origins of the products were dominated by Peru, Chile and Germany.

**Table 2: Production by Fisheries Sub Sectors of Fishery, 1994 – 1998**

Sub Sector	1994	1995	1996	1997	1998	Annual Rate of Increase (%)
<b>Total</b>	<b>4,013.83</b>	<b>4,263.59</b>	<b>4,452.27</b>	<b>4,581.22</b>	<b>4,761.27</b>	<b>4.37</b>
Marine fishery	3,080.17	3,292.93	3,383.46	3,481.89	3,616.14	4.11
Inland fishery	933.66	970.66	1,016.81	1,099.33	1,145.13	5.27
• Inland Open water	336.14	329.71	335.71	337.91	341.10	0.38
• Culture	597.52	640.95	733.10	761.42	804.03	7.78
Brackish water	346.21	361.24	404.34	421.51	448.47	6.73
Freshwater pond	140.10	162.20	182.92	188.71	199.22	9.32
Cage	33.01	39.86	44.63	45.47	46.80	9.38
Paddy field	78.20	77.66	101.21	105.73	109.54	9.43

## 5. Annual Fish Consumption Per Capita

Supply of fish for domestic consumption grew by 2.53% per year between 1994 and 1998. Average consumption per capita increased from 18.54 kg (1994) to 19.25 kg (1998). According to the national target of 26.55 kg/capita/year, the level of fish consumption was only 72.50%. The rates of fish consumption during the period are presented in Table 4.

## 6. Development of Fish Processing Industry

Over 50% of the total fish production was distributed in the fresh state in 1998 and the rest were processed products, such as salted-dried, salted-boiled, smoked, fermented, frozen, canned and fish meal.

The modern processing plants, orienting for export of quality products, comprise over 249 freezing units, 30 canneries, 44 salting/drying units and 22 chilling (fresh) factories. Also in operation are traditional processing units engaged in salting, drying, steaming, cooking, smoking and fermentation. Small-scale processors mostly operate those. Industrial scale fish processing plants are accorded high priority in the export markets. The main type of commodities include

**Table 3: Trade of Fishery Products, 1994-1998**

Year	Volume (tonnes)		Value (US \$ 1,000)	
	Export	Import	Export	Import
1994	545,371	276,829	1,678,720	136,713
1995	563,065	163,240	1,763,989	115,917
1996	598,385	154,895	1,785,799	126,972
1997	651,568	147,029	1,904,491	129,411
1998	714,427	152,049	2,030,725	139,285
Annual rate of increase (%)	7.01	-11.95	4.90	0.97

shrimp, tuna/skipjack, frog legs, ornamental fish, seaweed and other fish.

Shrimp is marketed either live, fresh/chilled, frozen, canned or dried. Product styles include headless shell-on, head-on, peeled and undeveined, individual quick-frozen or block frozen depending on the requirements of the intended market.

A slight difference was observed that tuna/skipjack are marketed fresh, frozen, canned or dried for domestic and for export. Products other than shrimp

**Table 4: Fish Consumption Per Capita, 1994 – 1998**

	1994 (kg)	1995 (kg)	1996 (kg)	1997 (kg)	1998 (kg)	Annual Rate of Increase (%)
Total Consumption	3,534,87	3,653,39	3,728,88	3,805,20	3,906,53	2.53
Consumption/ Capita/year	18.54	18.86	18.95	19.04	19.25	0.95

and tuna/skipjack that play an important role to the economic development include frog legs, seaweed and other species of potential market value (red snapper, lobster, etc.).

## ■ Fish Inspection and Quality Control System

### 1. Historical Development of Fish Inspection and Quality Control

Since the enactment of the Foreign and Domestic Investment Acts, the development of industrial fisheries has brought about significant progress to the exported fisheries products. In 1970-1972, frozen shrimp was thought as prime product to be marketed to Japan, US, and Europe. Despite the evidence that the export of fish and fishery products continue to expand, Indonesia still is unable to take advantage over the export of shrimp, particularly to US. Due to inferior quality, Indonesia used to be included in the "block list" and the import of Indonesian shrimp product was subject to "automatic detention".

This market access restriction led the government to establish a Memorandum of Understanding (MOU) between the Minister of Health and Agriculture in setting-up jointly a compulsory Fish Inspection and Quality Control Regulation in 1975, based on the Health and Hygiene Acts of 1960 and 1962, respectively. In the MOU, Directorate General of Fisheries (DGF) took over responsibility for inspection and quality control of fish and fishery products. The fish inspection and quality control program administered by the DGF included development of fishery standards and hygiene and sanitation; of which DGF adopted CAC FAO/WHO- Codes of Practices for infrastructure, environment, facilities, plant personnel and operation of fish processing plant. The programs include development of standards, fish inspection and certification of fish production facilities in accordance with Good Manufacturing Practices (GMP), certification of competence, and the certification of the quality of the final product for export.

Since the issue of promoting quality assurance became a growing concern of several Ministries, National Council of Standardization was established and later issued regulations setting forth the Indonesian National Standardization (INS) and its implementation of the system. The regulations require, among others compliance on: (i) code of practices, (ii) technical specification, (iii) method of testing, (iv) safety and health requirement, (v) methods

of packing, marking and labeling, and (vi) methods of producing and description.

Additionally, the INS has the aims to: (i) provide consumers with safety and health protection, (ii) provide quality assurance, (iii) promote efficiency and productivity of fish processing plant and meet the standard, (iv) promote competitiveness in international trade/market, and (v) take part in environmental conservation.

### 2. Current Legislation and Jurisdiction

There are a number of legislative decrees concerned with regulation of quality control and inspection of seafood products. These are:

- (1) Government regulation No. 15/1991 issued on March 1, 1991 laying down the Indonesian National Standardization.
- (2) Presidential Decree No. 12/1991 issued on March 1, 1991 setting forth the National Standardization Agency.
- (3) Presidential Decree No. 13/1997 issued on March 26, 1997 setting forth the National Standardization Agency.
- (4) Decree of Minister of Agriculture No. 41/Dpts/IK.210/2/98 issued on February 9, 1998 setting forth the HACCP based on Integrated Quality Management System of Fishery Products.
- (5) Decree of Director General of Fisheries No. 14128/Kpts/IK.130/XII/98 issued on December 17, 1998 setting for the Implementation Guidelines of HACCP based on Integrated Quality Management System of Fishery Products.

The above legislation also stipulates the following compliance under respective jurisdiction of the Ministries concerned:

- (1) Fish Inspection and Quality Control Supervisory Program under jurisdiction of the Ministry of Agriculture viz. Directorate General of Fisheries.
- (2) Accreditation Program for Testing Laboratories of Fish and Fishery Products for export purpose under jurisdiction of National Standardization Agency.
- (3) Control of Additives in Handling and Processing of Fish and Fishery Products for export purpose under jurisdiction of National Standardization Agency.
- (4) Control of Additives in Handling and Processing of Fish and Fishery Product under jurisdiction of the Ministry of Health viz. Directorate General of Food and Drugs Control.

### 3. Inspection and Quality Control Institution

The Directorate of Fishery Enterprise and Processing Development, Directorate General of Fisheries is responsible for coordinating technical matters concerning the supervision of inspection and quality control, which is operationally carried out by Sub-Directorate of Fish Inspection and Processing Development.

There are two Sections assisting the Sub-Directorate dealing with: (1) Fish Processing Technology Development, and (2) Standardization and Accreditation. These sections have their functions in: (i) providing supervision and guidance on handling and processing technology of fish and fishery products, (ii) providing technology packages on fish engineering, (iii) setting up and monitoring the application of Code of Practices and Quality Standards, and (iv) developing, monitoring and controlling the implementation of HACCP plan.

At the provincial level, the Fisheries Services operationally assisted by Sub-Directorate of Quality Control, coordinates local inspectors to conduct supervision, inspection and quality control, on a daily basis, whilst fish inspectors engaged to the central office supervise, and monitor the conduct of local inspectors and also do cross-inspection in the processing plants periodically. The Provincial Laboratory directly performs the fish quality control, including certification of fishery products for Fish Inspection and Quality Control. In total, there are 38 laboratories located in different provinces. The National Center for Fish Quality Control and Processing Development acts as a reference laboratory to provide supervision to the provincial laboratories in terms of analytical methods, processing technology development and training packages.

#### ■ Implementation of HACCP in the Fishery Industry

##### 1. Fishery Industry Development Policy

Strategic policy in the development of the fishery industry is taken through an agribusiness development approach. The introduction of agribusiness subsystems comprising stages of pre-harvesting, harvesting, post-harvesting, marketing is taken in consistent with implementation of HACCP. This approach is supported with improvement of infrastructure, facilities and human resources.

##### 2. HACCP Development Program

The export market of seafood products is becoming more competitive in this global era, due to the following reasons:

- (1) A supply-led approach in the fisheries development policy in most parts of the world tends to outstrip global demand.
- (2) Growing concern over public health and consumer protection based on food safety in the developed countries leading to a tightening of requirement by importing countries.
- (3) Environmental issues, which have been forcing the exporting countries into a difficult position, and has been used by some importing countries to protect their interest. Up to date issues are the dolphin issue, antibiotic, pesticides, etc.

The government and the private sector have addressed all the challenges above. As far as quality and safety are concerned, the fishery industry inevitably, has to keep pace with the requirement.

The traditional approach in quality control, which puts too much stress on the inspection of end product is no longer able to cope with the challenges. It has been replaced by a new approach, which encompasses the complete system of production, which is based on HACCP.

Many plants have used some process control and record keeping procedures similar to those required in HACCP-type program in terms of self-monitoring quality control. However, they should be provided with more support to disseminate the implementation of the program nationwide. For this reason, the HACCP supervisory program in the fishery industry has been enhanced to:

- (1) Improve seafood quality and safety.
- (2) Improve the Indonesian product reputation in the international market.
- (3) Reduce cost in the quality control and inspection in the Indonesia fishery industry.
- (4) Establish self-regulatory quality control in the Indonesian fishery industry based on HACCP concept.

To achieve these objectives, the Directorate General of Fisheries carried out development program consisting of:

- (1) Strengthening the fish inspection and quality control institution by conducting training programs both in the country and overseas on HACCP. The target group for training programs is senior

fish inspectors and quality controllers from the DGF who were trained as trainers (TOT) on application of HACCP-based program.

- (2) Training workshop for provincial fish inspectors engaged in both government and private sector. This program emphasizes the implementation of HACCP in the fish processing industry.
- (3) Supervising on the complete implementation of HACCP at selected fish processing plants based on the results from the provincial training workshop.
- (4) Disseminating the implementation of HACCP in the Indonesian seafood industry.
- (5) Legislative support for the implementation of HACCP. The implementation of HACCP in the fishery industry needs to be accompanied with adequate legislation, which will govern the relationship between the government and private sector. The role in the government (fish inspector and quality controller) and the task as well as benefits that will be gained by private sector having applied the new system should be clearly identified. This has been outlined clearly in the Ministerial Decree of Agriculture No. 41/Kpts/IK.210/2/98, and the Director General of Fisheries Decree No. 14128/Kpts/IK.130/XII/1998.

The implementation of the program has partly been funded within the auspices of the Asean-Canada Fisheries Post Harvest Technology Project Phase II and the US-AID supported Project on Development of Agribusiness.

### 3. Problems in the Development of HACCP

The development of HACCP is hindered mainly due to technical, social and economic reasons. A number of constraints remain in the way of developing an effective HACCP. Some of the constraints include:

- (1) Lack of enforcement in complying with the regulation.
- (2) Lack of a harmonized basic concept by the regulatory agencies on strategic approach of promoting quality assurance for the enhancement of Indonesia's share in the international market.
- (3) Lack of understanding of HACCP by fish processors.
- (4) Lack of effective training method provided to all levels from the inspectors to the processors.
- (5) Lack of education and extension on the part of fishermen and traders.
- (6) Lack of budget to develop the system.

The inspection and quality control program carried out by the government personnel, as well as the "self-regulatory quality control" carried out by the processor needs to be effectively and efficiently implemented. The program needs to:

- (1) Empower more skilled and experienced fish inspectors and in-plant quality control personnel.
- (2) Upgrade educational level of fishermen.
- (3) Enhance awareness and understanding of processors with regard to the task of fish inspectors.
- (4) Provide sufficient facilities and equipment for laboratories, fish landings, fish auctions and fishing vessels.
- (5) Empower qualified laboratory analysts.

### 4. Expected Goal of HACCP Implementation

The prospect for continual growth of export earning from fishery products is expected to be much brighter in the future. Indonesia possesses all the requisites for rapid growth thanks to an excellent natural fish supply and good condition for fish farming, proximity to major markets, a favorable climate and the beginning of a commercially sound processing industry.

For the recent National Development Plan, as far as fish export markets development is concerned, the DGF has positioned itself to meet these challenges by development of an integrated quality management system in the fishery industry. This program would pursue the improvement of the system developed so far that covers all aspects of fish production, both at pre and post-harvest stages, in order to provide high quality assurance of seafood to consumers. The goal of the system would be to enhance the safety of seafood. To implement the integrated quality management system on fishery products requires good practices in all aspects of production, which are:

- (1) Good Farming Practices  
These practices cover all key hygiene and sanitation aspects from site selection for farming establishment to the final phase of fish production.
- (2) Good Handling Practices  
These practices include hygiene and sanitation aspects during harvesting and loading, transportation or handling on board of fishing vessel before further handling and processing stages.
- (3) Good Manufacturing Practices  
These practices deal with hygiene and sanitation

aspects of handling and processing techniques, construction, facilities and equipment, personnel and self-regulatory quality control management in fish processing plant.

(4) Good Laboratory Practices

These practices include laboratory management for conducting quality control of fishery products at all stages of production and require an establishment of standardized laboratories.

(5) Good Inspection Practices

These practices include improvement of inspection system and its implementation does apply not only to government fish inspectors but also to the processing plants in their self-regulatory quality control to enhance preventive measures at critical control point.

(6) Improved Standardization System

Under the coordination of the National Standardization Agency, DGF develops standards for fishery products and other related measures, and procedures and implement adopted Indonesian National Standards.

## 5. Inspection and Quality Control Supervisory Program

Within the Ministerial Degree of Agriculture, regarding HACCP based Integrated Quality Management System on Fishery Products, the scope of activities of inspection and quality control supervisory program covers harvesting, transportation, handling, processing, packaging and storage up to distribution, in order to obtain fish and fishery products which are wholesome and safe for human consumption.

The objectives of inspection and quality control are to:

- (1) Improve quality of fishery products
- (2) Protect consumers from adverse effect to health, fraud and adulteration.
- (3) Increase competitiveness of fishery products in international market.
- (4) Supervise processors in implementing HACCP plan in terms of a "self-regulatory quality management system".

For these reasons, the programs are targeted towards those who deal with fish harvesting, handling, processing, packing, storage, distribution, at production sites (vessel and pond-sites), auction and landing places, distribution sites, processing plants, fish markets, and

cold storage; such as fisherman and fish farmer, collectors, traders, processors, quality control personnel, and fish inspectors, to implement good handling, harvesting and manufacturing practices according to the prescribed Code of Practices.

To carry out these activities, DGF have registered 183 fish inspectors who serve fish processing plants in different provinces of Indonesia. The fish inspectors can be from the local government or central government, namely Provincial Fish Inspector and National Fish Inspector respectively.

Activities of fish inspectors are as follows: (1) assessment of prerequisites of processing plants, (2) performing pre-validation, (3) validation, (4) audit and (5) audit verification of the implementation of HACCP. Activities (2) and (4) are performed by Provincial Fish Inspectors whilst (3) and (5) are by National Fish Inspectors.

The Quality Control and Inspection program for processing plants is manifested in certification, namely:

- (1) Certificate of GMP/SSOP issued by Directorate General of Fisheries.
- (2) Certificate of HACCP implementation issued by Directorate General of Fisheries
- (3) Certificate of Competence Required by Plant Quality Control Supervisor issued by Directorate General of Fisheries
- (4) Certificate of Quality or Health Certificate for Export Product issued by Provincial Laboratory and Inspection Services

## 6. Other Matters

It is widely anticipated that the international market for seafood will become more competitive in this global era. The major issues in the fishery industry, environment and safety, have an influence on fish trade relation between exporting and importing countries. These issues have been reflected in fish hygiene legislation applied by the developed countries (importing countries), such as EU's Commission Decisions, Council Directives, and US Federal Regulation etc.

To deal with the "new trend" in the business climate, the government has been making efforts to establish a cooperation or mutual arrangement with fish importing countries. Such an arrangement is very important in building up an understanding,



with respect to interpretation of all aspects of trade issues between both sides:

- (1) According to EU's Commission Decision No. 94/324/EC, dated 19 May 1994, the Commission has adopted that Ministry of Agriculture, Directorate General of Fisheries shall be the Competent Authority in Indonesia for verifying and certifying compliance of fishery and cultured products.
- (2) MOU with Australia Quarantine and Inspection Services.
- (3) MOU with the Canadian Government (Department of Fisheries and Oceans) on joint inspection of the implementation of HACCP has been signed by both parties.
- (4) Initiation of MOU with US-FDA.

Development of MOU between Indonesia and USA, regarding Fishery Product Inspection and Certification has been initiated. Progress of the MOU has been achieved, such as side-by side evaluation, exchanges of information (regulation, and procedures) and field visits to fish processing plants. The results indicate that MOU between the two countries will be achieved in reasonable time.

## ■ Conclusion

- (1) As the fishery sector's contribution to the country is expected to escalate by generating foreign exchange, and on the other hand the international market is becoming competitive, the country will cooperate to achieve harmonization or mutual recognition of national sanitary measures (national

quality assurance system) and certification programs as appropriate and explore possibilities for establishment of mutually recognized control and certification agencies.

- (2) The Directorate General of Fisheries has responded to meet all these challenges by implementing consistently HACCP system and other appropriate requirement issued by international bodies, such as FAO/WHO.
- (3) To set standards for safety and quality assurance and make sure that the standards are effectively applied throughout the fishery industry. Some improvements have been made by strengthening the fish inspection system by providing training program for instructors, fish inspectors, quality control personnel; providing workshops to industries; supervision on application of HACCP and establishment of legislative supports on the application of the HACCP.
- (4) In addition, agribusiness-led approach in the fishery industry development policy is taken in consistent with HACCP, which require good practices in every subsystem of the agribusiness system. The objective is aimed at maximizing the utilization of resources and minimizing the "losses" and maintaining safety in seafood production.
- (5) In the implementation of HACCP, DGF as competent authority performs consistent validation, audit and verification audit of the fishery industries.