Thesis for the Degree of Master of Fisheries Science

A Comparative Study of Fisheries and Distribution Structures between D.R. Congo and Korea

by

David Kabeya Tshiminyi

KOICA-PKNU International Graduate Program of Fisheries Science

The Graduate School

Pukyong National University

February 2013

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콩고와 한국의 수산업 및 수산물 유통구조에 관한 비교 연구

Advisor: Professor. Young Soo Jang

by

David Kabeya Tshiminyi

A thesis submitted in partial fulfilment of the requirements for the degree of

Master of Fisheries

in KOICA-PKNU International Graduate Program of Fisheries Science,

The Graduate School,

Pukyong National University

February 2013

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A dissertation

by



February 22, 2013

데이비드 카베야 치미니의 수산학석사 학위논문을 인준함

2013년 2월 22일



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List of Abbreviations and Acronyms

ACP African, Caribbean, and Pacific Group of States

AU African Union

CIF Cost Insurance and Freight

COOPEFIMA (Coopérative Des pêcheurs des Filets Maillants); The

Cooperative for the fishermen using the gill nets

COPEVI Cooperative of the fishermen of Vitshumbe

DRC or DR Congo Democratic Republic of the Congo

EEZ Exclusive Economic Zone

ERAIFT The postgraduate training school in tropical forest

management launched by UNESCO in 1999 at the

University of Kinshasa in DRC

EU European Union

F & FPs Fishery and Marine Products

FAO Food and Agriculture Organization of the United Nations

FAOSTAT FAO Statistics

FEPELAKI The federation for fishermen of Lake Kivu

GDP Gross domestic product

INERA (Institut Nationale d'étude et de recherches agronomiques);

National Institute of Agricultural Research and study

ISP (Institut Supérieur Pédagogique); Institute of Education

KOREA The name Korea used in this thesis indicates the Republic

of Korea, also known as South Korea.

LDCs Less developed countries

LRA Lord Resistance Army

MAFL DR Congo Ministry of Agriculture, Fishery and Livestock

MIFAFF Ministry for Food, Agriculture, Forestry and Fisheries

NFRDI Korean National Fisheries Research and Development

Institute

NGOs Non-Government Organizations

OECD Organization for Economic Co-operation and Development

ONATRA Office National de Transport (National Office for

Transport)

PRODEPAAK Projet de développement de la pêche artisanale et de

l'aquaculture au Katanga

SENADEP The National Service for Promotion and Development of

fishery

SMEs Small and Medium Enterprises

SNCC Société nationale de chemins de fer. Congolese National

Railway Company

TAC Total Allowable Catch

UNCLOS United Nations Convention on the Law of the Sea

UNCTAD United Nations Conference on Trade and Development

UNEP United Nations Environmental Programme



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KOICA-PKNU International Graduate Program of Fisheries Science,

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Abstract

The development of the fishery sector in DR Congo and the increase of fish production are in center of this topic as a concern since, the country abounds with big potential of fishery resources but cannot produce enough fish to satisfy the demand of the population.

The study examines the fishery resources between DR Congo and Korea, from the catches, fish farming, management and the distribution systems in both countries. At one hand, the both countries are rich in fishery resources and can provide sufficient fish and make guaranty of food security.

The DR Congo have a potential estimated to produce every year about 700,000 tons of fish, but up to now the present production cannot meet the demand of the population which

estimated to 66 million. Up to now there is a real need in the local market, remaining unsatisfied by the current production, and the country is becoming more dependent on import; about 150,000 tons of the foreign fish are imported every year (Le Potentiel, 2007). The aquaculture which is the secondary sector in fish supply is not too much sustained. There is really a necessity for the country to get technical assistance and expertise to make this industry viable.

The second country studied in this paper is the Republic of South Korea, which has no other natural resources than the surrounding marine fishery resources. With the population estimated to 48,754,657, the country has developed the fishing industry among others to build up the economy. Whilst, the depletion observed in the catches during these last years, some measures have been taken to rebuild up the fish stock and the fish stock rebuilding plan of 2005.

Nevertheless, the development of aquaculture have considerably been intensified and made the second source of fish protein and still researches are made to carry it out ecofriently.

The fishery management and the seafood distribution structure are examined to show the importance behind the successfulness in fisheries. Owing to the development of the seafood distribution structure, a less developed country such as DR Congo can solve gradually some issues attached to the artisanal fishing and the post-harvest loss.

1. Introduction

1.1 Background

Increasing the local production of fish and fish products in DR Congo has become a real concern for the authorities and the Congolese population.

In June 24th 2010, it was held a celebration of the fish day at the Municipality of N'sele in DR Congo, where the Congolese government through Mr. Norbert BASENGEZI, the minister in charge of Agriculture, Fisheries and Livestock, invited publicly both local and foreign investors to invest in industrial fishing. During his speech, the former minister made a recall that the DRC has a potential to produce fish estimated to 700,000 tons/year but the artisanal fishing in practice is unable to produce over 250,000 tons of fish per year (ACP, 2010)¹. He confirmed that, the fishing potential is mostly residing in our hydrography network dominated by the majesty Congo River where the big tributaries come to supply waters, and in the lakes, all of them abounding with fish. At one hand, he showed that it is possible to make a small-scale fisheries in the Congo River and its tributaries at one hand, and at the other, the industrialized fishing is possible in the Lake Tanganyika, Lake Mweru and Lake Albert. Frankly, the minister declared that, despite the modest Atlantic coastline (about 40km), the marine fishing could be also possible.

Previously, on June 24, 2007 this idea of industrializing the DR Congo fisheries was mentioned by his predecessor, Mr. Joseph NZANGA, who also, was much concerned about the growth of local fish production. In the same way, he had already disclosed some estimates that the Congo had a potential of 707.000

¹ http://www.occ-rdc.cd/article494.html

tons to produce fish per year (Le Potentiel, 2007). That year, the DR Congo per capita consumption was 7kg, far below to meet 21 kg required by AU (Chilima, 2007) and this consumption has gone down up to the 4 kg in 2010 because of the low production of the artisanal fishing. The fish consumption for the Congolese population is evaluated to 450,000 tons and to respond this demand the DR Congo is importing 150,000 tons of fish per year (Le Potentiel, 2007).

Nevertheless, "the fishery sector plays a key role in food security, not only for subsistence and small-scale fishers who rely directly on fishery for food, incomes and services, but also for consumers who profit from an excellent source of affordable high-quality animal protein. A portion of 150 g of fish provide about 50-60 per cent of the daily protein requirements for an adult. Fish is also a source of essential micronutrients, including various vitamins and minerals. With a few exceptions for selected species, fish is usually low in saturated fats, carbohydrates and cholesterol" (FAO, 2012).

Moreover, until vitamins A and D were synthesized and produced commercially, marine oils were the most important natural source of these vitamins. The body and liver oils of fish are particularly rich in vitamins A and D and still are used in animal feed (Kromhout et al., 1985). Fish is one of our most valuable sources of animal protein food and its contribution to our health is very important.

As the seafood resources are available and also can be renewable, the improvement of the seafood supply structure could play key role in increasing the production and responding to the demand.

1.2 Research questions

In order to study the above described issues, I propose the following three questions:

- Are there really opportunities for the DR Congo to provide sufficient seafood and satisfy the need of the local and international markets?
- What then are the main challenges to be recovered for an efficient distribution?
- What kind of strategies to take for an efficient seafood distribution structure from the producers to the consumers?

1.3 Hypothesis

There are really opportunities of sufficient seafood production in DR Congo, but it still necessitates the instituting of a viable distribution structure and facilities to make these attractive for investors and become profitable for all.

1.4 Research Interest

The present research looks to study the Korean Seafood supply structure and compare it with the DRC's. The reason for choosing Korea is essentially that, about fifty years ago, this country was poor and undeveloped, but has passed in short time from that position to the development in a tremendous way, that the DR Congo can learn from her experience.

1.5 Objectives

Whereas Korea and DR Congo are geographically two different countries, having different types of fish species and different development levels, still, one can learn from the experience of another.

The present research aim is:

- To develop the DR Congo fishery sector, increase the fish production and reduce the foreign fish dependence;
- To promote the intensive and extensive aquaculture;
- To improve the seafood supply structure inside the DR Congo and create the viable fish market system.

1.6 Method and Techniques

A. Method

To attain these objectives, the comparative method will be used as a crossnational approach to assess the current fishery state between the DR Congo and Republic of Korea.

In fact, the comparative method is necessary to be utilized since this study aim is to learn of the experience of other nations, like South Korea who among many other nations, has succeeded in developing its fishery sector, and brought the changes in the seafood supply channels.

Generally, the comparative method does not just make a comparison, but it is an approach (methodology) to study a certain class of problems between different sectors and societies (Hantrais and Mangen, 1996).

B. Technics

Diverse materials were useful during our research to provide you with sufficient data. For the completion of this study we have used:

a) Document review enabled me to have a better understanding of fishery issues in the world and in particular, Congolese fishing and fish distribution conditions;

- b) **Multimedia tools** were very useful for me in so much, I could have access to all kind of research done previously by others people and to some administrative and international organizations publications and reports;
- c) Field trips were important for discovery of the Korean fish markets and aquaculture farms. By these, I got acquainted about modern fisheries, fishing gears and infrastructures as well as, the factors of fishery production and distribution development.

1.7 Topic Limitation

The fisheries topic being too broad, the present study is limited to the fisheries management and distribution structure. Therefore, it will be comparing the management and distribution channel, from the producers to the consumers between DRC and Korea.

1.8 The Research Plan

The present research is divided into four major parts:

- The first one is of the introduction describing the what and why of this research;
- The second is focused on the D.R. Congolese fisheries management and the seafood marketing system;
- The third is about the Korean fisheries management and the seafood and the Market system;
- The fourth finally, makes the comparative analysis on the two fisheries management and the seafood Distribution Channels.

2. The present status of fisheries in DR Congo and Distribution Problems

2.1 The DRC: Localization and Hydrography

The DR Congo is the second largest country in Africa behind Algeria, and is located in heart of Africa. The country shares borders with Central Africa Republic and South Sudan in the North; Angola and Zambia in the South; Uganda, Rwanda, Burundi and Tanzania at East; and the Republic of Congo at the West.

a) Localization

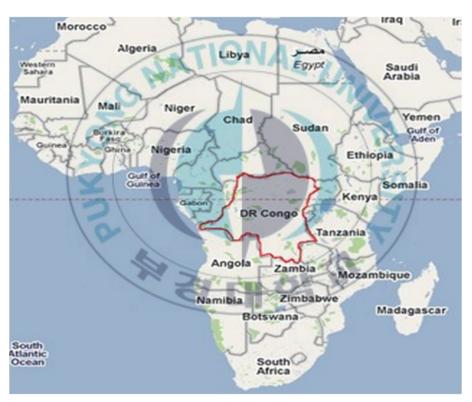
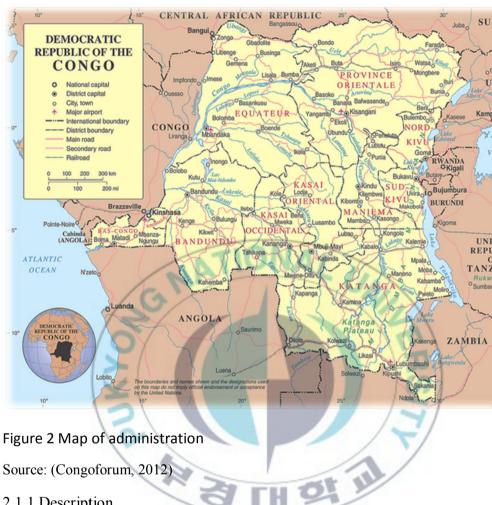


Figure 1: DR Congo Localization

Source: Congo Action

b) Hydrography and Administration



2.1.1 Description

Democratic Republic of Congo (DRC) has a surface area of 2,344,858 km² (UNCTAD, 2005). It has 52% of Africa water surface reserves (UNEP, 2011). And it is the 14th among the major producer countries of inland capture fisheries (FAO, 2010). The water resources, which include freshwater (lakes and rivers), and a coastline of about 40km (FAO, 2009) of Atlantic Ocean are a big potential for sustainable fisheries and aquaculture production.

The main commercial freshwater species include; tilapia (*Oreochromis niloticus*), African catfish (*Clarias gariepinus*, *Parachana sp.*) and the marine species which include: anchovy (family Engraulidae), Greate white shark (Carcharodon carcharias), sole, sardine, sharks, (Mavinga, 2008). Other seafood organs found are shrimp, crab, lobster, squid, octopus etc.

DRC has a human population of 71million and produces about 390,000 versus about 700,000 tones estimated potential. The fish per capita was 7kg/year; whereas, AU recommends 21kg/year (Chilima, 2007). This indicates that the low production and the total import do not meet the population demand. Fish is sold locally in the landing areas and in the general markets, where fish stalls and cold storage facilities are established.

Table 1 The resume for fisheries potential in DR Congo

Surface area:	2,344,858km ² (UNCTAD, 2005)
Coastline:	40km (FAO, 2009)
Total water surface area:	86,000 km² thus, 3.5% of national area (MAFL)
Population:	66 million people (World Bank, 2011)
Fish production potential:	700,000 tons/year (MAFL)
GDP per capita:	\$ 199 (World Bank , 2011)
GNI per capita:	\$ 310 (World Bank 2011)
Fish per capita in DRC:	7kg/annum (Chilima, D., 2007)
Fish per capita recommended by AU	21kg/year
Agricultural area:	22,450km² (1000 Ha), (FAO, 2009).

2.1.2 State of fisheries in DR Congo

The DRC coastline is very limited and for such reason, its production potential in regard with the marine products is small. However, it has a big potential for inland fishery resources, justified by the presence of diverse lakes and rivers that, it can become an exporter of fish and fish products. The wide land area can serve for aquaculture, through the irrigating systems and creation of fish ponds.

According to an assessment program conducted by ACP and financed by EU, the fishery sector in DRC is focused essentially upon the distribution on the local markets and it is generally felt that, problems exist in the areas of conservation, processing and marketing of fish and fishery products (Lesourd, 2009).

Facing these problems, the DRC government requested in 2009 to EU for an assistance of the development capacity building program tailored to the sector and the first mission which was linked to the SFP ACP/OCT program, has been set up on-site the very year (Lesourd, 2009). This program had as responsibility to carry out an assessment of the situation and proposed the capacity building initiatives. The evaluation revealed a number of important shortcomings in such areas as hygiene, the internal structuring of Competent Authority, control and regulation, and the functioning of veterinary services. Consequently, at the end of this evaluation, 3 plans of action were proposed:

1) The capacity building of the competent Authority

The EU mission emphasized that, the assistance mission could be efficiently feasible, unless the competent authority was officially nominated and

could have a capacity to work together with provincial inspectors, which is a fundamental condition. Therefore, the budget should be provided for the circulation of these provincial inspectors up to Kinshasa, the capital city. This is a key point for the success of the mission.

2) The operational capacity building of laboratories;

The EU mission recommended:

- A replacement of some laboratories equipment;
- An accurate inventory of the need in new material;
- A rehabilitation of laboratories to become operational so that they can run the experiments;
- An accurate inventory on the need of personnel training.
- 3) A support program directed at artisanal fishing.

Finally, the EU mission had recommended undertaking a program of artisanal fishing.

In principle, this program shall have a role:

- To provide teaching materials
- To train the local trainers who will in turn, go to train also in fishing areas.
- 2.1.3 The fisheries Policy in DRC

The fisheries policy can be summarized as the followings:

- Improved living conditions of fishing communities
- Growth and diversification of income-generating activities
- Increase domestic production of fish in a sustainable manner.

In fact, this policy was elaborated in 1986 with aim to increase the production, supply domestic markets and increase exports by improving incomes and the welfare of the population and develop both regional and international cooperation. The basic strategies retained to achieve these objectives were the reorganization of producers, the promotion of private initiative, pollution control and enhancement of product quality. However, the socio-political economic parameters have been changed since its elaboration. Therefore, the updating of this policy is now required to associate the fisherfolk in the management and the development of fisheries and biodiversity, and the integration of fisheries in local development strategies (Mwedde, 2009).

The new Policy on Fisheries and Aquaculture in project of adoption is based on a sustainable vision of the sector, and it defines the general and specific objectives, including with the guidelines. It is a society of hope, capable of hoisting the DRC among the middle-income countries, emerging economies and achieving the Millennium Development Goals (MDGs). Its main objective is to bring the fisheries and aquaculture sector in a dynamic of the sustainable management to improve productivity through entrepreneurship, taking into account the provincial, sub regional, regional and international environment.

Therefore, the promotion of aquaculture in all its forms and differentiate fisheries management with appropriate provincial institutions, improvement of the structure and organization management, are the specific objectives of this policy.

2.1.4 Fishing Regulation

For long ago, fishing in DRC is still governed by the colonial Decree of April 21, 1937 enforced alongside the one of 1932, and the ordinance of October 18, 1958.

The law states that, fishing is permitted in the territorial waters: lakes, ponds, streams which belong to the State. The native people also are exercising their traditional rights of fishing, including through dams, traps and nets.

At the time of the operations of fishing, the destruction of the abrasion (Laying, Remnants) and alevins as well as fishing in the spawning grounds are prohibited.

The exercise of any industrial activity of fishing is subordinated to obtaining a delivered fishing permit, with the holder, by the General Secretary with Agriculture, Fishing and Livestock.

The ordinance of October 18, 1958 prohibits: fishing with electric gear, explosives, and toxic substances (such as insecticides, fungicides or other substances in order to poison the waters and cause massive destruction of fish).

Considering the different changes occurred through years, the revision of the fisheries law was necessary. For this reason, this revision was done and adopted by the book called the code of conduct for fisheries in DRC. It is evident that this code will be sooner promulgated.

Therefore, the future policy for fisheries and aquaculture sector wants to promote the public and private dynamic actors, who are able to create jobs and increase the fish production through sustainable exploitation of fisheries and aquaculture resources and reduce poverty, ensure food security and make people accessing to the basic social services.²

2.2 Conditions for Investing in Fishing and Advantages

2.2.1 Conditions

To invest in fisheries in the DR Congo you need to satisfy the following conditions:

- a) To be, or create an economic entity (company) under Congolese law;
- b) To relate to a minimum amount of USD 200,000 (or USD 10,000 for SMEs);
- c) Commit to respect the regulations on environmental protection and national staff to specialized technical functions and duties of supervisions and accountability and,
- d) Ensure a value-added rate equal to or greater than 35%.

2.2.2 Advantages

The fisheries investments are supported in DRC and here below are some of the profitable advantages:

- a) Total exemption for investments in utilities, taxes and duties on imports of machinery, equipment and new equipment, spare parts of initial charge not exceeding 10% of the CIF value.
- b) Exemption from duties and import taxes, excluding the administrative fee for customs services, equipment, machinery, tools and materials imported new and spare parts for first allocation not exceeding 10% of the CIF value of the

_

² IMMORDC, June 5, 2012.

- equipment necessary for the realization of investment, and whose list is attached to this Order.
- c) Exemption from duties and taxes on exports of all or part of the finished products, finished or semi-finished under conditions favourable for the balance of payments.

2.2.3 Tax incentives

- a) Exemption of the benefit carried out by the investment, of professional tax on the incomes;
- b) Exemption of the tax on the turnover inside for the products and services bought near the local producers;
- c) Applies, during the period of approval, of the rule of depreciation on diminishing values to the investments in socio-economic infrastructures, such as schools, hospital, sporting infrastructures and roads, in addition carried out to approved project;
- d) Exemption, for the surfaces only related to the investment plan, of the tax on the surface of the built and not built land concessions, envisaged with Title II of the Ordinance-Law n°69-006 of February 10, 1969.
- e) Exemption during the accreditation period, tax revenues within the capital goods manufactured in the Democratic Republic of Congo where the company would buy from local producers such goods or using the services of third parties for the construction work on the project.
- f) Exemption from the proportional Rights during the formation or increase of capital of the limited liability companies.

2.2.4 Fisheries Authority in DRC

There are three institutions involved in fisheries:

- The Ministry of Agriculture, fisheries and Livestock, for production;
- The Ministry of Environment and nature conservation, for Regulation;
- The movement with co-operative vocation for rural development.

However, the Aquaculture and Fishing are under the ministry of Agriculture, Fishery and Livestock. And within the ministry services, two of them are in operational charge for fisheries:

1) **SENADEP**: The National Service for Promotion and Development of fishery, with 6 Divisions, 14 Offices and 10 Fishery Centers, where only five are in service. There rest of them is out of service. This service was formerly in under the Ministry of Environment.

This service is mandated to:

- a) Design, plan, and coordinate all programs to ensure the promotion and development of fishing in the territorial waters of the DRC;
- b) Organize the artisanal fishermen in cooperative associations;
- c) Promote improved techniques of fishing, collecting and analyzing the statistical data thereof;
- d) Provide training for staff in charge of technical support to fishermen and for fishermen themselves.

Next to it is the Direction for fishing which is a normative. Its role is:

- Developing strategies and management policies for fisheries and water in our country;
- Development of fisheries legislation and its application (on the primary, secondary and tertiary levels);
- The establishment of police for the monitoring of spawning areas and the fishing practice;
- Negotiation and monitoring of fisheries agreements;
- The development of procedures for issuing fishing licenses and operating permits and export of aquarium fish;
- Identification of national quality standards of fish for local consumption and competitiveness on foreign markets;
- Analysis and dissemination of fishery statistics (frame survey, assessment survey catch, and the fish processing, socio-economic data).
- 2) **SENAQUA**: National Service of Aquaculture has a National Coordination Panel with 6 Divisions and 18 Office. At the provincial level, it has 11Provincial Coordination Panels, one Bureau in each District of 52. One unit in each Territory of 245 and, 25 Primary and Secondary Breeding Centers in every Province.

It has a responsibility to draft the national aquaculture policies and strategies, to coordinate and organize aquaculture development.

The following are the tasks of SENAQUA:

- Managing the primary and secondary breeding centers;
- Organizing aquaculture coordination in the administrative areas of the country;

- Evaluating current aquaculture resources, ways of reviving aquaculture, and priorities;
- Re-establishing the national register covering the whole area of the Ministry's aquaculture policy;
- Directing the Ministry's aquaculture policy;
- Coordinating all the aquaculture actions initiated by national, bilateral or multilateral projects and program of which these projects are specific and specialized branches;
- Re-launching applied research in aquaculture;



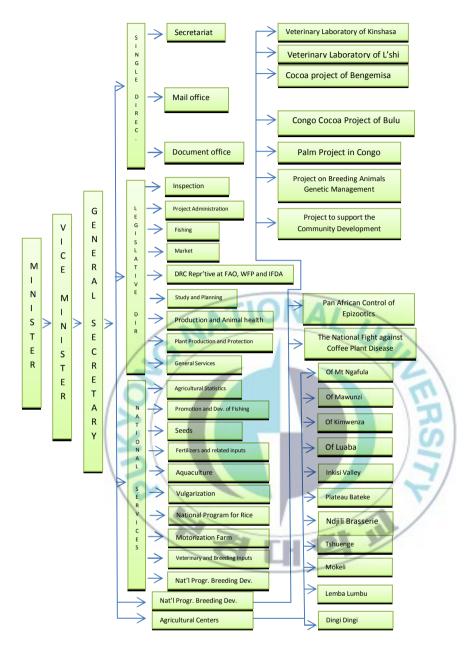
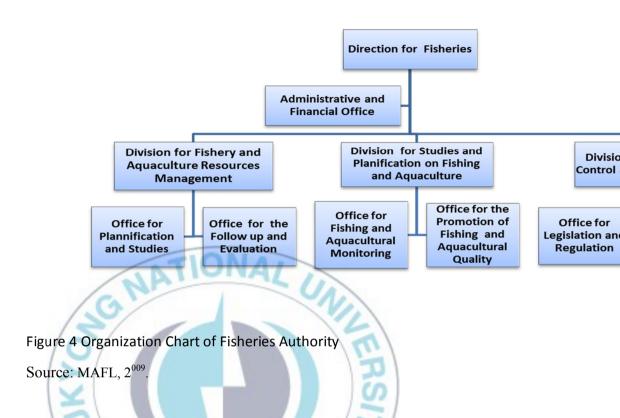


Figure 3 Organization Chart of the Ministry of Agriculture

Source: http://www.rdc-agriculture.com/



2.3 Fishery Resource Management in DRC

The fisheries management in DR Congo is based upon the decree of 1937 and enforced alongside that of 1932 as explained above, there were some articles giving power to provincial directors to pass by-laws to regulate fishing, and provide for fish sizes, sale and sustainable management. This law is not uniformly applied due to different conservation aspects such as nature and the biological importance of resources.

Therefore, the following practices are forbidden according to the law:

- Fishing in the breeding grounds
- Use of electrical fishing methods
- Use of poison in fishing
- Use of chemicals for fishing
- Use of dynamites
- Use of high capacity engines
- Plundering on the lakes protected areas
- Settlements on Lake shores for lakes in protected areas against existing regulations
- Use of fishnets less than 4.5 inches
- Use of beach seines

The 1932 decree provided for fishing concessions and to get their allocation, one has to assure the use of sustainable methods such as, proper fishing gear, financial capacity of concessionaire to carry out the sustainable fishing and sticking to demarcate the fish areas. And the concessions are not transferable.

A number of challenges face the Congolese fisheries to meet a sustainable management (Mwedde, 2009):

- Existence of many unauthorized fishermen. e.g. around 2,300 illegal boats on the lake Edward;
- COPEVI, a community organization responsible for fisheries management is not efficient at its work due to insufficient financial capacity to run the industry and the political interference in its management;
- Unrestricted entry of people and immigrants into the fishing villages, which
 reportedly created and expended settlements around the lake thereby
 destroying flora and increasing incidences of poaching and illegal fishing;
- Presence of armed groups in the lake area and surrounding villages which make the regulation so difficult.

The above challenges are among the causes declining the fish stock and, have adverse consequences not only on fish resources, but also on the food for the human population.

As remedies to these, the authorities are invited to strengthen the security measure capable to put in force the existing law and adopt the revised law correcting the gap in the previous one.

Eradicate the armed groups creating terror in the eastern lakes region and forbid illegal fishermen to have access in the resources.

Reinforce the capacity of rural governments and associations to manage the resources sustainably.

Undertake programs of building and rebuilding infrastructures for storage, preservation and processing of fishery products; cold rooms and fishing Cooperatives.

For the aquaculture, the policy is to support the development of fish ponds in all provinces; support for the production of fingerlings (tilapia, catfish) within existing structures; and support the farmers in fish feed (MAFL, 2012).

For an efficient fisheries management, the government works together with fishermen regrouped into cooperatives and federations for, a sustainable fisheries co-management. There are, FEPELAKI, COOPEFIMA situated in the eastern part of the country. They are established at Vitshumbi, on the Lake Edward, Lake Kivu, and Lake Albert and work together with the government for a sustainable co-management of fishery resources. The interchange meetings are also organized by the government to bring the fishermen from the other areas to learn the experience of these structures. There is now for example, one project going on at Lake Maindombe financed by Belgium WWF for the restructure of fishermen to preserve the lake's biomass.

The fishery sector is planning if supported, to make the identification and intervention reaches (lakes, rivers), purchases and distributes the inputs and fishing gear such as: nets, hooks, outboard motors, canoes, by tendering restricted.

Up to now, the DRC which shares some water bodies with the neighboring countries, as already presented above, has not yet the new monitoring technologies for efficient fishery control. The non-access of different stations to internet for sharing information and be in a permanent communication cannot promote efficient development in fishery sector. In addition, the vessel monitoring

system (VMS) which is a cost-effective tool for the successful monitoring, control and surveillance (MCS) of fisheries activities proves significant. The small coastal area, on Atlantic Ocean needs such system prevent IUU and maintain the fish stock that can be easily destroyed by foreign fishing vessels.

2.3.1 Water body Agreements Legal framework

There many agreements or Convention between the water bodies shared by DRC with its neighboring States. Some of them need to be mentioned as the following:

- 1. The agreement of November 6, 1999 signed in Brazzaville established the International Commission Congo-Ubangi-Sangha, CICOS, based on the tradition of the cooperation in use of shared International Rivers for the management of the Congo River.
- Semliki River and Lake Albert (Congo (Leopoldville) and Uganda and Sudan),
 Agreement between Great Britain and the Independent State of the Congo,
 modifying the Agreement signed at Brussels on 12 May 1894, signed in
 London on 9 May 1906.
- 3. River M'Pozo (Angola and Congo (Leopoldville)): Convention between Belgium and

Portugal regarding questions of economic interest in the colonies of the Belgian Congo and Angola, signed at Sao Paulo de Loanda on 20 July 1927.

4. The Convention on Sustainable Management of Lake Tanganyika "Lake Tanganyika Convention"

Adopted in Dares Salaam, Tanzania, on 12 June 2003.1 On 30th July, 2004, the Convention was formally registered with the Commission of the African Union. In September 2005, the Convention was entered into force and by the end of November 2007; all the four Contracting States had ratified the Convention (Mwima, 2011).

At this level, another meeting to be mentioned is a *Greater Virunga Tans* boundary Collaboration, grouping DRC and Uganda for the sustainable management of the Lake Edward held in March 18, 2009, at Kasese in Uganda, where these recommendations were made:

- To establish a joint monitoring team comprising of Uganda and DRC.
- Demarcate and respect international boundary
- Carryout scientific study to establish fish stocks, determine allowable number of fishers and catch levels,
- Develop a coordinating body for the entire Lake Edward.

2.3.2 Education, Training and Research

About three institutions provide a fish farming lecture in DR Congo. That is the faculty of agronomic science at the University of Kinshasa, and the faculty of agronomic science and faculty of veterinary science at the University of Lubumbashi.

Researches on aquaculture are made at the faculty of agronomy and the faculty of veterinary science at the University of Lubumbashi. It is also made at ERAIFT which is a postgraduate training school in tropical forest management and at INARA, the National Institute of agronomic research, and at ISP Bukavu.

2.3.3 Evolution of fish production

Table 2 Catch Fisheries Unit: M/T

	Water Resources	2002	2003	2004	2005	2006	2007	2008	2009	2010
1	coastline	3,990	3,968	3,979	3,974	3,973	4,251	4,549	5,458	6,549
2	River Network	90,880	86,036	89,458	88,747	88,747	94,959	101,606	121,927	146,324
3	Lake Tumba	2,022	2,007	2,015	2,010	2,010	2,151	2,302	2,762	3,314
4	Lake Mai Ndombe	9,825	9,731	9,777	9,800	9,769	10,453	11,184	13,420	16,104
5	Lake Albert	9,546	9,499	9,522	9,510	9,510	10,175	10,887	13,064	15,676
6	Lake Edward	4,800	4,781	4,790	4,785	4,785	5,120	5,478	6,566	7,879
7	Lake Kivu	1,794	1,787	1,790	1,780	1,788	1,913	2,047	2,456	2,947
8	Lake Tanganyika	88,590	88,531	88,560	88,546	88,545	94,743	101,375	121,650	145,980
9	Lake Mweru Luapula	8,730	8,687	8,708	8,719	8,705	9,314	9,966	11,959	14,350
10	Lake Tshangalele	1,627	1,619	1,623	1,621	16,769	17,943	19,199	23,038	27,645
11	Lake N'Zilo	377	369	373	371	1,621	1,735	1,857	2,228	2,673
12	Depression Kamalondo	16,821	16,752	16,736	16,769	371	397	425	510	612
13	Others									
	total	239,002	233,767	237,331	236,632	236,593	253,154	270,875	325,038	390,053

Source: SENADEP, 2011

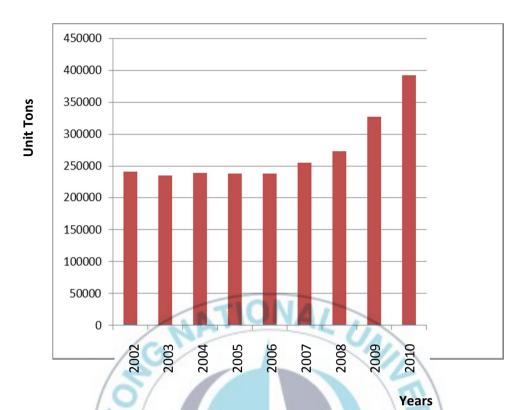


Figure 5 Fisheries Catch trends 2002-2010

Source: SENADEP, 2011

The above table shows the evolution of the production within 9 years. It reveals that the production, long time remaining stagnant has now started to increase a bit, owing to the introduction of a fishing boat of 150 HP engine capacities by the government, determined to reduce the foreign fish dependence (Berger Media, 7.3.2012). It is also reported, the presence of a certain Canadian investor who now operates with a trawl on some of Congo River tributaries in Bandundu province. And the other important factor to be mentioned is the insecurity issues brought by different wars which had destabilized the country from 1996 up to 2005 and the changes of political regimes.

Some members of the fisheries personnel became demotivated and even had abandoned their positions. Some of them have become hired by International NGOs and there is a need to train some of the staff members (Kalibu, 2002).

The fishery production can hardly being improved; because, the management of the Congolese fisheries had become very complex for some reasons as stated here below. So many factors hamper the development of agriculture as well as fisheries; such as low percentage of budget assigned to the agriculture sector (3%). According to the international standards where the DRC is taking part, the Agriculture sector should benefit 10% of the national budget. As had explained a ministry's official who was questioned about the productivity of this sector. He complained that the small amount assigned to the agricultural sector is liberated only at 30 or 40%. Giving an example that in 2011, the ministry of agriculture fisheries and livestock was waiting for 200 billion of Congolese francs (USD 217,391,304) but, received only 92 billion, (USD 100, 000, 000), equal to an average of 40% of the budget assigned to it (Kembola, 2011).

The export is concerned with the aquarium fish and most of them are exported illegally during the decade. However, the quantity of fish exported is not available in total. Nevertheless, the export was presented like the following: in 2001, 8 tons 2002, 24 tons and, in 2003, 22 tons (SENADEP, 2012).

2.4 Fishing potential, species and Distribution by production units

The wide surface area of the DRC and its diversity in water resources, have made about 12 fishing zones. These zones are in three main groups that are found at the Atlantic sea coastline, at the lakes and the rivers throughout the territory.

2.4.1 Marine fisheries

The DRC has a very small coastline at the Atlantic Ocean with a marine production estimated in 1980s, 2% of total national fish harvests. However, most of the marine production derives from artisanal units using canoes and beach seines. The study conducted from 1980 to 1984 by an experimental project, proved that the fishing at the coastline could be profitable only with an artisanal and a partly industrialized methods. The small quantity of pelagic fish like sardines was not justifying the big investments. But, other were so rich in production evaluated of 4 000 to 6 000 tons/year (PNUD-FAO-ZAI/80/003).

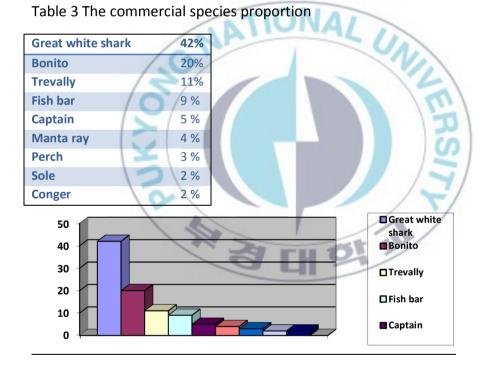


Figure 6 The Volume of mostly commercial species

Source: SENADEP, 2002.

2.4.1.1 Distribution

After harvest, the fish from artisanal fishing is easily sold from the nearby population up to the markets in Kinshasa. But during the time the trawls were used, the fish were brought to the market in Kinshasa by refrigerated Trucks, where cold stores are available.

2.4.2 Inland Fisheries

The DRC inland fisheries have a total of 1,089 fish species according to Fishbase. The main species exploited belong to the family of Allestidae, Morydae, Claridae, Cichlidae and Cyprinidae.

The inland water resources cover a surface area of 98,000 km². The number of fishers is not known, neither the number of canoes. In 2007 the production where estimated to 230,000 tons, thus 96% of the fisheries production (FAO, 2009).

Recognizing that the DR Congo is too big and wide, it appears very difficult to study the whole country fishing zone. Therefore, this research has selected some cases to find out some social factors constituting hindrances for the development of the fisheries sector. Two major networks will be the main point of this study. At one hand, The Katanga province located in the south of the country where Lake Tanganyika and Lake Mweru Luapula are found, and at the other hand, the fishing in the Congo River.

2.5 Main Fishing Zones and Current Problems of Marketing and Distribution

2.5.1 Lake Tanganyika

2.5.1.1 Production and Distribution of the fish products

The Lake Tanganyika has a total area of 33 000 km² and DRC shares this lake with the neighbor countries in this way: Burundi 8%, DR Congo 45%, Tanzania 41%, and Zambia 6%.

Table 4 Fishing potential

Country	Km ²	(%)	Fishing Potential			
			Minimum M/T	Maximum M/T		
Burundi	2 600	8	21 000	80 000		
DR Congo	14.800	45	135 000	450 000		
Tanzania	13 600	41	122 000	400 000		
Zambia	2 000	6	19 000	70 000		
Total	33 000	100	300 000	1 000 000		

Source: (SENADEP, 2002)

The fish species found in the Lake are about 214 and the most commercialized *Stolothrissa tanganicae* (75%), *Limnothrissa miodon* (10%), *Lates /Luciolates* (15%)

According to the SENADEP, estimates show that the annual catches are about 30 000 Tons at the DR Congo side which is equal to 22 % of the potential production. Therefore, the possibility to increase the catch at the DR Congo side is evident.

2.5.1.2 Fish Processing

Generally, after the catch, the sardines are dried since they are so brittle and need to be handling quickly. The fishing is mainly done during the rainy season and during this time the drying conditions are really tough; due to the non-existence of adequate facilities and hygienic conditions are not so good to keep the fish in the good quality.

Other fish are salted and smoked by the fishermen or by the traders and some companies do the same operation by salting or drying.

Concerning the freezing, some ship-owners are now involved in this method to supply the fish to the Lubumbashi market which has always the demand and still profitable (Kalibu, 2002).

2.5.1.3 Marketing and Distribution

The fresh fish are sold only at Kalemie market and the surroundings areas. Its distribution is not go beyond 50 km from Kalemie. The rest of the fish is destined to be sold in these provinces: Kasai, Kivu and Katanga. Hundreds of traders come to kalemie to buy dry salted fish and dried fish to supply the wholesale market of Muena Ditu 67%, Kananga 32% and 1% for Lubumbashi.

The information found from the ministry of fisheries reports that the frozen fish are sold in Lubumbashi to the companies by contracts and to the wholesalers who supply the other towns of Kolwezi and Likasi. The distribution of salted-dried fish in good conditions is not worried. However, the frozen fish are transported to Lubumbashi by isotherm wagons belonging to SNCC. The quality and state of fish at the destination depends on the time of the trip. The temperature

on the departure -20° C becomes at the destination 0° to -5° C; totally no more frozen.

The transportation of fish from Kalemie, the landing area up to Lubumbashi the nearest City, is once a week. This depends on the fish price and the processing cost, (salting and drying) which at least do or not bring an added value. But remain necessary to limit the loss of fish, to make stable the price of fresh fish in Kalemie's market, and supply the products to the two Kasaï, Kivu and Katanga provinces.

But the freezing only brings an added value to the fish. The two main problems happening at this level are the loss during the drying that can go from 25 to 50% due to the rains and the insufficient transportation means for the frozen fish (Kalibu, 2002).

2.5.2 Lake Kivu

The Lake Kivu is situated between DRC and Rwanda and effluent to Lake Tanganyika by the River Ruzizi, has a total area of 2 370 km². A 1 370 km² or 58% of its waters belongs to DRC (FAO report, 2001).

2.5.2.1 Potential of fishing

Table 5 Potential at DR Congo side

Main species	Temperature	Fishing p		
Barilins ubangensis Barbus	22,8 °C	MIN	AVERAGE	MAX
Clarias Tilapia haplochronis		7.000	10.000	12.000

Source: SENADEP, 2002

2.5.2.2 Production

The annual production potential of the total lake is estimated between

11,300 Tons and 30,000 tons per year, and for the DRC part is to 7,000 to 19,000

tons per year. However, the ministry in charge of fisheries recognizes these

estimates to be uncertain and need a biological study for the precision. But the

fauna of this lake is poor in fish species and the main are shown in the above table.

In fact, the fish fauna of the Lake Kivu has about 30 species of cyprinidae,

Claridae and Cichlidae. And among Cichlidae there is six endemic species of

Haplochromis.

2.5.2.3 Marketing and Distribution

The dried fish are not too much. The reason is that the markets are near the

production area. The cold store existing must be repaired to improve their

efficiency.

The production from this lake being low, and the riverine population

enough big, it is mostly sold to surrounding local markets.

With its potential, the Lake Kivu can despite the low production offer the

possibilities to set up a program of sustainable fisheries. For, the evacuation of the

fish products is easy; owing to the good quality of the road along the lake (Kalibu,

2002).

2.5.3 Lake Edward

2.5.3.1 Fishing potential

Total surface: 1 940 km²

DRC portion: 1630 km² thus 84%,

33

- Uganda 310 km², thus 16%
- Water volume: 78, 2 billion m³

The fish production is estimated between 80 and 100 kg/ha/year, which can bring to the harvest of around 13 000 to 16 000 tons per year according to the ministry in charge of fisheries at the DR Congo side. For a good production planning a hydrobiological study is necessary.

The most commercial species are: Tilapia (60%), *Protopterus* (10%), *Bagrus* (10%), *Clarias* (10%), *Barbus* (5%), others (5%) The two main production centers are Vitshumbi and Kyavinyonge (Kalibu, 2002).

2.5.3.2 Processing

The smoking remains the most expended technic though wood are not easy found in this area. This makes the operations so painful but there is no choice since some species, like *clarias* and *Protopterus*) require it.

Another method was the freezing done by COPEVI³, a former fishing group. It had two cold stores but these are no more functional.

2.5.3.3 Marketing Distribution

Until 1983, the fishers were obliged to sell 60% of their production to the cooperative "COPEVI" who was distributing fish to the neighboring zones by two Lorries of 8 and 15 tons.

Nowadays, the distribution is made by the private wholesalers. The roads are available and a big part of fish is sold fresh in the surrounding cities. The

³ COPEVI: a former fishing company which had changed the Social denomination in 1979. http://www.fao.org/docrep/005/AC753E/AC753E03.htm

processed fish are sold in Uganda in order to get from there the fishing gears. But for the absence of the cold storage, very often the fresh fish arrive to the consumers in the big markets perished.

2.5.4 Lake Albert

The Lake Albert has a total surface 5 270 km² and is shared by two countries. Uganda has 5 270 km² (60%) and DRC has 2 420 km (40%). The maximum deep is 58 m deep and the minimum is 25 m. The temperature is 27°C (SENADEP, 2002).

2.5.4.1 Production

The potential for fishing is estimated between 21 000 and 30 000 tons thus, 9 700 to 13 300 tons for the DRC part. The production mainly consists of predatory species: *Alestes, Baremose, Hydrocynus forskahli* and, *Lates niloticus albertinus*. At the other hand, the main species are Tilapia, *Hydrocyon* goliath and *Bagrus ubangensis*. According to Congolese government, the catch is estimated between 2,400 and 4,800 tons. Up to now there is no reliable data. The fishing remains artisanal, done by canoes and boats using oar or engine from 6 to 15 horses.

The industrial fishing was done before by Greek shipowners. But after retrocession forced by the former president Mobutu, those who replace them failed to continue with the production.

2.5.4.2 Processing

The big part of fish is salted and dried. There are infrastructures in each fishing zone. The salt is imported from Kenya. The lesser part is smoked because finding wood is not easy.

The cold warehouses in function belong to the koskinos, Cogepa and Nduba shipowners and have respectively the capacity of 80, 25 and 18 tons.

2.5.4.3 Marketing and distribution

The artisanal Fish products are very often salted and dried. These are sold to the wholesalers moving with the motorized boats and resell them at Kasenyi and Mahagi Ports. But some of them bring these salted and dried fish to Kinshasa by air, which make the fish unaffordable by the population of low income. They also bring some frozen, salted and dried products to the consumption cities of Kisangani, Isiro, Irumu etc. by trucks or trailers.

2.5.5 Lake Mweru Luapula

2.5.5.1 Production

The total surface area of the Lake is 4,650 km², it is shared by DRC 1,950 km² (42%) and Zambia 2,700 km² (58%). It has historically served as an important commercial fishing area because of the strong markets for fish in the nearby Coperbelt and Shaba (Katanga) Province (DRC) mining districts (FAO, 2001). The study carried out by Malaisse in 1997 revealed that the potential of annual production is 28 000 tons and 12 000 tons at the DRC side (Malaisse, 1997).

The most commercial species are: Tilapia *macrochir* with around 80% of the total catches, followed by *Clarias, Synodontis, Barbus, Labeo altivelis and Mormyridae*.

The fishing is semi-industrial than by Greeks entrepreneurs and Congolese businessmen. There are no reliable details about the number of boat actually in operation. But the lake is threatened by overfishing.

2.5.5.2 Processing

The main technics in practice are salting, drying and smoking. The conservation of fish in ice is much expanded in this Katanga Province. The ice is brought from the commercial towns up to the fishing zones to facilitate the evacuation of fresh fish up to the market places.

2.5.5.3 Marketing and distribution

For the product issued from semi-industrial fishing and artisanal fishing the most supplied market places are the urban cities of Lubumbashi and Likasi. However, this supply is still low to the demand of the market need. Lubumbashi is the market for distribution of the fish coming from Lake Mweru at one hand and, at the other the fish from Kasenga via Luapula River to Lubumbashi. This Lake is an important reserve of fish for Katanga Province in general and Lubumbashi in particular.

2.5.6 Lake N'Zilo and Tshangalele

The Lake N'Zilo and Tshangalele are the isolated lakes from the commercial channels and located at the South-East of Katanga. They serve artisanal fishing despite the incredible production and the diminution of ichtyo-

biodiversity caused by the mining. The main species are: *Labeo, Barbus, Clarias, Tilapia*.

Table 6 Lakes Description

	Lake N'Zilo	Lake Tshangalele
Surface area	280 km²	446 km²
Fishing Potential	2,500Tons/year	4,500 tons/year

Source: (Malaisse, 1997).

2.5.7 The depression of Kamalondo

The depression is composed of 22 small lakes with the total surface area of 26 256km². The potential production is of 30 000 tons/year. In 1983 the catches were estimated to 15 300 tons. The fishing is artisanal and the main commercial species found are *Lates niloticus*, processed by the local traders established in Bukama, and Kinkundia, using the same methods of salting, drying and smoking.

This part of Katanga has a lot of transportation networks facilitating the circulation of fish products to the province of Katanga (23%), Kasai oriental (33%), Kasai occidental (43%), Kivu (1%) and sometimes to Kinshasa. But the stock needs to be assessed in order to facilitate sustainable fisheries (Kalibu, 2002).

2.5.8 Fishing in Congo River Network

2.5.8.1Hydrography of Basin

• Surface at the River mouth: 3 822 000 km²

Length: 34 000Km;

■ Total length of the River in Congo: 4,200 km;

■ Total length of tributaries : 29,800 km;

♣ Width:

■ At Kisangani : 630 m

■ In the confluent with Ubangui : 15,500 m

At the Pool Malebo : 23,400 m

■ At Matadi : 450 m

■ At Banana : 18,800 m

Source: SENADEP

The Congo's discharge at its mouth ranges from 23,000 cubic meters per second (810,000 cu ft/s) to 75,000 cubic meters per second (2,600,000 cu ft/s), with an average of 41,000 cubic meters per second (1,400,000 cu ft/s).

2.5.8.2 Resources and Production

The system of the Congo River belongs to the equatorial sub-region waters comprise with river ponds of central Africa. The upper part of the River 1,500 km up to Kisangani presents a family consisted of *cichlidae* of Zambezi (*Tilapia macrochir* and *Haplochromis mellandi*) and Nilotic species (*Protopterus acthiopicus* and *Protopterus senegalus*).

The middle part of the River between Kisangani and Kinshasa has, as reported by the information from SENADEP, a diversity of fish fauna of about eight hundreds species among them a fifty comprises twenty families of the main

⁴ http://en.wikipedia.org/wiki/Congo_River

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catches. Other species are of the family of *Mormyridae*, *Characidae*, *Bagridae*, *Cyprinidae* and *Mochokidae*.

2.5.8.3 Production

The natural productivity could be between 30 and 40 kg/acre/year, in the most full fish part between Basoko and the channel of Iberu, in the tributaries of the lake Tumba and Mai-Ndombe.

Therefore, the production potential can reach 10 to 15 kg/acre/year in the forest areas where waters are dark with acidity (pH of 3, 8 to 5, and 0). However, all estimates the fishery authority detains indicate the potential of 120 000 to 200, 000 tons/year. The number of fishers on the River is irregular and they are more concentrated near the big towns. The reasons are socio-economical: quickness in sale of their catches, easy supplies, and possibility to reach the medical facilities. Thus, the actual production cannot explain the potential. In general, it is difficult to have the supervision on the fishers, because these are dispersed all along the River and the individualism is very pronounced in the organization of the work. However, the fishing on the Congo River is artisanal for the simple reason that, the biological environment is not favorable.

2.5.8.3 Processing and Distribution

After the catch, the fish are mostly smoked to wait until the time it will be sold. For the zones of catches are remote from the consumer's centers. The big quantity become carbonized or attacked by ichtyophagous insects and reduce the value of the fish even creating the huge loss of the animal proteins evaluated to 30% of the total catch The fishers are in dire need to find infrastructures and adequate processing technics and viable equipment to handle the harvest (Kalibu, 2002).

The cold conservation of fish is limited to the big cities like Kinshasa and Kisangani. In the past, fish were collected from the fishers along the River by some equipped boats belonging to ONATRA, and were conserved and sold at Kinshasa where cold infrastructures are available. Kinshasa and Kisangani are big consumers of the fish from the Congo River.

2.6 Aquaculture

The aquaculture in DR Congo started when the fish were collected in the rivers and water reserves in Katanga province between the years 1940 and 1945 during the colonial period. The number of ponds was estimated at around 126,100 covering a total surface unit of 9,000 ha. After independence, the majority of the fry production centers where abandoned or badly exploited. And this activity got a heavy downsides that brought the average production which was 0, 45 fish t/ha/year to less than 0,035 t/ha/year (FAO, 2012). The departure of the Belgian supervisory staff at independence, the inexperience and the insufficiency of the national expertise and especially the various movements of wars and rebellions were the cause of the fall of the production. In the seventies, several projects financed by bilateral donors rehabilitate 4000 ponds with annual production estimated at 3000 tons.

Generally, the country does not really have an aquaculture tradition. In many areas prefer to fish because of water abundance resources than rearing fish. Tilapia are raised by the small farmers in earth ponds built in the valleys wetlands, using extensive and semi-extensive household aquaculture systems, to improve the diets of the indigenous and rural people. All the provinces in DR Congo are now encouraging the practice and development of aquaculture (FAO, 2011).

Mainly this culture is based on:

- Bandundu Province: Tilapia rendelli (Provincial Coordination, annual report 2002 by FAO);
- Kasai Province: T. rendelli and Oreochromis machrochir. Aquaculture is more practiced in Kasai Oriental and Occidental. The ponds cover an area of 1 504 ha (Provincial Coordination, annual report 2003 quoted by FAO, 2011).
- *Katanga province: Oreochromis machrochir* and *Tilapia rendelli*. The area under aquaculture was 850 ha in 2002.
- Nord and Sud Kivu Provinces: T. rendelli, O. nigrus, O. niloticus and O. andersonii. The total area farmed was in 1990 exceeding 192 ha.
- Orientale and Equateur Provinces: in these predominant forest provinces the individual pond areas can reach several dozen acres in size. The total farmed areas exceed 526 ha in the Oriental Province and about 100 ha in Equateur province (FAO, 2011).

Concerning the number of people involved in aquaculture, full time or part time workers, no information is yet available. But, the following numbers of aqua culturists have been published by the National Service of Aquaculture for some of the largest towns:

Kinshasa Province/city: 1 800; Orientale Province (Kisangani): 593; Katanga Province (Lubumbashi): 130; Bas Congo Province: 152; Sud Kivu Province: 1 444; Nord Kivu Province: 126; Bandundu Province: 2 156; Maniema Province: 445; Kasaï Oriental Province: 1 245 (FAO, 2012).

The fishery sector has lost the control on the collection of reliable statistics for last decade in aquaculture after the end of USA, Belgian and French Cooperation project activities in 1990, caused by several outbreaks of war conducting fish farmers to abandon their activities.



Table 7 The provincial statistics

Province		1998			1999		
	No. of ponds	Total area (ha)	Estimated production (tonnes)	No of ponds	Total area (ha)	Estimated production (tonnes)	No. of ponds
Kinshasa	769	49	123	769	49	123	1 071
Bas Congo	3 432	39	97	3 612	44	111	3 612
Bandundu	18 979	90	224	53 233	91	226	54 199
Kasaï Occid.	2 627	12	31	3 127	20	50	3 189
Kasaï Orient	2 089	10	123	2 132	59	148	2 132
Katanga	1 127	64	160	1 147	65	163	1 147
Kivu	4 987	53	1 342	10 983	501	1 253	10 983
Equateur	1 477	7	177	1 546	73	184	1 546
Orientale	1 028	190	474	1 028	170	423	1 028
Democratic Republic of Congo	36 515	1 101 TIO	2 751 NA/	77 577	1 072	2 683	78 907

Source: FAO (2012)

The unstable period of war followed by the fragile peace could not make easy the job for b legal authority. But we still hoping that the efforts made by the administrative authority are go makers' especially, for the eastern part of the country so that everyone can resume with his task.

The tilapia is sold about two to three dollars. But, for the present time, it is very difficult the aquaculture to the global GDP since the production is still lower and in most cases it is

2.7 Projected Demand and population growth in fish

Table 8 National demand projection

Year	Per capita consumption kgs		Population	Demand in M/Tones
2000		8	52,099,000	416,732
2005		8	61,576,000	492,608
2010		8	72,778,000	582,224
2015		8	86,018,000	688,144
2019		8	98,325,000	786,600

Source: (Mulunba, 2000).

As the population growth is projected in this table, it is likely that the demand of fish will exceed the potential by 2019. The actual manifest inefficiency of resources management, the absence of updated data and related information, and the delay in the adoption of new fisheries laws adapted to the current context, the country will fail to provide adequate food security. The light of the forgoing, the country should think to promote the fish farming.

2.8 Situation of Seafood and Marketing in DRC

The big demand of fish in the increasing population of DRC, the absence of adequate roads and others transportation infrastructures to make the flow of fish throughout the country and, the deficit for the local production to provide enough quantity to satisfy the population need, induced the country to be a permanent fish importer.

The DRC imports fish over 150,000 tons/year; especially the frozen Mackerel, from Namibia and Mauritania which was estimated in 2007 in the value of \$94,756,023.08 and the value of export was at \$535,947.00.

Other species like Tilapia, Catfish, Sardines, etc. are also imported from neighboring countries. At the other hand, DRC fish export is also high in the regional market, due to the luck of roads and related infrastructure for local distribution. However, the formal export is made to EU and USA, especially the aquarium fish.

2.8.1 Fish Distribution Channel in Katanga Province

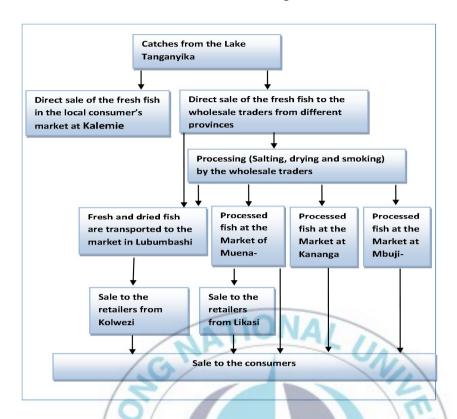


Figure 7 Katanga fish distribution axis

Source: (SENADEP, 2002).

Distribution Chain Explanation

Lake Tanganyika is one of the fish reserves and plays a big role in DR Congo. It supplies Tilapia, Catfish and other endemic fish species to the big cities located in southern and central parts of the country. However, despite its role, the fish and fish products distribution need to find improvement on infrastructural plan including with processing, packaging, and conserving in order to sell them in good quality and minimize the post-harvest loss. In this way the local fish can prevail in the local market and change the behavior of the consumers. The unstable electricity and roads quality are the main factors to be considered if we want to promote a high quality of fish distribution as well as the preservation of food safety.

The establishment of fisheries school and colleges are also needed in this area for the improvement in fishing, processing and distributing. The only way to make the local fish attractive and promote investment in fishery sector and maximize the production is by solving the problem stated above.

2.8.2 Fish and Fish Product from Congo River Distribution Channel

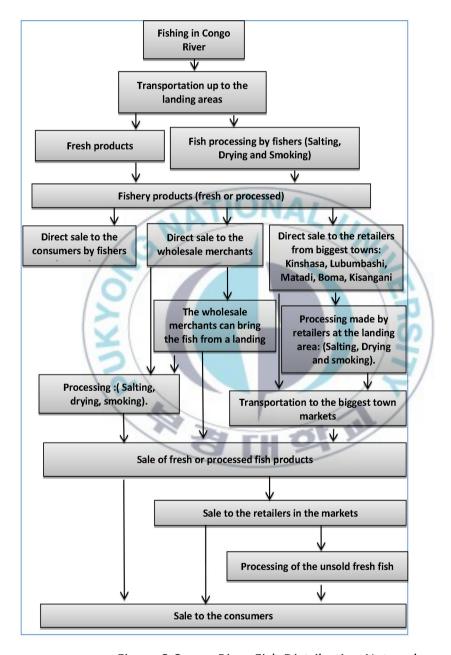


Figure 8 Congo River Fish Distribution Network

Source: (Lesourd, 2009).

In order to increase the fish production and improve the fish products distribution, there are some parameters to take into consideration. Fish being perishable commodities, some of these factors are: the solving of the issues of the conservation facilities, the ways of transport and the processing methods. One of the most used methods in the DRC, to conserve the fish is the smoking as it is mentioned in these two channels

An example is taken here to illustrate one of the challenges met by the fishermen after the harvest. This will testify about the loss of fish, I have already mentioned in the previous parts, concerning the fish processing. Near Zambian border is located a small lake Kibakabaka and the fishermen from there, still use rudimentary techniques to process the fish (PRODEPAAK, 2010). These techniques conserve the fish only for a very short time, one month at most. Once charred, the fish break up in small bits when transporting them to the markets. At the other hand, sales are extremely low and do not provide with the fishermen the necessary income to sustain their households. Fortunately, the PRODEPAAK project has started training them with a new method of Chorkor oven since 2010. And this method is keeping smoked fish to be edible even after six month as assured by the project.

A survey carried out in the second city of Lubumbashi, by World Fish Center in 2009, upon the inventory of fish markets, revealed the inexistence of cold rooms in almost cases of the markets. Traders are obliged to find out where freezers are available among the food depots in the markets to rent them and store their fish. As perishable commodities, they even lose their price when remained unsold during the daytime.

In conclusion to this chapter, the country has enough fishery resources as shown in this research. But the supply of the fish to the population remains in deficit and the population need in fish is still continuous. Therefore, this part of the study went in assessment of the existing problems that need to be solved in order to increase the production and respond to the population demand. To see how can become the sector viable for more fishery investments.

By investigating the real problems, it is clear to see in particular; the social economic factors necessitate improvement and changes to create a favorable environment. These are the challenges and even hindrances to the development. Even a superficial reading of the situation presented above, concerning with fishing, processing and distribution, can still reveal some inadequacies in regard with supply structure. These are remarkable by the scarcity of basic infrastructures in fish market, a limited number or total absence of adequate storages and processing facilities at the landing areas. In many cases, fishers are the ones playing the role of processing. The evacuation of fresh fish to the big cities is painful and climate conditions sometimes destroy the fish during processing operations.



3. Korean Fisheries status and Seafood Distribution Structure

3.1 Description of South Korea

South Korea is an Asian country officially known as the Republic of Korea, and sovereign state in the southern part of the Korean Peninsula. The name Korea comes from Goryeo, a dynasty which ruled in the middle Ages. It shares borders with, China to the west, Japan to the east, and the south, with the East China Sea. The South Korea is located in the Northern hemisphere with a temperate climate, and has a mountainous land.

Republic of Korea



Figure 9 Map of South Korea

Source: Herald, 2009.

3.2 Country Profile

The Korean peninsula is Covering a total area of 228,148 km² of which the Republic of Korea has 99 000 km². It has a coastline of 8,693 kilometers

around its peninsula and an additional 17, 269 kilometers of coastline around some 3,000 islands within its territory (Bai, 1999, quoted by FAO).

The country has partially forested mountain ranges separated by deep, narrow valleys and cultivated plains along the coasts particularly in the west and south. The main cities are Seoul the capital, Busan, Daegu, Incheon, Gwangju, Daejeon and Ulsan.

Korea has a population of 48,754,657 estimated in July 2011 with an annual growth rate of 0.23%. The total labor force by occupation in 2010 was: services 68.4%; industry 24.3% and agriculture 7.3% (Bai, 1999).

Economically, the South Korea has achieved a remarkable high level of economic growth after several decades of Korean War and is now in the ranks of the Organization for Cooperation (OECD). Today, it has become the United States' seven-largest trading partner and is the 15th-largest economy in the world. Korean economy, in recent years, moved away from the centrally planned, government-directed investment model toward a more market-oriented one. With the aid from international Monetary Fund (IMF) the South Korea bounced back from the 1997-98 Asian financial crisis and its recovery was based largely on extensive financial reforms that restored stability to markets. The economic reforms pushed by President Kim Dae-jung, helped Korea to return to the growth, with the growth rate of 10% in 1999 and 9% in 2000. The gross domestic product is of \$31,700 (CIA, 2011).

3.3 Marine and Inland Fisheries profile

3.3.1 Status of Coastal and Offshore Fishery Resources

The Korean Marine fishery resources which used to be up to 10 million tons in the 1980s have now been reduced to 7.9 million tons as of 2004 (OECD, 2009). The decline in fish stock increased up to, where the catch reduction had reached 1.6 million tons in the mid-1990s and 1.15 million tons in 2007 with a rate of 20 % in adult among the fish catch, especially in 2000s, so the production had dramatically declined.

Though the production was declining, the level of the fishing efforts remained in increase. That means the Catch per Unit Effort (CPUE) for tonnage and horse power in coastal and offshore fisheries had been decreasing. The catch ability of some offshore fisheries had already exceeded biologically appropriate catch ability.

The management of Korean fisheries by tradition is through technical measures such as closed time, closed area, mesh size regulation, etc. as well as input control based on the licensing system of fishing vessels and fisheries. Also the vessel buyback program promoted since 1994 and the input control by adoption of TAC. Previously, Korea used to rely heavily on capture production; however, a continuous decrease in capture production in recent years has led the country to an increased attention on aquaculture. The total fisheries output were respectively, 2.25 and 3.11 million tons in 2010 and 2011 as reported by Korean statistics (FAO, 2012).

The commercial aquaculture was first started around 300 years ago before the partition of Korea, however; science-based research activities were initiated in 1929 by the Jinhae Inland Fisheries Research Institute which is a part of the National Fisheries Research Institute (NFRDI). The early research activities done by NFRDI was focused on fresh water finfish and, was quick followed by others organizations which organized various inland fisheries research programs. These in return contributed to the development of the Mariculture sector. The hatchery-based seed production and advanced aquaculture technology have led to a rapid development of the industry, enabling mass production of juveniles and the introduction of foreign species into the country (FAO, 2012).

The Mariculture is dominated by seaweed followed by mollusks and finfish and crustaceans. The practiced culture includes with land-based raceway culture systems, long line culture, bottom culture, and offshore culture and recirculation systems. It makes the highest contribution to the employment of labor, which was estimated in 2004, about 92 percent of people employed in aquaculture industry. And only 8 percent of the people were employed in freshwater aquaculture (FAO, 2012).

3.3.2 Development of Inland Fisheries in South Korea

Previously, the South Korea was good in fishing industry. But this started declining over the last 2 decades with only 315,000 people employed in 1999, down from 750,000 in the 1970s. Its role in the economy has declined along with that of agriculture in general as a result of industrialization and growth of the service sector (Min-guk, 2012). So, the country relies on import of the fishery products for the domestic consumption, despite the increase of the catches from 2.4 million metric tons in the 1990s. The value of the imported fish products was about US\$1 billion in 1996-97. It was a tremendous jump by 1970s when they were less than US\$20 million annually (Min-guk, 2012).

At the other hand, the history of inland fisheries resource stock in the Republic of Korea started in 1970's when fishing pressure was relatively low, and its development was closely related to the overall trends in the inland fishery production. From that time, the annual average production of inland capture fisheries increased rapidly until the mid-1980. This annual average production declined severely after. Unexpectedly, that decline in commercial capture fisheries brings an opportunity to promote aquaculture development and to reach a social agreement on the needs for intensive enhancement of inland fisheries resources. Consequently, since the 1990's about 70 percent of the annual inland fisheries production was from aquaculture in comparison to the contribution of nearly 94 percent from capture fisheries until 1980's. The development of aquaculture-related technology is of use to optimize stock enhancement efforts (Park, 2010).

The very used inland culture systems consist of the tanks (for flounder, eel etc.) or raceways (for rainbow trout), while the offshore culture system is the floating net-pens system (for Korean rockfish, Sebastes schlegeli).

The release of hatchery reared juveniles of inland fisheries resources has become an increasingly common practice for stock enhancement and conservation over the last three decades. The primary purpose of the hatchery practice was to increase the stock size of the commercial valuable species in the early stages but now this has changed to compensate for recruitment overfishing and to mitigate disturbances to the environment from human activities. By 2007, the number of target species for enhancement is eleven, namely common carp, Crucian carp, Korean Bullhead, far eastern catfish turtle. The average number of hatchery-reared juveniles of the eleven target species released is approximately 12 million during the last 5 years, valued at about US\$1.3 million. In addition, about 13 million of hatchery-reared salmon were released. And to more initiatives on stock enhancement and conservation were started to aid depleted inland fisheries populations through the provision of artificial spawning facilities, development of seed production and supply techniques. The former aims to create artificial spawning and rearing environments as hatcheries and the later to conserve and preserve native species. Regarding negative species and ecosystems, the management of invasive alien species is increasingly being addressed. Two other species introduced from abroad, largemouth bass and bluegill are listed as invasive alien species that threaten the native ecosystems (Park, 2010).

3.3.3 Korean seafood consumption

The Korean per capita fish consumption is of 54.2 kg/year and has grown by 57% this last decade and the 40% of animal protein comes from fish products (MIFAFF, 2012).

The major fish species that Koreans consume are Alaska Pollack, squid, mackerel, hair tail, yellow corvine, mackerel, cod, herring, atka mackerel, Spanish mackerel, monkfish, ray, skate, sable fish, rock fish, cuttle fish, lobster, shellfish. Croaker, saury pike, etc. however, Korean prefer live fish, fresh or chilled fish and lastly frozen fish.⁵

Korean seafood industry is based upon inland and coastal/offshore fishery resources. The major fishing grounds are on the coastal areas including the East Sea and Yellow Sea. These waters have historically provided an abundance and wide variety of fish, including the walleye Pollack, sardine, squid, yellow corvina, hair tail, herring, mackerel, pike and yellow tail (Vizzone, 2006).

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⁵ Agriculture and Agri-Food Canada, 2012.

3.3.4 Fisheries Resources Management, Legal Frameworks and Policy

3.3.4.1 Fisheries Authority

The fisheries in Korea are under the Ministry for Food, Agriculture, Forestry and Fisheries. The ministry serves as a capstone over four (4) different offices. Among these are, the National Fisheries Research and Development Institute (NFRDI), the National Fisheries Products Quality Inspection Service, the Fisheries Human Resource Development Institute and, the Fisheries Supervision Office for the East sea/West sea in the ten (10) local governments.

The fishery sector is organized as follows:

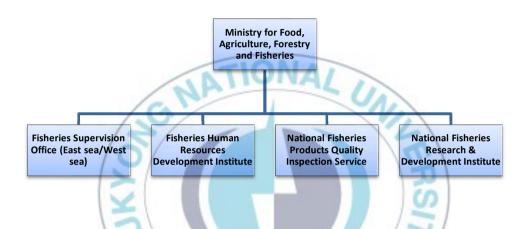


Figure 10 Ministry for Food, Agriculture, Forestry and Fisheries Chart

Source: (MIFAFF, 2012).

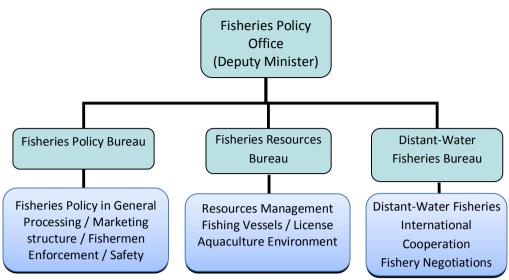


Figure 11 Fisheries Organization Chart

Source: (MIFAFF, 2012). The detailed chart is available on MIFAFF website.

3.3.4.2 Legal Framework

For the management of Korean fisheries and related resources diverse acts, laws and regulations have been enacted to establish the institutions responsible for enhancing and protecting fisheries resources. It also strives for the development of fisheries and the democratization of the fishing industry by increasing the productivity and managing of waters in a comprehensive way (FAO, 2003). Here below are some of these Acts:

Fishery Resources Protection Act (Act No. 298, Dec. 12, 1953), regulating the exploitation of fishery resources through the provision of requirements such as obtaining licenses.

Inland Waters Fisheries Development Act, 1975, promoting the comprehensive development of inland water fisheries and also providing the protection and cultivation of marine resources. This legislation supports improved incomes for farmers and fishermen.

Fisheries Products Quality Control Act (2001), promoting the qualitative improvement and standardization of, fisheries products through inspection.

Fisheries Resources Management Act (April 22, 2009) for conducting a comprehensive and systematic fisheries resource management and establishing

and implementing a fisheries resources recovery plan, with objectives to strengthen research and assessment of fisheries, establish and implement fish stock rebuilding plans (Lee, 2010).

The Korea's fisheries law is fractionized into three Presidential decrees and 15 Ministerial ordinances.

Some standards in the law were set in the 1960s when fishery resources were abundant still apply. Some measures had become contradictory to the current fishery resources management measures and fishery resource rebuilding plans. This brought the government to establish and announce the "fisheries Resources Management Act" on April 22, 2009 to conduct a comprehensive and systematic fisheries management and to establish and implement a fisheries resource recovery plan. This had as objectives to strengthen research and assessment of fisheries (Lee, 2010).

3.3.4.3 Management Policy

By tradition, the Korean fisheries were based on licensing system of fishing vessels and fisheries. Some technical measures used to be taken by the government for an efficient management such as, closed time, closed area, mesh size regulation, etc. as well as input control to manage fish stock and the fishing industry for the last century. And in 1994, the government promoted the vessel buyback program and then, implemented the total allowable catch (TAC) system in 1999 (OECD, 2009).

The artificial reef program was also promoted in 1971 as a part of ecosystem-based stock enhancement programs, the fry releasing program since 1976, marine ranching program since 2001, and seaweed forest program since 2002 in order to increase both fishery resources and fishing income for offshore and coastal fisheries. But, despite this consistent policy effort that the total amount of fishery resources has continued to decrease in coastal and offshore areas from 10 million tons in 1980 to 7.9 million tons in 2004 (OECD, 2009).

From 2005, the Korean government established a basic plan of fish stock rebuilding (FSRP) and its fisheries management policies in order to overcome the

limitations with the conventional fisheries management policies and to achieve an actual recovery of fishery resources within the EEZ since the UNCLOS and the Korea-Japan/Korea-China went into effect (Lee, 2010).

The FSRP's policy was to increase the level of the fish stock from the current level to a target level within a rebuilding period. It had a specific and scientific fish stock management programs based on the selection of the most effective fisheries management measure and complimenting any necessary fishery management supports. It has been established from a general approach at the national level and had an ecosystem-based approach to fisheries management explicitly as a policy framework (OECD, 2009).

The fisheries Resource Management Act have the following characteristics:

- Research and assessment of fisheries resources shall be conducted every year
- 2) A basic fisheries resource management plan shall be established every five years for the comprehensive and systematic recovery and management of fisheries resources
- 3) Institutional grounds for self-regulated fisheries resources management, such as settlement of disputes, was established
- 4) International rules, such as promoting international cooperation, sharing information on fisheries resource management, and using environmentally-friendly fishing methods and precautionary approaches.

Therefore, the Fisheries Resource Management is defined as follows:

- 1. "Fishery resources" means the marine plants and animals which are useful for national economy and people's living
- 2. "The fishery resources management" means the acts to protect, recover, and create fishery resources
- 3. "Total allowable catch" means the annual catch limit allowed for certain fish species

- 4. "Fish stock enhancement" means acts that artificially enhance fishery resources, including the creation of artificial reefs and seaweed forests capable to improve reproduction of marine living organisms
- 5. "Marine ranching" means a certain area where some equipment is placed to facilitate fishery resources.
- 3.3.5 General Information on fisheries in S. Korea

3.3.5.1 Fisheries Production (2009)

Table 9 (2.1% of the world's production) Unit: 1,000 tons

Types	Production	Major Species
Coastal & offshore	1,227	Mackerel, Hair tail, Anchovy, Squid, Croaker, Blue Crabs, Clam
Aquaculture	1,313	Flounder, Rockfish, Oyster, Laver, Kelp, Abalone
Distant water	612	Tuna, Saury, Alaska Pollack, Squid, Krill
Inland	30	Eel, Trout, Catfish

Source: MIFAFF

3.3.5.2 Aquaculture and capture fishery in projection for future

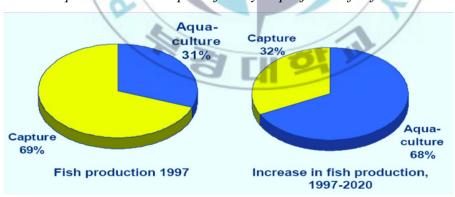


Figure 12 The future Expected production

Source: MIFAFF, 2012

3.3.5.3 Fishing household

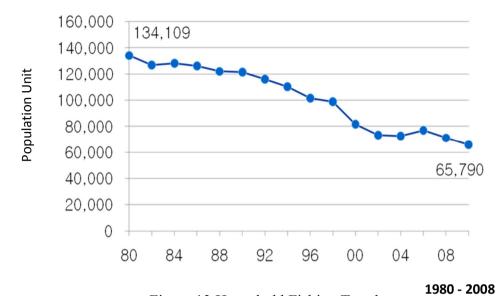


Figure 13 Household Fishing Trends

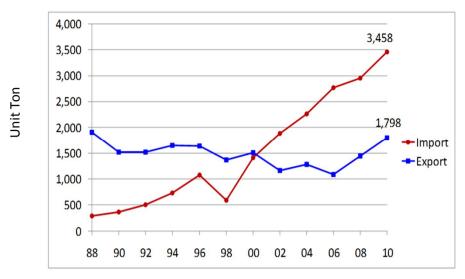
Source: MIFAFF, 2012 3.3.5.4 Fishing Vessels 120,000 99,658 100,000 80,000 **Unit vessel** 76,975 75,244 60,000 40,000 20,000 0 84 04 80 88 92 96 00 08

Figure 14 Evolution in number of fishing vessels

1980 - 2008

Source: MIFAFF, 2012

3.3.5.5 Korean Fish Trade



1988 - 2010

Figure 15 The Trends of Fish Import and Export

Source: MIFAFF, 2012

3.3.5.6 The position of Korea in the World Fishery Trade 2008, unit = million

USD

Table 10 Export in 2008

Y	Country	Exports
10	China	10,114
2	Norway	6,936
3	Thailand	6,532
4	Denmark	4,601
5	Viet Nam	4,550
6	USA	4,463
7	Chile	3,930
8	Canada	3,706
9	Spain	3,465
25	Korea	1,286

Source: MIFAFF, 2012

Table 11 Import in 2008

	Country	Imports
1	Japan	14,947
2	USA	14,135
3	Spain	7,101
4	France	5,835
5	Italy	5,453
6	China	5,143
7	Germany	4,501
8	UK	4,220
9	Denmark	3,110
10	Korea	2,928

Source: MIFAFF, 2012

3.4 Founding of the Republic of Korea and Wholesale Market

3.4.1 Wholesale in view of central wholesale market law

Liberated from the Japanese colonial yoke in 1945, Korea established a new government and then a new law of Central Wholesale market was set up in June 1951, to replace the previous law set up by Japanese regime in 1923. This new law operated until 1973. This new law was set up to get rid of the Japanese regulation.

The important aspect of this law is:

- Market opener is allowed only for district public body, and
- Market opener should be a corporation to get approval from the related minister. The appointed corporation must have been recognized adequate for public interests and was permitted to act as a proxy for the entire wholesaler for a part, or for entire wholesale business affairs.

- The central wholesale market fell under the jurisdiction of the Ministry of Commerce and industry, and the minister of this had to designate the market region;
- The exclusive commercial rights of wholesale market were protected under the one market per one city principle.

But, such wholesale market could not fulfill the proper function of the wholesale markets and the market function was made dual by the regulation of the central wholesale market, i.e. already opened wholesale markets and quasi-wholesale markets. Afterwards, in 1961, revision of the article 13 of the National Agricultural Cooperative Federation made it possible to open the joint markets of agricultural and marine products, an own body of sale organization of such products within the sphere of central wholesale market. Then, the wholesale market became triple: central wholesale market, quasi-wholesale market and joint markets of agricultural and fisheries. After the several discussions showing that it was not reasonable for the central wholesale market to be under the Ministry of Commerce and Industry, the resolution came in January 7, 1963 to transfer the business affairs of this central wholesale market to the Ministry of Agriculture. The law revised in October 7, 1965 passed and finally, in August 21, 1967 the central wholesale market was transferred to the Ministry of Agriculture (Jang, 2011).

This agricultural and fisheries wholesale Market law has six important points:

- 1) The related authority was changed from the agricultural and fisheries;
- 2) In the market, the opener was the district public entity, which was changed to Seoul special city, Busan city under the direct control of the central government, cities and local governments;
- 3) The form principle of one city one market had been remained without alteration;

- 4) Analogous or quasi wholesale activities were banned and its penal regulations had been strengthened;
- 5) Accumulation of facility funds was obligated, reinvestment of fees and dues was enforced, and financial support from the government was put in a statutory form and,
- 6) In case of severe conflict for joint market with the wholesale market, the minister of agriculture and fisheries department was to conduct mediation.

The law was to strengthen public nature of the wholesale market and to build up institutional backup for modernization of facilities.

3.4.2 Marketing

The imports of fish and seafood are relatively straight-forwarded when compared to other food and agricultural products. Importers import fishery products and sell to hotels and food service industry directly and to distributors who sell to traditional markets and restaurants. When the import volume is large their generally sell to retailers such as supermarkets, discount stores, department super stores directly. But if the import volume is small, they sell to distributors who sell to retailers.

3.4.2.1 The Distribution Concept

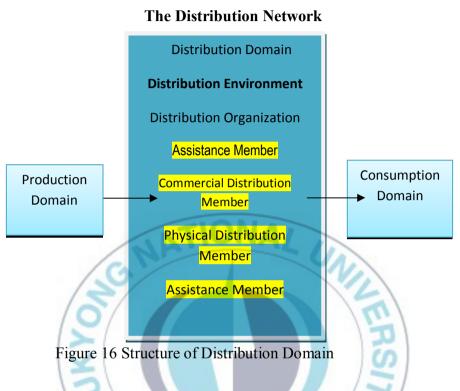
The concept of Distribution has different aspects as summarized here below:

- The distribution as a National economy point and secondly,
- Marketing: individual business management point.
- Then the distribution process which is the process from producers to the consumers.

3.4.2.2 Wholesale Market on Marine Products in Korea

a) Distribution Channel for Marine Products in Korea

The distribution channel for marine products in Korea is understood as a general term of various distribution organizations, through which aquatic products are transmitted, from producers to consumers, thus performing distribution function is at the process of distributing aquatic products.



b) Fisheries distribution channels in Korea

The distribution channels of the fisheries in Korea have two phases. At one hand there is the distribution in port market and at the other, the distribution in the consuming market.

3.4.3 Port Market

At the upstream of the channels of distribution, we have the port Market, the producer who is the set of the fishermen delivers the catches first to the Cooperative Wholesale Market in the port. This sells them via a group of the middlemen, transacting a part of their harvested products to the processor and, to the cooperative wholesale markets in the city and then, to the central wholesale market.

Secondly, the producer delivers also some fish to the collector who also in his turn, delivers to the central wholesale market.

Thirdly, the producer sells to the semi-wholesale market via the broker and fourthly, the producer sells at the producer gate market directly to the consumer. And finally, the producer sells to the consumer by using the direct market methods. He is communicating directly with the consumer.

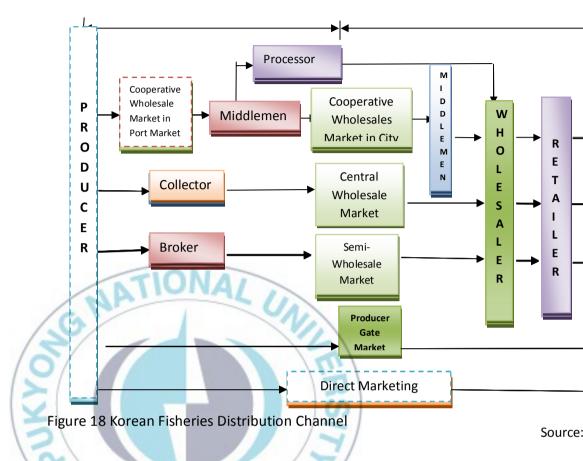
At the downstream, we have the consumer who is supplied by the wholesale through retailers. He is also supplied by producer gate market and via the direct marketing. The Fisheries distribution channels will be presented like the following:

3.4.4 Consumer Wholesale Market

In Korea, the consumer Wholesale Market is located for consumer in the larger city. And there are 17 Consumer Wholesale Markets in Korea. The largest fisheries consumer wholesale markets are located in Seoul and are under regulation and management of the Seoul city government.

Structure and Organization of Consumer Wholesale Market Establishment: Local Autonomous Entity Permission: Minister of MIFAFF Authorization: Local Autonomous Entity Admission: Permission Organization Auction Assistant Admission: Wholesale Market Company Intermediary Wholesaler Transaction Participant Admission: Local Autonomous Entity Admission: Local Autonomous Entity

Figure 17 Organization of the wholesale market Source: (Jang, 2011)



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The relation between Fisheries distribution function and of production and consumption is of many orders:

- Discrepancy of Place corresponds to the Function of Transportation;
- Discrepancy of time corresponds to the function of Storage;
- Discrepancy of understanding corresponds to the function of Transmission;
- Discrepancy of ownership corresponds to the function of transaction;
- Discrepancy of Assortment corresponds to the function of merchandize assortment;
- Discrepancy of quality corresponds to the function of sorting;
- Discrepancy of quantity corresponds to the function of gathering/dividing

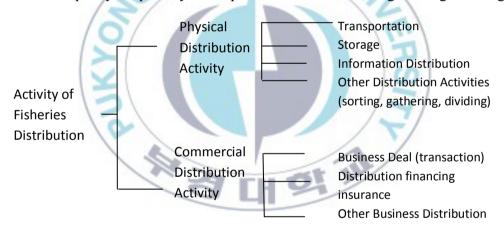


Figure 19 Fisheries Distribution Activity in Korea

Source: Jang, KOICA-PKNU, 2011

In conclusion to this part which, consisted of presenting the Korean Fisheries in general and distribution structure in particular, I would like to say that, the fisheries in Korea had been for long a concern of the government researchers, professors, and fishermen. Many technical measures and approaches have been undertaken to regulate fishery resources in Korea even though, these have not yet succeeded to recover the fish stock. The reason is on different aspects. Among these aspects are, environmental or ecosystem disequilibrium and non-observance of the ideas suggested by researchers.

The seafood distribution structure and its importance have been presented in this part including the Korean fishery regulations and the market system.



4. A Comparative analysis of Fisheries and Distribution Structures between D.R. Congo and Korea

In recent, the fisheries managers agree that the world fishery resources are seriously declined by environmental and socio-economic factors such as, global warming and climate change, pollution, IUU, overfishing etc., but the market still have a continuous need in fish and fish products. Therefore, the fish resources require a sustainable management for their rebuilding. To achieve this purpose, the participation of each State concerned in fishery resources is desired to undertake the responsible actions of control and regulations, capable not only for prevention of resources to get decline, but also for their recovery. The comanagement of fishery resources by both fishermen and fishery authorities proves essential for efficient preservation. The governments have to play well the role of employing, training, equipping and, deploying the staffs to accompany fishermen on the use of the responsible and ecofriendly technics, so that they can preserve resources and get the knowhow on handling the production to alleviate the post-harvest loss

Moreover, to be thus efficient in seafood resources management the marketing distribution structure plays an important part. Because, it makes easy both sales and management of the resources and accelerates the transactions from fishermen via middlemen and traders up to consumers. It also helps the government to have access to the remote landing zones and facilitates the surveillance. Consequently, the application of regulations can be effective and the collection of reliable data will be evident. For this reason, the fishery sector

can be considered as a whole set where the management and distribution of resources are the components.

The seafood demand is growing in the market and has become undeniable to the fact that, the fishing industry is suffering from dramatic reductions in the supply of the wild caught traditional species. The aquaculture which is an alternative source to the wild fish catches has now an advantage in the marketplace. Once, it was viewed as the wave of the future, it is now generally accepted as a significant source of the product (Timmons and Ebeling, 2007).

Though, some States have tremendously performed well in the development of their fisheries and have even already made the aquaculture, as a second source of fish and fish products, especially some of Asian States like: China, India, Indonesia, Korea and Japan; for others, it is not the case.

In this part of research, the case of Korean fishery early described in the second part, will serve as a source model of inspiration for the development of the DRC fisheries.

4.1 Impetus and impact of Seafood Trade Structural Changes

Before comparing the two fisheries management and distribution systems, let us have a glance on the impetus and impact of seafood trade structural changes and see how important it worth it for the creation of the market in a country of potentials and opportunities, namely DR Congo.

In fact, the fish and fishery products are tremendously traded in the world. They have long been commercialized, and in the period 1976-2008 the fishery trade grew significantly, at an average annual rate of increase of 8.3 percent in

value terms. This rise was aided by structural changes in the fishery sector, including the growing globalization of the fisheries and aquaculture value chain, and by the outsourcing of processing to the countries where comparatively low wages and production costs provide a competitive advantage (Kim, 2011). Therefore, in his study, it was realized that, the improvement in processing, packaging, transportation and changes in distribution and marketing, changed significantly the way fishery products were prepared, marketed and delivered to the consumers.

The role of the marketing system should be also more considered in the fisheries of the less-developed countries to enhance the seafood supply structure, as well as in the developed countries. It was observed that, in less-developed-countries (LDC) economic planners traditionally are more productive than marketing oriented. They tend to regard marketing or distribution as an inferior economic activity and are more concerned with the problems of production, investment, and finance than with the problems of efficiency of distribution (Reddy and Campbell, 1994). By the way, it was find out that, while the marketing in the developed countries focuses on satisfying needs and wants in the presence of material wealth, in LDCs marketing is more focused in the delivery of goods and the development of infrastructures to permit further development. Here is the key point of this study which is more concerned with the seafood production and distribution structure.

Therefore, this chapter tries to compare the Korean and Congolese seafood distribution structures by making an analysis based upon the fundamental parameters already defined above.

4.2 Fisheries market

In a broad meaning, the total fisheries related markets are for all fisheries using, Trade and Distribution such as, the Fisheries Processing Market, Fisheries Wholesale Market, Fisheries Retail Market, Fisheries Export Market, etc.

In a narrow meaning, there is only Fisheries Wholesale Market. For example, the Fisheries Cooperative Wholesale Market in Port Market, Central Fisheries Wholesale Market in the larger city.

4.3 Identification, analysis and explanation of similarities and differences between these two countries

To make such comparison, some contextual parameters need to be considered, in order to understand the cases taken for analysis. As these two countries have been already identified and described, the present stage is of discussing the similarities and divergences based on:

- Water resources;
- Seafood supply structure and Processing facilities and Market;
- Electricity energy;
- Circulation infrastructures:
- Education and research and,
- Labor (human resource).

4.3.1 Similarities

Korea and DR Congo had in common the same characteristics of being dominated by the foreign countries and been on the brink of poverty, having passed through different wars, lost many of their people in diverse manners. They have also received financial and technical assistance from other developed countries to combat poverty, starvation including the rebuilding of infrastructure and human resources. In addition, they have the big size of the population (Korea 48,754,657 with a land area of 99 000 km² and Congo around 66,000,000 with a land area of 2,345,000 km²) to feed and utilize as labor for development of all sectors including fisheries.

4.3.2 Differences

The differences between the two countries consist mainly on the geographical location and climate aspects. Korea is a temperate country with four seasons (summer, fall, winter and spring) endowed with a long coastal line providing an enormous fishing industry, though the production is now decreasing during these last years. Consequently, Korea has the cold water fish species and has developed this industry from the fishing up to the market, with the very high technology such as, the fishing gears, processing facilities and circulation infrastructure, high industries of fishing gears, fish feed and fish processing. Among the biggest fish markets, it has Busan International Fish Market, Busan Cooperative Fish Market, Noryangjin Fish Market, and Seoul Seafood Show, Family Fish Market tour, etc...

At the other side, DR Congo is a tropical country with a very limited coastline (about 40 km) but, have a big potential in the inland fishery resources estimated to 700,000 tons per year (Lakes and River with its tributaries. Comparing to Korea, the country has mainly the freshwater fish species familiar to two seasons (rainy and dry season). However, the fish stock is still seemingly promising the high productivity if efficiently exploited with adequate gears and there is a big opportunity to diverse the fish culturing. The improvement of infrastructures at all level and order in licensing to eradicate the IUU fishing can hopefully, create a big impact on the yield and the market supply.

4.4 Republic of Korea

Korean seafood Distribution Structure (Channels) presents a coherent system in which, each element seems to playing its part. Once fish are harvested, they pass through several channels before reaching the consumers. And in this diversity of channels, the consumers have an advantage to buy more fresh fish than processed one.

The first unit is the Cooperative wholesale market at the Port. This market deals with the middlemen, who sell the products by auction to the processing companies, to the Cooperative Wholesales Market in the city. This cooperative Wholesale Market together with the semi-Wholesale Market, receive respectively the products from the Middleman, Collectors and Brokers and forward them to the wholesalers in the consuming Market in the city where the retailers buy and sell to the consumers. The Producer Gate Market and the Direct Marketers take immediately the products from the producers at the Port and deliver them to the consumers without any intermediary.

In fact, the fisheries cooperatives has two important groups, based on regions and fishing industrial classification such as trawl fishery, purse seine fishery and, fish processor's cooperation. The major role of these cooperatives is to assist the fishermen in the marketing of their catch. They also provide to their members (fishermen and fish farmers) with the market information based on production amount, price etc. they operate cold storage plants to freeze and hold the fish freshness until the market is more favorable. Finally, they also operate in the fish port markets and city markets for selling the fish products of their members and make arrangements from ship to the port market.⁶

4.5 Distribution Organization

There are three forms of organization in fisheries distribution in Korea:

- Gathering Function Organization with the small quantity of production but, mass consumption;
- Dividing function Organization with a mass production but, small quantity consumption;
- Gathering-Dividing function Organization with a small quantity dividing production and a small quantity dividing consumption.

Observation: All this happens without hindrance caused by traffic or poor road condition. Everything is well organized and the electrical energy is always permanent to make function, all the appliances and machines in the offices and conservation facilities.

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⁶ Jang, 2011, KOICA-PKNU lecture

- The transportation mode: is so convenient, comprise of Train, Vehicles, and Airplane.
- Physical mode: Station, Harbor, Airport, Terminal Station and Physical center

4.6 Democratic Republic of the Congo

The Congolese fishery Distribution Channels presents a slow mobility of fish between the producers and consumers though, in most cases the trade intermediaries are not too much involved in the distribution process compared to Korean seafood distribution channel. Except the riverine, lakes and coastline area populations who can easily afford fresh fish from their resources, it is not the case with the rest of the population living in the big consumption centers. For the only fast way to bring fresh fish to them is by air or by some times by mobile freezers. However, this makes fish very expensive and unaffordable by the majority of the population characterized by low income. The second one is by freezer trucks that can move from the fishing zones to the nearest towns. But in rest of cases, the traders have to go to the landing area and spend some days for salting, dying and smoking. These long processes also make fish products expensive.

Because the fish have to be first, sold to the wholesalers and other traders by the fishermen, which could be the simplest way for them to avoid the middlemen cost, they also spend some days or weeks to transform their fish in a state that it can be transported for the long journeys. These journeys are made by roads, or by trains for the distances of, 336 km like Matadi – Kinshasa, and near 400 km between the Atlantic coastline and Kinshasa. The impracticability of

some of the roads makes the very difficult the evacuation of fish as well as the case for all other commodities.

The fish distribution channels are affected and weaken by the current situations of absence of adequate infrastructures like roads and facilities, though some efforts have now been made to connect rural areas and big consumers' cities. For long distance and time to spend in the way, the traders prefer to sell fish to the neighboring countries. Others prefer to import the frozen fish like mackerel from Mauritania, Namibia etc. which can be sold cheaper than the local production fish.

To close this chapter, the Korean fishery sector which is more developed in general, and in particular the seafood supply channels, can be taken as an example for the development of the Congolese fisheries, despite the weakness observed in overfishing and the stock depletion. But this phenomenon concerns almost every country shared waters. For, the sea has no fence to stop the fish migrating from an area to another, where the living conditions are better for them to survive. The role played by the seafood distribution channels in the development of the fish sector remains preponderant. The DRC can be inspired by the Korean model to get a successful fish distribution system.

Conclusion

The present study consisted of presenting the status of fisheries management and seafood distribution channels between the DR Congo and Korea.

In first part, it presents the purposes behind carrying out such study, the approach used to compare these two systems.

In the second part, the DR Congo fishery resources and management is largely described, by showing how the country is rich in inland fisheries but still unable to increase the production. Again, the tiniest quantity of fish produced is suffering the post-harvest loss. The market demand in fish remains higher than the current production. Consequently, the country continues to depend on fish products import. The main constraints delaying the increment of the production are shown as the incoherence and inefficiency in management; lack of basic infrastructures, the very poor and slow interaction within the system, and the inability to conduct the permanent fish stock assessment and promote provide industrial or semi-industrial fishing investment. The seafood distribution system is also presented in chart and reveals the heaviness in processing and delivery.

Thirdly, the Korean fishery resources, management and seafood distribution and the marketing system are presented. This part have examined the status of all fisheries in Korea, from where it had the high production, how it came to be declined and the control measures and plan adopted to rebuild up the fish stock. As in the previous part, it presents the marketing system, going from the genesis of the wholesale market up to the current situation. Here, the distribution system is almost totally developed compared to the Congolese system, which is still poor and even moribund.

Finally, the last part is comparing the fisheries management and the distribution systems between the two countries. And came to the conclusion of one is highly developed despite its own problems and at the other hand, the other is still almost primitive and needs technical assistance and expertise for recover.

Therefore, for the DR Congo which has water resources and the potentialities to develop fisheries, it is possible that the fish production can be improved to meet the population demand; the volume of production is remaining lower than its potential.

The transfer of technology and expertise from Korea to DR Congo is necessary. Because development of the fishery sector like all others, can begin only by training both the staff at all levels and the fishermen on the importance of the responsible use of the resources. The development of aquaculture nearby some of these water resources such as, deviation of rivers to create bonds and rear fish can also improve much better the fish production.

Therefore, the increase of fish production and improvement of infrastructures and the distribution channels will make the DR Congo the viable fish market in Africa. The creation of fishery research centers, the rehabilitation and upgrading the existing institutions will bring an efficient fishery resources management.

The reform made with the help of FAO on the fishery legal framework and already submitted to the parliament, needs to be adopted in order to enhance the regulation and the resources management. The reorganization of the fisheries sector and motivation of its staff will assure the preservation of the resources.



Acknowledgements

First of all, I am so grateful to my, Professor Yang Soo Jang, who supervised this thesis from the beginning up to the end with big concern in regard with the progress. His advices helped me to carry this thesis to a good achievement.

Secondly, my thank is directly expressed to the Korea International Cooperation Agency (KOICA) who financially supported my studies in this International Graduate Program of Fishery Science at the Pukyong National University, with aim of capacity building the human resource development in the developing countries (Democratic Republic of the Congo) and enhance the technical cooperation program for the successful development.

Thirdly, I would like to thank all the professors and student colleagues who directly or indirectly brought their contribution for the realization of this thesis.

I deeply appreciate the Professor Yong Ki Hong (The Program Chairperson) and Dr. Kyung Mee Kang (The Program Coordinator), Professor Hong Sung Yun, Professor Sang Go Lee, Professor Hee Dong Pyo, Professor Seong-Kwae Park, Professor Chun Woo Lee, Dr. Dohoon Kim and all other Professors of Fishery Science, I sincerely

thank them for their cooperation during my study and research in Korea and at Pukyong National University.

Finally, I thank all my Korean friends, acquaintances and international students for their love and kindness manifested to me during my stay in Korea.

Pukyong National University

Busan, Republic of Korea



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