

## **SUPPLY CHAIN ANALYSIS FOR FRESH SEAFOOD IN HAITI**

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### ABSTRACT

The Republic of Haiti is located in the Caribbean region and shares the island of Hispaniola with the Dominican Republic. There are around 50,000 subsistence fishers who rely on over-exploited and poorly managed coastal fisheries resources. There is a lack of policy, legal, institutional and administrative framework, and resources to ensure proper management, sustainable use and preservation of products. At present there is no plan for fish production in Haiti. Fish processing and quality control are poorly developed. Traditional fish processing methods such as sun drying and smoking are widely used resulting in considerable post-harvest losses. Most fishing boats lack ice and refrigeration capabilities and are therefore not conducive for fresh fish preservation. Establishment of a marketing chain for fresh seafood in Haiti can contribute to economic development by providing employment opportunities throughout the value chain, especially in marketing. The development of a marketing chain can also increase the local supply of fish thereby improving human nutrition and national food security. Small and medium fisheries enterprises can be developed as export-oriented agribusinesses. In this paper a preliminary assessment of the situation is provided, as well as recommendations are given for specific activities to be conducted for the strengthening of the sector and establishing a marketing chain for fresh seafood in Haiti.

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## 1 INTRODUCTION

The Republic of Haiti is a Caribbean island surrounded by the Caribbean Sea to the south and the west, the Atlantic Ocean and Dominican Republic to the north and east respectively (Figure 1). Haiti has an area of 27,750 km<sup>2</sup>, with an Exclusive Economic Zone of about 112,025 km<sup>2</sup> and the coastline is nearly 1,700 km. The country is divided into 10 regions with a total population of about 10 million (Michel 2010).



Figure 1. Map of Haiti (Mollen 2009).

Haiti has diverse renewable marine resources that stretch from the coastal zone into the Caribbean Ocean. There is a great potential that these marine resources can contribute to the overall development of the country. Fisheries in Haiti are solely artisanal (small scale) and it contributes significantly to the income of the practitioners. Local seafood is important in providing food security to the Haitian population. The fisheries sector has been given a priority by the Haitian Government over the past ten years with considerable promotion of artisanal fishing. The effort has been focused on implementing a number of projects with the aim to improve the capacity of fishermen. However, there is a lack of proper handling practices, preservation and marketing of seafood products. According to a survey done by Institute of Research and Application of Development Methods (IRAM) in July 2007, more than 40% of harvested seafood is lost due to insufficient facilities and handling on board fishing boats, mainly due to limited use of ice and refrigeration (IRAM 2007).

The country has not been able to produce enough food to feed the population. Over 50% of all food is imported. As with other foods, fish is imported to meet national demand. The current per capita consumption of fish in Haiti is 4.5 kg/year. This is four times less than the global average, which is 18 kg/year (Hargreaves 2012). Fishing and other domestic food production has not been as profitable as imported goods. Private investment in domestic fisheries has consequently been low and that has inhibited growth in the sector. The poor state of basic infrastructure such as road and electricity system has also prevented development of fisheries in Haiti (IRAM 2007).

According to the fisheries divisions the estimated fisheries potential in Haiti is about 23,000 to 25,000 tons (Robert 2008). In order to increase the consumption of local seafood in Haiti, an additional effort is needed to improve fish handling, processing and marketing. This project identifies and highlights the constraints and opportunities of the fisheries in the country that can be implemented to strengthen the development within the fisheries sector. The main objective is to analyse and propose ways of improving the efficiency of the fish supply chain in Haiti. The supply chain is defined as “The management of upstream and downstream relationships with suppliers and customers to deliver superior customer value at less cost to the supply chain as a whole“ (Christophe 2000). To achieve this, a detailed

description of the current situation of the fishermen will be given, specifically the state of their livelihoods.

This project will focus on improving the livelihood of the fishermen through access to new business opportunities, and adding value to the seafood products they sell. The situation of the fisheries sector in Haiti is facing various problems including production, storage, processing and marketing. In many fishing communities, fishermen are facing difficulties in the preservation and sale of their catches because the local market is not structured and organized. The lack of adequate means of storage and distribution and marketing of products represents a major handicap. The lack of ice accelerates the problem of preservation of seafood products on the fishing communities. This fact has serious implications on the quality of fish products available on the market, especially a perishable product like fish.

Many efforts have been made for the past ten years, in terms of promotion of improved fishing. Including the implementation of fish aggregating device (FAD) in many parts of the country has improved the capacity of fishermen. Further efforts should be made to make the work already done more profitable for fishermen. The purpose of this project is to contribute to the development of Haitian fisheries.

## **2 THE FISHERIES SECTOR IN HAITI**

Fishing in Haiti is divided into two categories, inland and marine fisheries. This project will focus on the latter.

### **2.1 Inland fisheries**

The inland fishing is practiced mainly in fresh water (lakes and rivers) of about 22,000 hectares. This sector has social and economic importance because it contributes about 4% of the national fish production and provides employment to about 800 fishermen. Averagely the Inland fish production is about 600 tons a year. Aquaculture, which is relatively underdeveloped, produces about 100 tons per annum (FAO 2013, Michel 2010).

### **2.2 Marine fisheries**

Marine fisheries in Haiti are exclusively artisanal. This sector is one of the most marginalized and neglected in Haiti (Aquablog 2010). This sector supports about 50,000 fishermen who operate from 400 fishing communities (IRAM 2007). Different boats and a range of diversified fishing equipment characterize marine fishing in Haiti.

There are two main types of fishing boats, the non-motorised and motorised, which was introduced in 2004. The non-motorised consist of the dugout wooden boats and the flat-bottomed boats, which range in length of about 3.3-5 m that are propelled by paddles and oars. Currently, there are about 15,000 dugout wooden boats and 4000 flat-bottomed boats (Masters 2010, IRAM 2007).

Rowboats and the fiberglass boats are motorised, with outboard engines of 15-25 horsepower, and lengths up to 6 m. There are about 1000 rowboats, and the fibreglass boats, which have recently been introduced particularly in the southeast region and are not yet estimated (Masters 2010, IRAM 2007).

Fishing gear used includes the gillnets or trammel nets that catch ground fish and beach seine nets, which mostly catch the sardines, mullet, snapper and sparidae species. The traps are for the lobsters and queen conch and the rifles, which targets the sharks. Also there are lines for capturing various pelagic fish such as sea bream, tuna and wahoo.

### 2.3 Marine fisheries production and importance

The marine fisheries contribute a greater amount of Haiti's total fish production. Over the years, the composition of marine fisheries has been between 90 to 95% of the total national production. In 2010, the marine production was 16,000 tons (95%) out of the annual production as seen in Figure 2 (Masters 2010).

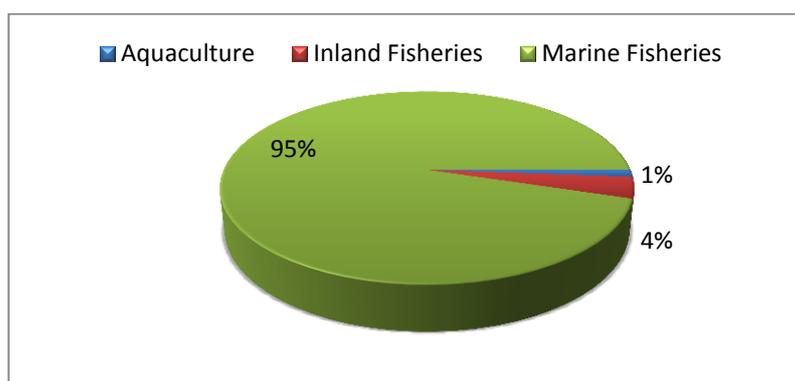


Figure 2. Contribution of each sector in Haiti fisheries.

In 2004, the introduction of the outboard motors and FADs by an NGO called the Economic and Social Assistance Fund (FAES) brought significant changes to the marine fisheries in terms of production. Fish production has increased gradually since 2005 from 8,000 tons to about 16,000 tons in 2010 as illustrated in Figure 3 below.

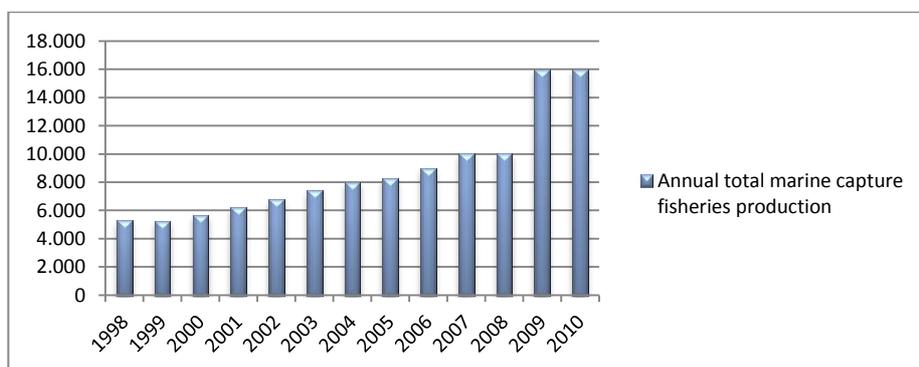


Figure 3. Annual marine catch from 1998 to 2010 (Masters 2010).

#### 2.3.1 Species harvest in the marine fishery in Haiti

Marine fishing in Haiti produces diversified seafood, which includes fish, crustaceans, molluscs and ornamental fishes of varying commercial importance.

## Fish

Fish constitute a large amount of the marine fisheries production in Haiti. According to a survey done by Institute of Research and Application of Methods Development fish species contributed about 75% (12,000 tons) of the total marine catch (16,000 tons) in 2010. The survey also estimated that 30 to 40 % of this volume was salted and dried for preservation (IRAM 2007).

The fish captured in Haiti comprises pelagics from the families clupeidae (herrings and sardines), scombridae (tuna, bonitos) and carangidae (mackerel, scads, pompanos). The demersal fishes consist of the sphyrnidae (barracuda, snappers), serranidae (groupers) and the sparidae such as the seas breams.

There is generally local demand for all fish types except for the larger pelagic such as marlin, and tuna, which are exported. On the other, to supplement local production about 15,000 tons of frozen fish (mackerel), salted herring (5,000 tons) and smoked herring (1,000 tons) are imported mainly from Canada and these frozen fish are popularly consumed as fried fish.

## The Crustaceans

### a. Queen conch (shells and flesh)

The average Queen Conch harvest is about 300 tons per annum (IRAM 2007). It is important for its flesh (domestic use and export) and shells, which are solely for export. The export trade in queen conch to Europe has been closed as part of the Convention on International Trade in Endangered Species (CITES) since 2003. What is harvested is only for local consumption. Data on exportation of the queen conch (flesh & shell) is shown in Table 1.

*Table 1.* Export of conch (shells and flesh) form 1994 to 2004 (IRAM 2007).

Conch	94-95	95-96	96-97	97-98	98-99	99-00	00-01	01-02	02-03	03-04
Shells	173	161	152.92	124	132	192	236	392	338	228
Flesh (tons)	-	-	-	-	53	71	113	154	219	110

### b. Lobsters

Lobsters, which are caught using traps, are the most expensive of all the seafood in Haiti. The national production of lobster is on average 900 tons. Lobster was mainly exported to North America, Dominican Republic, Europe, Martinique and Guadeloupe, but exports were closed due to the absence of a quality control system required by the Europeans. According to IRAM (2007), export of live lobsters continues to the Dominican Republic and is facilitated by middlemen. It is estimated that on the average about 150 tons is illegally transported yearly (IRAM 2007). Due to the high price, domestic consumption is very low and is mainly in hotels and restaurants in the capital and the coastal tourist sites.

### c. Shrimp

With the average production of 200 tons per year, shrimps are mostly consumed locally and in cases where there are exports, it is only in small quantities (IRAM 2007). Shrimp exports

have been inconsistent, as illustrated in Table 2, since 2000 and currently there is little or no trade due to stricter requirements imposed by importing countries.

*Table 2. Export of Shrimp from 1994 to 2006 (IRAM 2007).*

Year	94-95	95-96	96-97	97-98	98-99	99-00	00-01	01-02	02-03	03-04	04-05	05-06
Shrimps (tons)	93	143	31	53	139	100	63	52	49	28	-	-

#### d. Crab

Haiti fisheries produce about 900 tons of crab annually, of which some are exported. Between 2004 and 2005 about 240 tons were exported (IRAM 2007). Usually there is high local demand for crabs, which are caught using nets.

#### Others species

##### a. Ornamental fish

According to IRAM (2007), there is only one exporter of ornamental fish, producing about 50,000 to 100,000 fishes per year. Export is sent primarily to the United States (Bruckner, 2005). These include the butterfly fish, angelfish and trigger fish.

##### b. Holothurians (Sea cucumbers)

The fishing companies in the Caribbean funded a study in 2001 to survey the potential of sea cucumber harvest in the Haitian coast. This study was done by Cuban scientists who estimated that around 800 tons (weight after drying) per annum can be harvested annually from each coastal region. Thus, from nine coastal regions about 7,200 tons of sea cucumbers can be exported (Table 3).

*Table 3. Export of Sea Cucumbers (IRAM 2007).*

Year	01-02	02-03	03-04	04-05
Sea Cucumber (tons)	160	154	494	710

## 2.4 Challenges in Haiti's Marine Fisheries

The problems associated with the fisheries sector in Haiti have been the subject of many recent studies. Haiti's fisheries are administrated by the Ministry of Agriculture, Natural Resources and Rural Development (MARNDR) and directly under the Fisheries division. However, due to a lack of resources and equipment, limited organizational capacity, lack of personnel, poverty and political instability, there is little to no monitoring, surveillance or enforcement of the Fisheries Act (1978) and regulations (ACP 2013). This has resulted in a lack of fisheries data. The few data available were gathered through funding from NGOs and other Overseas Development Agencies (ODAs) such as JICA and ACP Fish II.

To date, no assessment of marine resources (apart from the sea cucumber survey) has been made. Given that seafood is in high demand, and considering the urgent requirements to protect marine resources, 'such an evaluation would allow better planning of operations while

safeguarding the environment for a sustainable and productive fisheries' (Haiti libre 2010). This is why better assessment of the marine resources in Haiti is required.

The destruction of forests in Haiti has led to the erosion of the topsoil and its deposition into the marine environment causing very high levels of sedimentation in the near-shore waters. Additionally, mangroves that serve as possible nursery grounds for some species in the coastal waters, are destroyed for utilization as domestic fuel. Dumping of solid waste and sewage into the sea, mainly in the form of plastic remains and petroleum waste products has also contributed to the environmental challenges. This has led to the pollution of the marine environment and resulted in the relative depletion of fish stocks in the coastal waters (CRFM 2010). However, the degree of depletion is varying in all the regions with the West, Grand'Anse and the southeast being more productive (CRFM 2010). One major issue, which cuts across all these three fishing regions, is the problem of adequate fish storage, processing and marketing.

The number of fishers in Haiti is increasing due to high poverty and unemployment conditions in the country (ACP 2013). Fishing is now considered as an alternative livelihood source. NGOs, such as the Spanish Corporation in 2004 provide support to the fishing industry through distribution of fibreglass boats and out board engines, a majority of which are in the southeast region of Haiti. However, the Fisheries Division did not regulate the distribution and this has resulted in increased effort. At the same time, this intervention that increased fish production (since 2005 as shown in Figure 3) created the problem of preservation and distribution.

The supply chain of seafood products is a challenge due to the absence of adequate fish storage and preservation systems such as fishing harbours, cold stores, and ice making plants. As such, fish landed must be sold immediately to middlemen and fish retailers. The unsold fish are usually salted and dried to avoid spoilage.

The development of sustainable fisheries requires effective institutional capacities and should aim to solve basic problems such as the supply chain.

## **2.5 Fisheries marketing in Haiti**

Haiti is a member of the Caribbean Regional Fisheries Mechanism (CRFM) and contributes significantly to the region in terms of marine capture fisheries (Figure 4). Between 2006 and 2010, the average total marine fish production from Haiti was estimated as 13,600 tons, which was about 10% of the Caribbean region total (136,802 tons). Haiti production is ranked third among CRFM member states (Masters 2010).

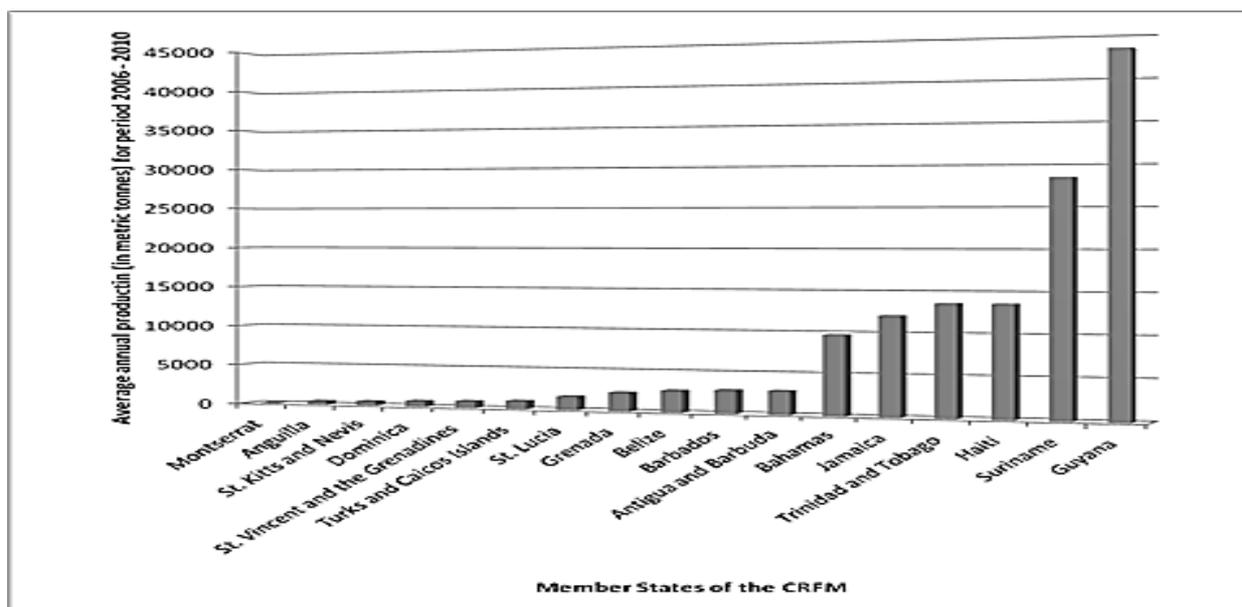


Figure 4. Average annual marine capture fisheries production of CRFM Member States (ordered from lowest producer to highest producer) for the period 2006 – 2010 (Masters 2010)

However in Haiti's domestic market, fish production does not meet the per capita seafood consumption of Haiti. Fish supply in Haiti is mainly from three areas, West, Grand' Anse and Southeast, out of the nine fishing regions (Figure 5). To analyse the existing situation of fish supply in Haiti the Southeast region will be used as an example.

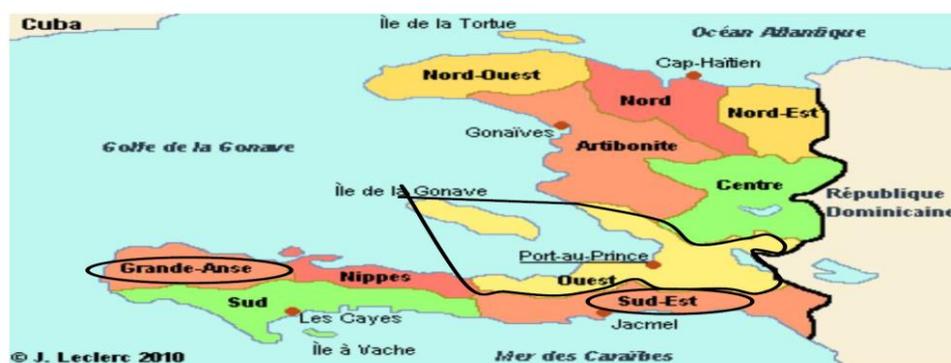


Figure 5. Map showing the 3 more productive regions, West (Ouest), Southeast (Sud-est) and Grand'Anse (Jacques 2013).

The Southeast region is located close to the Caribbean Sea to the south. It has an area of 2034 km<sup>2</sup>, a coastline of 140 km. Its population is estimated at 461,998. It is divided into 10 sub-regions eight of which are near the sea. There are about 4,800 fishermen operating 1,029 artisanal boats including dugout wooden and rowboats. About 36% of these boats are motorized with 15 to 25 horsepower engine. There are about 600 fibreglass boats with engine. For fishing, lines, traps, nets, trammel nets, rifles and beach seines are used.

The economy of the Southeast is dominated almost exclusively by agricultural activities (agriculture, livestock and fisheries), handicrafts and tourism. Fishing is an economic activity of primary importance and creates many employments. According to the fisheries division, the catch per year in 2009 was estimated at 5,000 tons.

Over the past twenty years, the marketing activity of the fish in the Southeast has seen a great change, with the development of seafood export and the arrival of middlemen. The middlemen are the first link in the marketing, after them come the fish retailers. There are about a hundred middlemen and 2,000 fish retailers, most of whom are the wives of fishermen. The middlemen buy the crustaceans and some pelagic species to sell to intermediary, who then sell to wholesalers, exporters and market in Port-au-Prince. The fish retailers buy demersal species including red snapper, grouper, and barracuda and some small fish as sardines and grey mullet. The supply chain for marine fisheries in the southeastern part of Haiti is illustrated below in Figure 6.

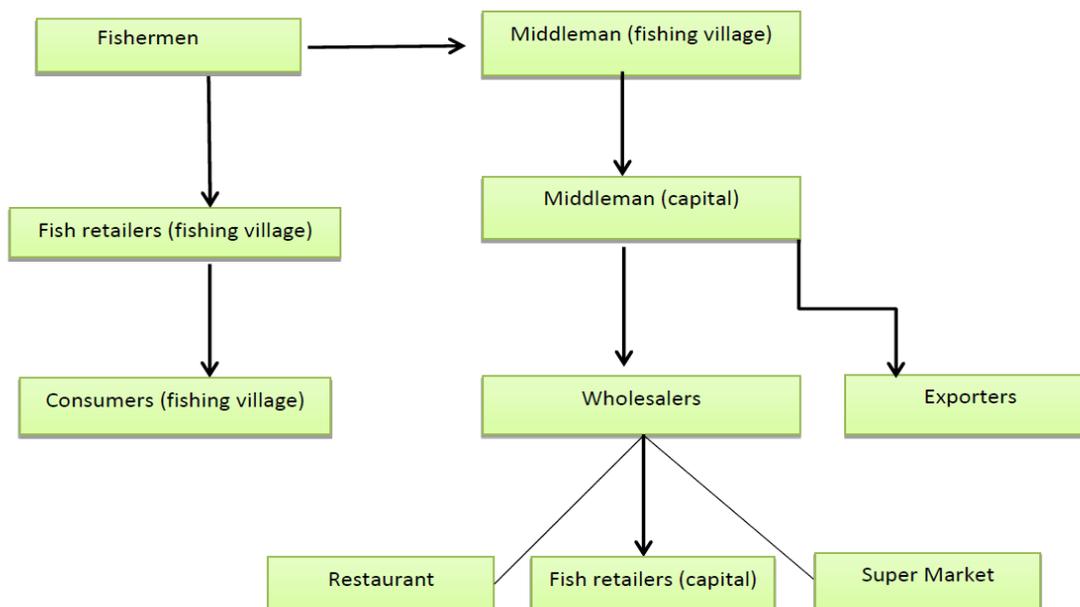


Figure 6. Seafood supply chain in Haiti.

The middlemen also supply equipment, including boats, engines, and fishing gears or give loans to fishermen. In return for providing fishermen with fishing equipment, they reserve the exclusive fishermen's catches or purchase it with discount. Many fishermen lack the means to rent equipment. This results in a high cost of operation for the fishermen, taking into account the calculation of wages after deduction of shares covered by fishing equipment. The main beneficiaries of the sharing system are the middlemen.

The development of artisanal fisheries in the southeast cannot be realized with the use of these marketing channels. They are not effective and insufficient for purchase, and fishermen who miss the opportunity cannot go to another place to sell their catch. In fact, the catches are highly perishable due to lack of preservation. Favrelière (2008) in his study of fisheries in the Southeast Department wrote: "The opening of external markets for seafood, has led to an unprecedented development of fisheries in the South-East. However, this development is carried out without any consideration for fishermen. The level of poverty in fishing communities is generally very high, and fishermen most often marginalized live in the greatest vulnerability. The lack of services specific to their profession and the severe lack of technical support made the fishermen, poorly organized, are not in a strong position, and then they maintain inequitable relationships with other actors in the chain fishing"

### **3 METHODOLOGY**

For this project, combinations of both primary and secondary data were sampled. Primary data were mainly interviews on Skype and phone with select stakeholders such as government officials, NGO's and indirectly fishers, to obtain first-hand information on the fisheries and current situation. Secondary data were collected from country and survey reports and literature.

The logical framework was used to ensure a consistent analytical approach on identification and formulation of the project. The logical framework can be split into two phases, which are: the analysis phase and the planning phase. However, this project will only focus on the analytical part. Hence, the analytical part was used to describe the problem of oversupply of fish in the south coast of Haiti and lack of supply inland.

The analysis phase analysed the existing situation and developed a vision of the future desired situation. There are four stages on the analysis phase (European Commission 2004):

1. Stakeholder analysis: The purpose of the stakeholder analysis is to identify the different individuals or institutions that were affected directly or indirectly, positively or negatively by the proposed project and giving their characteristics and roles.
2. Problem analysis: Analyse the major challenges faced by stakeholders in order to identify the negative aspect and establish the causes and effect.
3. Objective analysis: The aim is to reformulate the challenges in a positive aspect to find out the means and end, based on the problem analysis.
4. Strategy analyses: Select the strategies that will be applied to achieve the desired objective and also look at the feasibility of different interventions.

A properly planned project addressing the real needs of the beneficiaries cannot be achieved without an analysis of the existing situation.

#### **3.1 Limitations of the project**

Data collection was carried out to reconstruct an overall concept of fisheries in Haiti and the current situation on the supply chain. Data is focused on quantity of seafood export. The lack of statistics and data is one of the major challenges in the fisheries sector. The data available were limited.

### **4 RESULTS AND ANALYSIS**

#### **4.1 Stakeholders Analysis**

The stakeholders are people, group or organizations that have concerns or interest in an organization. Stakeholders can affect or be affected by the organization's actions, objectives and policies. Table 4 shows the different stakeholders in the marine fisheries in Haiti.

Table 4. Description of each actor on fisheries in Haiti.

<u>Key Stakeholders</u>	<u>Primary stakeholders</u>	<u>Secondary stakeholders</u>
<ul style="list-style-type: none"> <li>• Fishers               <ul style="list-style-type: none"> <li>○ Small scale fishers</li> </ul> </li> <li>• Government</li> <li>• NGO</li> <li>• Consumers</li> </ul>	<ul style="list-style-type: none"> <li>• Local communities</li> <li>• Fishermen families</li> <li>• Traders               <ul style="list-style-type: none"> <li>○ Middlemen</li> <li>○ Exporter</li> <li>○ Wholesaler</li> </ul> </li> <li>• Service in input</li> <li>• Transports               <ul style="list-style-type: none"> <li>○ Land</li> <li>○ Marine</li> <li>○ Air</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• International market</li> <li>• National market               <ul style="list-style-type: none"> <li>○ Institution (restaurant, hospitals)</li> </ul> </li> <li>• Retailers</li> <li>• Tourist industry               <ul style="list-style-type: none"> <li>○ Tourist</li> <li>○ Hotel</li> </ul> </li> </ul> <p>Restaurants</p>

#### 4.1.1 *Characteristic of Stakeholders*

##### Fishermen

Fishermen are people who earn their living by exploiting marine resources, and / or who own fishing vessels in order to exploit them. They have low and middle income, they are classified as small or medium-scale. This also includes women involved in the marketing and processing of fish.

##### Government

Ministry of Agriculture who consented considerable efforts to increase economic activities that can improve the fishing crafts in Haiti.

##### NGO's

NGO's provide economic support to fishermen. They are a high interest group, and have low political influence.

##### Consumers

Consumers have the purchasing power. They play an important role in the economic system.

##### Local communities

They will find fresh fish and also benefit from creation of employment.

##### Traders

They represent an important part of the supply chain of seafood, often large quantities of fish are transported through them. In Haiti, they are better compared to fishermen. Some of them are owners of boats or fishing material. They usually buy fish from fishermen and sell them to exporters, retailers and restaurants.

##### Logistics

Transporters provide transportation service to fish traders/wholesalers. They are important in the fish trade channel. The transportation means differ from one area to another. Fish are usually transported by boat, mini truck or pick-up to local markets and fish distribution centres.

## 4.2 Problem analysis

The problem analysis deals with the negative aspect of the marine fisheries in Haiti. The focal problem was identified as inefficient fish supply chain (Figure 7). Other existing problems (causes) such as inefficient fisheries management, bad fish handling, inefficient processing/preservation and inefficient fish marketing have contributed to this focal problem. This has resulted (effects) in low fish consumption arising from insufficient fish supply to the domestic market. Another effect is the poor livelihood of fishers, which is as a result of inefficient middlemen who manipulate fish prices to the disadvantage of fishers.

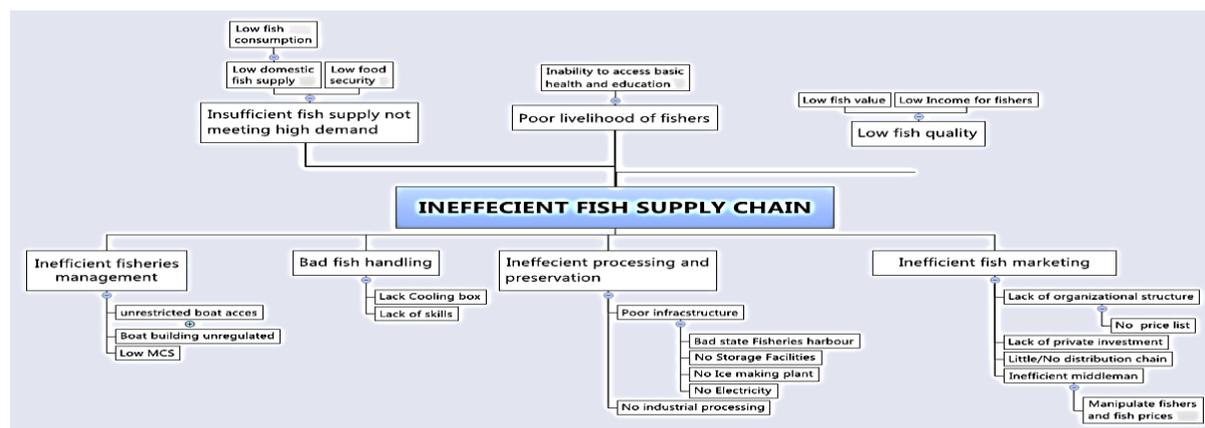


Figure 7. Problem tree shows the different challenges in the fisheries sector.

Also, marketing of seafood products is carried out in the absence of adequate means of preservation (Haiti lacks an ice making plant and other cold storage facilities), which has resulted in low fish quality and subsequently low fish value and income for fishers.

## 4.3 Objectives analysis

The objective analysis shows the positive aspects of a desired future situation, as shown in Figure 8. This is the reformulation of the existing problems. Thus, efficient fish supply chain can be achievable when fish handling is improved and fish processing and preservation is efficient. This will result in improved fish quality and high income, thereby making the livelihood of fishers better.

Through adequate supply chain fish marketing becomes efficient. This leads to sufficient fish supply in the domestic market, increasing fish consumption.

## 4.4 Strategy analysis

The strategic analysis phase involved the selection of the strategy, which will be used to achieve the desired objectives, and focused on the efficient fish marketing. According to the EU project cycle management guide (European Commission 2004), the type of questions that need to be asked in this stage are related to prioritizing the objectives that should be worked on, and working out how achievable the objectives are.

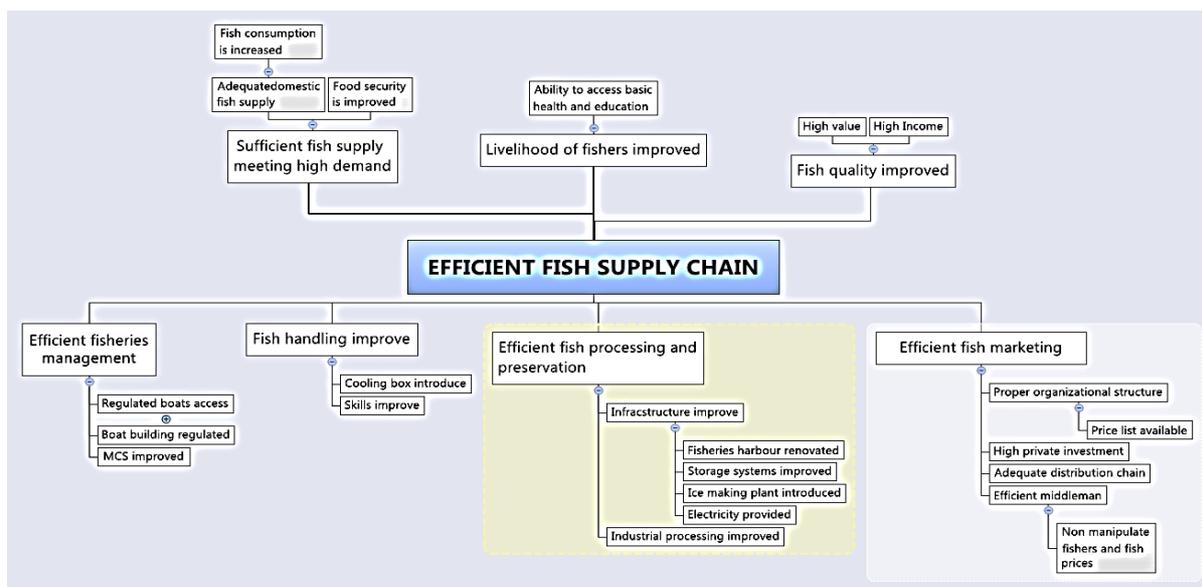


Figure 8. Objective tree showing the problem tree in a positive aspect.

According to earlier the description of the problem in the Haiti fisheries, it is evident that lack of supply chain is one of the biggest problems. Therefore it was proposed here, that instead of working on all the objectives in the objectives analysis, the marketing part would be focused on and solved. This limits the influence of the middlemen in the supply chain and offers the fisherman opportunity to sell their fish through formal marketing channels. Also establishing efficient markets for fish in Haiti can contribute to economic development by providing employment opportunities throughout the supply chain. Small and medium fishing enterprises can be developed as export-oriented agribusinesses and can develop the capacity of the local institutions. There are many opportunities that can be built on, such as high demand for fish and high productivity of the fishermen. Fishers who highly depend on the fisheries need an alternative livelihood and an adequate distribution chain by efficient fish marketing. This can increase the livelihood of fishermen and also increase consumption of seafood, which is very low.

The effects of efficient markets could be on many levels, for example:

*Social Impact:* The income of fishermen beneficiaries should be increased. Additional jobs will be created, especially in the fisheries sector.

*Environmental impact:* Making the exploitation of the high seas possible to reduce the pressure on the continental shelf that is largely overexploited.

*Economic impact:* Improving the livelihood of the fishermen by starting from the most productive place.

To improve the market facilitates in Haiti, it is proposed here to take on a project that would be based on establishing marketing organisation in markets and fish distribution in Haiti. The overall goal would be to improve the marketing mechanisms and distribution of fisheries resources in Haiti, together with the objectives to minimize waste in landed fresh seafood in south Haiti, and to improvement the food security and livelihood through the promotion of sustainable coastal fishery.

It is likely that marketing organisations will solve other problems such as the problem of bad fish handling through providing more transparency in pricing and assistance to fisherman to improve the handling. In the same way, the marketing organisation will need to offer facilities to cool and preserve fish better than it is done today. It is therefore important that this marketing organisation focuses on problems that have been identified in the problem and objective analysis and work on, for example, the following issues:

*Training of local fisheries staff and assembly of marketing team:* Basic hygiene, fish handling and preservation, HACCP standards, processing and packaging innovations, including new equipment and technology, and improved preservation and distribution skills, will be covered in the training to introduce appropriate technologies for reducing fish spoilage (especially for small-scale fisheries). Training activities of the project will not only be theoretical sessions but also include practices, and exchange visits between communities in the project area and other parts of Haiti where levels structuring and efficiency of the sector-fishing are higher. During training sessions, awareness lessons learned by communities and by previous actions will be shared.

*Build a logistic unit equipped to treat freshly caught seafood at sea by fishermen:* This will cover places selling fresh fish to supply markets and to the capital regions. And it will be located at the fishing port and include the following elements:

- A space for receiving fish.
- A treatment room that will be used for cleaning, sorting and packing fish. This activity will be entrusted to women who were previously involved in the marketing of fish.
- A cold room and also some freezers to store seafood products.
- Establish a system of drainage cleaning. Quarantine conditions will be established to promote hygienic and eliminate all forms of contamination.

*Acquisition of refrigerated trucks for the transportation at the capital and other regions:* It is noted that a canter isothermal cooling must be available in order to avoid deterioration of the fish by the distance travelled and the heat during transport products to supermarkets and restaurant chains.

*Women's empowerment and gender equity:* A priority action is to promote the equal participation of men and women in decision-making, in associations and at the completion of activities foreseen in the project including awareness, preservation and marketing of seafood. Training and workshops on gender equity should be organized with associations to develop an organizational policy in gender equity that promotes greater participation and involvement of women in community development and organized spaces. The project will also promote women's participation in the quality and quantity of other activities including recruitment of manpower, training, exchange visits.

The implementation of this project requires a synergy of different partners who will be involved throughout the project; this includes the Ministry of Agriculture, fishermen associations and other stakeholders in the sector. The involvement of members of the associations in the management of centres will gradually grow until the complete withdrawal of the Fisheries Division Departmental Directorates is also concerned. The products will be delivered to the association representatives in charge of the center from a delivery contract. The payment is made once the goods are sold.

Materials made available, as part of this project for the benefit of various associations and groups of fishermen, would be on the basis of credit through microfinance institutions recognized and available in the areas of intervention of this project according to pre-established credit terms.

Considering that very few fishery data collection systems are in place, if fisheries department can obtain the data from the market, it would be very useful information for fishery management purposes.

Haiti should establish credit structures for the fisheries sector in order to allow fishermen and distributors to acquire the means of production and marketing more efficiently and sustainably, allowing them to increase their range and gain more time, and also allowing small merchants to increase their capital.

## **5 CONCLUSIONS AND RECOMMANDATIONS**

The focus of this study was on improving the livelihood of marine fishermen in Haiti, by providing adequate fish supply chain.

The current fisheries situation in Haiti is very challenging. Existing situations such as severe environmental degradation have led to resource depletion in some coastal regions. However, in areas like the southeast, where fish is in abundance, they are faced with distribution difficulties.

Using the LFA, the focal problem associated with these challenges was identified as 'inefficient fish supply chain'. Negative situations such as inefficient fisheries management, bad fish handling, inefficient processing and preservation and inefficient fish marketing have contributed to this problem.

In more desirable situation, when these negative situations have been reversed, the fish supply chain will be efficient. This will result in sufficient fish supply for the domestic market, improved fish quality for high value, which will yield higher income for fishers. As such, the livelihoods of fishers will be highly improved.

Considering the fact that not all the negative situations could be solved at the same time, it was necessary to choose one that would aim at reducing poverty and improving the lives of the fishermen, processors (mostly women) and other people directly/indirectly dependent on the fisheries resources. Efficient fish marketing was strategically selected to adequately solve the problem of inefficient fish supply chain. This will be done through building on existing opportunities such as high demand for fish and high productivity in some regions.

To improve the market facilitates in Haiti, adequate structures need to be in place. These include training of local fisheries staff and assembly of marketing team, building a processing centre, establishing a logistic unit and most importantly ensuring gender equity.

## Recommendations

The decisions on improving the marketing sector must be based on a prospective vision of the future.

The starting point is therefore to focus on the improvement of fish production, which is one of the government's main priorities, and needs to be critically valued. Enforcement of fish quality and safety standards in Haiti should therefore be viewed on a wider scale other than in retail fish selling points only. Nutritional value, quality management and consumer safety of the harvested fish should be given high attention. Implementation of HACCP and traceability requirements will be essential.

The department of fisheries and aquaculture in Haiti should be in a position to provide solutions to some of the problems being faced by the Haiti fisheries and fish marketing, through staff research and extension outreaches. The department can and should play a pivotal role in the area of training and sensitisation of the public.

Involvement of the fishers' communities is essential to project success; they must participate, feel responsible and take ownership of the project. Expectations of fishers' communities must be realistic. Technology required to meet modern facilities such as ice machines and generators, should be used in fishing communities. It will take years, more processing infrastructure and demonstrated benefits to change the mentality of the primary processors.

Substantive change will require constant monitoring and consistent evidence of better examples set by others who have followed the training courses and implemented what they learned about reducing post-harvest losses.

The sector's ability needs to be developed to create more employment, wealth, improve food security and reduce poverty and improve the development of products by subjecting them to the traditional and modern methods of processing and preservation marketing in the best conditions on the hygienic and technical support to provide added value to these products.

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